

CBCS SCHEME

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18MAT31

Third Semester B.E. Degree Examination, Feb./Mar. 2022 Transform Calculus, Fourier Series and Numerical Techniques

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Evaluate (i) $L\left\{\frac{\cos 2t - \cos 3t}{t}\right\}$ (ii) $L(t^2 e^{-3t} \sin 2t)$ (06 Marks)
- b. If $f(t) = \begin{cases} t, & 0 \leq t \leq a \\ 2a - t, & a \leq t \leq 2a \end{cases}$, $f(t + 2a) = f(t)$ then show that $L(f(t)) = \frac{1}{s^2} \tanh\left(\frac{as}{2}\right)$ (07 Marks)
- c. Solve by using Laplace Transforms

$$\frac{d^2 y}{dt^2} + 4 \frac{dy}{dt} + 4y = e^{-t}, y(0) = 0, y'(0) = 0$$
 (07 Marks)

OR

- 2 a. Evaluate $L^{-1}\left(\frac{4s + 5}{(s+1)^2(s+2)}\right)$ (06 Marks)
- b. Find $L^{-1}\left(\frac{s}{(s^2 + a^2)^2}\right)$ by using convolution theorem. (07 Marks)
- c. Express $f(t) = \begin{cases} \sin t, & 0 \leq t < \pi \\ \sin 2t, & \pi \leq t < 2\pi \\ \sin 3t, & t \geq 2\pi \end{cases}$
 in terms of unit step function and hence find its Laplace Transform. (07 Marks)

Module-2

- 3 a. Obtain fourier series for the function $f(x) = |x|$ in $(-\pi, \pi)$ (06 Marks)
- b. Expand $f(x) = \frac{(\pi - x)^2}{4}$ as a Fourier series in the interval $(0, 2\pi)$ and hence deduce that

$$\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots$$
 (07 Marks)
- c. Express y as a Fourier series upto the second harmonic given :

x:	0	60	120	180	240	300
y:	4	3	2	4	5	6

(07 Marks)

OR

- 4 a. Find the Half-Range sine series of $\pi x - x^2$ in the interval $(0, \pi)$ (06 Marks)
- b. Obtain fourier expansion of the function $f(x) = 2x - x^2$ in the interval $(0, 3)$. (07 Marks)

c. Obtain the Fourier expansion of y upto the first harmonic given :

x	0	1	2	3	4	5
y	9	18	24	28	26	20

(07 Marks)

Module-3

5 a. If $f(x) = \begin{cases} 1, & |x| < a \\ 0, & |x| > a \end{cases}$, find the Fourier transform of f(x) and hence find the

value of $\int_0^{\infty} \frac{\sin x}{x} dx$ (06 Marks)

b. Find the infinite Fourier cosine transform of e^{-ax} . (07 Marks)

c. Solve using z-transform $y_{n+2} - 4y_n = 0$ given that $y_0 = 0, y_1 = 2$ (07 Marks)

OR

6 a. Find the fourier sine transform of $f(x) = e^{-x^2}$ and

hence evaluate $\int_0^{\infty} \frac{x \sin mx}{1+x^2} dx ; m > 0$. (06 Marks)

b. Obtain the z-transform of $\cos n\theta$ and $\sin n\theta$. (07 Marks)

c. Find the inverse z-transform of

$$\frac{4z^3 - 2z}{z^3 - 5z^2 + 8z - 4}$$

(07 Marks)

Module-4

7 a. Solve $\frac{dy}{dx} = x^2 + y, y(1) = 1$ using Taylor's series method considering up to fourth degree terms and find y(1.1). (06 Marks)

b. Given $\frac{dy}{dx} = 3x + \frac{y}{2}, y(0) = 1$ compute y(0.2) by taking h = 0.2 using Runge - Kutta method of fourth order. (07 Marks)

c. If $\frac{dy}{dx} = 2e^x - y, y(0) = 2, y(0.1) = 2.010, y(0.2) = 2.040$ and $y(0.3) = 2.090$, find y(0.4) correct to 4 decimal places using Adams-Bashforth method. (07 Marks)

OR

8 a. Use fourth order Runge-Kutta method, to find y(0.8) with h = 0.4, given $\frac{dy}{dx} = \sqrt{x+y}, y(0.4) = 0.41$ (06 Marks)

b. Use modified Euler's method to compute y(20.2) and y(20.4) given that $\frac{dy}{dx} = \log_{10} \left(\frac{x}{y} \right)$ with $y(20) = 5$ Taking h = 0.2. (07 Marks)

c. Apply Milne's predictor-corrector formulae to compute y(2.0) given $\frac{dy}{dx} = \frac{x+y}{2}$ with

x	0.0	0.5	1.0	1.5
y	2.000	2.6360	3.5950	4.9680

(07 Marks)

CBCS SCHEME

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18MAT31

**Third Semester B.E. Degree Examination, Feb./Mar. 2022
Transform Calculus, Fourier Series and Numerical
Techniques**

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Evaluate (i) $L\left\{\frac{\cos 2t - \cos 3t}{t}\right\}$ (ii) $L(t^2 e^{-3t} \sin 2t)$ (06 Marks)
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- c. Solve by using Laplace Transforms
 $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t}$, $y(0) = 0$, $y'(0) = 0$ (07 Marks)

OR

- 2 a. Evaluate $L^{-1}\left(\frac{4s+5}{(s+1)^2(s+2)}\right)$ (06 Marks)
- b. Find $L^{-1}\left(\frac{s}{(s^2+a^2)^2}\right)$ by using convolution theorem. (07 Marks)
- c. Express $f(t) = \begin{cases} \sin t, & 0 \leq t < \pi \\ \sin 2t, & \pi \leq t < 2\pi \\ \sin 3t, & t \geq 2\pi \end{cases}$
in terms of unit step function and hence find its Laplace Transform. (07 Marks)

Module-2

- 3 a. Obtain fourier series for the function $f(x) = |x|$ in $(-\pi, \pi)$ (06 Marks)
- b. Expand $f(x) = \frac{(\pi-x)^2}{4}$ as a Fourier series in the interval $(0, 2\pi)$ and hence deduce that
 $\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots$ (07 Marks)

c. Express y as a Fourier series upto the second harmonic given :

x:	0	60	120	180	240	300
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(07 Marks)

OR

- 4 a. Find the Half-Range sine series of $\pi x - x^2$ in the interval $(0, \pi)$ (06 Marks)
- b. Obtain fourier expansion of the function $f(x) = 2x - x^2$ in the interval $(0, 3)$. (07 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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- c. Obtain the Fourier expansion of y upto the first harmonic given :

x	0	1	2	3	4	5
y	9	18	24	28	26	20

(07 Marks)

Module-3

- 5 a. If $f(x) = \begin{cases} 1, & x < a \\ 0, & x > a \end{cases}$ find the Fourier transform of $f(x)$ and hence find the

value of $\int_0^{\infty} \frac{\sin x}{x} dx$

(06 Marks)

- b. Find the infinite Fourier cosine transform of e^{-ax} .

(07 Marks)

- c. Solve using z-transform $y_{n+2} - 4y_n = 0$ given that $y_0 = 0, y_1 = 2$

(07 Marks)

OR

- 6 a. Find the fourier sine transform of $f(x) = e^{-x^2}$ and

hence evaluate $\int_0^{\infty} \frac{x \sin mx}{1+x^2} dx ; m > 0.$

(06 Marks)

- b. Obtain the z-transform of $\cos n\theta$ and $\sin n\theta$.

(07 Marks)

- c. Find the inverse z-transform of

$$\frac{4z^2 - 2z}{z^3 - 5z^2 + 8z - 4}$$

(07 Marks)

Module-4

- 7 a. Solve $\frac{dy}{dx} = x^2 + y, y(1) = 1$ using Taylor's series method considering up to fourth degree terms and find $y(1.1)$.

(06 Marks)

- b. Given $\frac{dy}{dx} = 3x + \frac{y}{2}, y(0) = 1$ compute $y(0.2)$ by taking $h = 0.2$ using Runge - Kutta method of fourth order.

(07 Marks)

- c. If $\frac{dy}{dx} = 2e^x - y, y(0) = 2, y(0.1) = 2.010, y(0.2) = 2.040$ and $y(0.3) = 2.090$, find $y(0.4)$ correct to 4 decimal places using Adams-Bashforth method.

(07 Marks)

OR

- 8 a. Use fourth order Runge-Kutta method, to find $y(0.8)$ with $h = 0.4$, given $\frac{dy}{dx} = \sqrt{x+y}, y(0.4) = 0.41$

(06 Marks)

- b. Use modified Euler's method to compute $y(20.2)$ and $y(20.4)$ given that $\frac{dy}{dx} = \log_{10}\left(\frac{x}{y}\right)$ with $y(20) = 5$ Taking $h = 0.2$.

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- c. Apply Milne's predictor-corrector formulae to compute $y(2.0)$ given $\frac{dy}{dx} = \frac{x+y}{2}$ with

x	0.0	0.5	1.0	1.5
y	2.000	2.6360	3.5950	4.9680

(07 Marks)

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18MATDIP31

Third Semester B.E. Degree Examination, Feb./Mar. 2022

Additional Mathematics – I

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- Find the modulus and amplitude of the complex number : $\frac{(2-3i)(2+i)^2}{1+i}$. (07 Marks)
 - Prove that $\left(\frac{1+\cos\theta+i\sin\theta}{1+\cos\theta-i\sin\theta}\right)^n = \cos n\theta + i\sin n\theta$. (06 Marks)
 - Show that the vectors $\vec{a}-2\vec{b}+3\vec{c}$, $-2\vec{a}+3\vec{b}-4\vec{c}$, $-\vec{b}+2\vec{c}$ are coplanar. (07 Marks)

OR

- Given $\vec{a} = 2\hat{i} + 2\hat{j} - \hat{k}$, $\vec{b} = 6\hat{i} - 3\hat{j} + 2\hat{k}$. Find : i) $\vec{a} \cdot \vec{b}$ ii) $\vec{a} \times \vec{b}$ iii) $|\vec{a} \times \vec{b}|$. (07 Marks)
 - Determine the value of λ , so that $\vec{a} = 2\hat{i} + \lambda\hat{j} - \hat{k}$, and $\vec{b} = 4\hat{i} - 2\hat{j} - 2\hat{k}$, are perpendicular. (06 Marks)
 - Express $1 - i\sqrt{3}$ in the polar form and hence find its modulus and amplitude. (07 Marks)

Module-2

- Using Euler's theorem, prove that $xu_x + yu_y = -3\cot u$ where $u = \sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$. (07 Marks)
 - Using Maclaurin's series, prove that $\sqrt{1+\sin 2x} = 1 + x - \frac{x^2}{2} - \frac{x^3}{3} + \frac{x^4}{24} + \dots$. (06 Marks)
 - If $u = x + 3y^2$, $v = 4x^2yz$, $w = 2z^2 - xy$, evaluate $\frac{\partial(u,v,w)}{\partial(x,y,z)}$ at the point $(1, -1, 0)$. (07 Marks)

OR

- Obtain Maclaurin's series expansion for the function e^x upto x^4 . (07 Marks)
 - If $u = \sin^{-1}\left[\frac{x^3+y^3}{x+y}\right]$ prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 2 \tan u$. (06 Marks)
 - If $u = f\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$. (07 Marks)

Module-3

- A particle moves along the curve $x = (1-t^3)$, $y = (1+t^2)$, $z = (2t-5)$ determine its velocity and acceleration at $t = 1$ sec. (07 Marks)
 - If $\vec{F} = 2x^2\hat{i} - 3yz\hat{j} + xz^2\hat{k}$, and $\phi = 2z - x^3y$, find $\vec{F} \cdot (\nabla\phi)$ and $\vec{F} \times (\nabla\phi)$ at $(1, -1, 1)$. (06 Marks)
 - Find the constants a, b, c so that $\vec{f} = (x+2y+az)\hat{i} + (bx-3y-z)\hat{j} + (4x+cy+2z)\hat{k}$ is irrotational. (07 Marks)

OR

- 6 a. Find the directional derivative of $\phi = x^2yz + 4xz^2$ at $(1, -2, -1)$ along $\hat{a} = 2\hat{i} - \hat{j} - 2\hat{k}$ (07 Marks)
- b. Find curl \vec{f} given that $\vec{f} = xyz^2\hat{i} + xy^2z\hat{j} + x^2yz\hat{k}$. (06 Marks)
- c. If $\vec{f} = x^2\hat{i} + y^2\hat{j} + z^2\hat{k}$ and $\vec{g} = yz\hat{i} + zx\hat{j} + xy\hat{k}$. Show that $\vec{f} \times \vec{g}$ is a solenoidal vector. (07 Marks)

Module-4

- 7 a. Obtain the reduction formula. $I_n = \int \cos^n x dx$, where n is a positive integer. (07 Marks)
- b. Evaluate $\int_0^1 \int_0^1 xy dy dx$. (06 Marks)
- c. Evaluate $\int_0^1 \int_0^1 \int_0^1 (x + y + z) dx dy dz$. (07 Marks)

OR

- 8 a. Evaluate $\int_0^{\pi/2} \sin^n(3x) dx$. (07 Marks)
- b. Evaluate $\int_0^{\pi/2} x \sin^4 x \cos^6 x dx$. (06 Marks)
- c. Evaluate $\int_0^1 \int_0^1 \int_0^1 xyz dx dy dz$. (07 Marks)

Module-5

- 9 a. Solve: $(2x + y + 1) dx + (x + 2y + 1) dy = 0$. (07 Marks)
- b. Solve: $(4xy + 3y^2 - x) dx + (x^2 + 2xy) dy = 0$. (06 Marks)
- c. Solve: $y(2xy + e^x) dx + e^x dy = 0$. (07 Marks)

OR

- 10 a. Solve: $(5x^4 - 3x^2y^3 - 2xy^3) dx + (2x^3y - 3x^2y^2 - 5y^4) dy = 0$. (07 Marks)
- b. Solve: $y(2xy + 1) dx - x dy = 0$. (06 Marks)
- c. Solve: $\frac{dy}{dx} + y \cot x = \cos x$. (07 Marks)

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18EC32

Third Semester B.E. Degree Examination, Feb./Mar. 2022
Network Theory

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Determine current through 12Ω resistor shown in Fig.Q1(a), using source transformation.

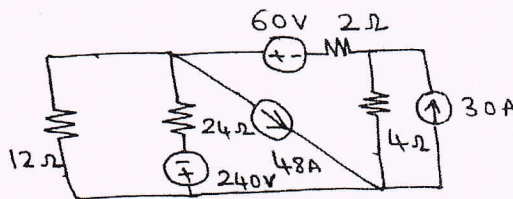


Fig.Q1(a)

(08 Marks)

- b. Find the equivalent resistance of the circuit shown in Fig.Q1(b), using star delta transformation.

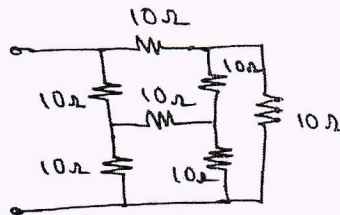


Fig.Q1(b)

(08 Marks)

- c. Discuss the dependent sources. (04 Marks)

OR

- 2 a. Using loop analysis, find the current through 10Ω resistor for the circuit shown in Fig.Q2(a).

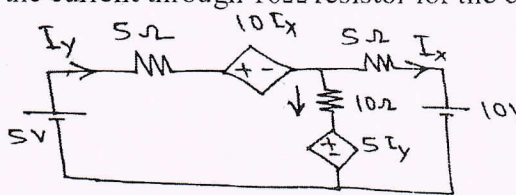


Fig.Q2(a)

(08 Marks)

- b. For the network shown in Fig.Q2(b), determine node voltages V_1, V_2, V_3 and V_4 using nodal analysis.

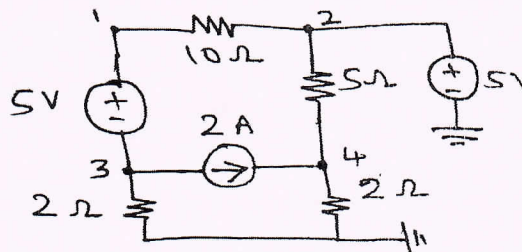


Fig.Q2(b)

(08 Marks)

- c. Explain the super Mesh with example. (04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-2

- 3 a. Using super position theorem, find the current through 20Ω resistor shown in Fig.Q3(a).

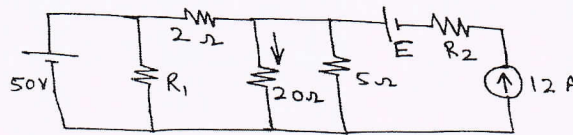


Fig.Q3(a)

(08 Marks)

- b. Using Millman's theorem, determine the current through $(2 + j2)\Omega$ impedance for the network shown in Fig.Q3(b).

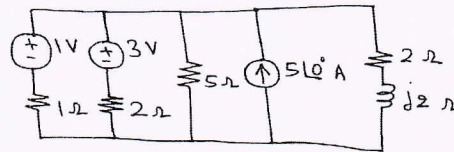


Fig.Q3(b)

(08 Marks)

- c. State the Norton's theorem and also write the procedure to be followed for solving the problem. (04 Marks)

OR

- 4 a. What should be the value of R such that maximum power transfer can take place from the rest of the network to R . Obtain the amount of this power for circuit shown in Fig.Q4(a).

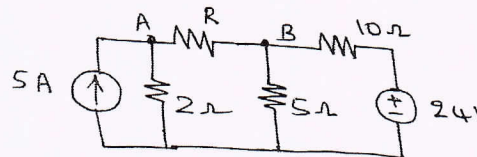


Fig.Q4(a)

(08 Marks)

- b. Obtain the Thevenin's equivalent circuit cross AB for the circuit shown in Fig.Q4(b).

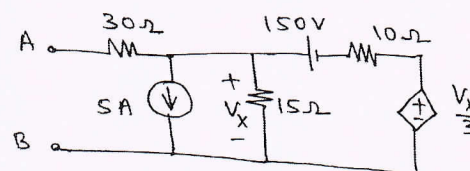


Fig.Q4(b)

(08 Marks)

- c. State the maximum power transfer theorem and also write equation of P_{\max} for both DC and AC circuits. (04 Marks)

Module-3

- 5 a. Explain the transient behavior of the resistance, inductance and capacitor. Also write the procedure for evaluating transient behavior. (10 Marks)

- b. In the network shown in Fig.Q5(b), a steady state is reached with the switch 'K' open. At $t = 0$ the switch is closed. Determine the value of $V_a(0^+)$ and $V_a(0^-)$.

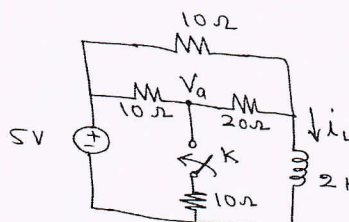


Fig.Q5(b)

(10 Marks)

OR

- 6 a. For the network shown in Fig.Q6(a) $V_1(t) = e^{-t}$ for $t \geq 0$ and is zero for all $t < 0$. If the capacitor is initially uncharged determine the value of $\frac{d^2V_2}{dt^2}$ and $\frac{d^3V_2}{dt^3}$ at $t = 0^+$.

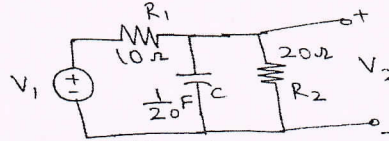


Fig.Q6(a)

(10 Marks)

- b. The switch 'S' is changed from position 1 to position 2 at $t = 0$. Steady state conditions have been reached in position 1. Find the value of i , $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$ for the circuit shown in Fig.Q6(b).

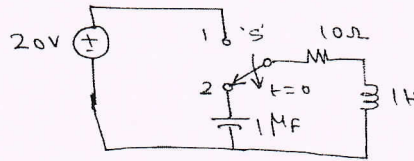


Fig.Q6(b)

(10 Marks)

Module-4

- 7 a. Find the Laplace transform of $f(t)$ shown in Fig.Q7(a).

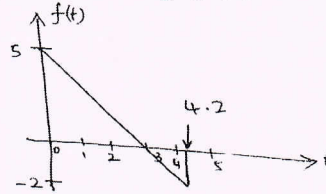


Fig.Q7(a)

(10 Marks)

- b. Find the Laplace transform of the pulse shown in Fig.Q7(b).

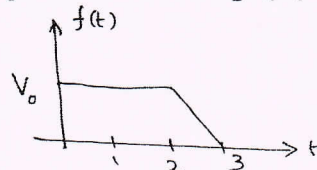


Fig.Q7(b)

(10 Marks)

OR

- 8 a. Find $i(t)$ for the circuit shown in Fig.Q8(a).

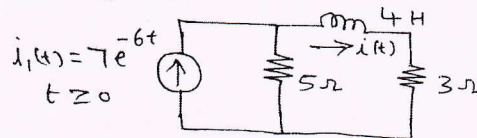


Fig.Q8(a)

(10 Marks)

- b. A voltage pulse of $10V$ and $5\mu\text{sec}$ duration is applied to the RC network shown in Fig.Q8(b). Find the current $i(t)$.

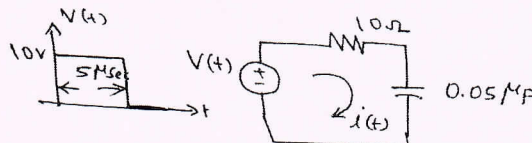


Fig.Q8 (b)

(10 Marks)

Module-5

- 9 a. Obtain y-parameters in terms of z-parameters and h-parameters. (10 Marks)
 b. For the network shown in Fig.Q9(b), find the T-parameters.

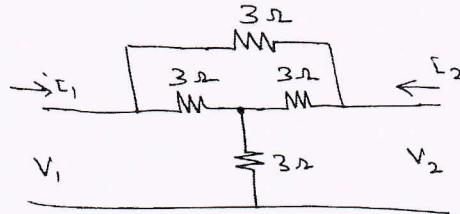


Fig.Q9(b)

(10 Marks)

OR

- 10 a. Derive the expression of bandwidth, half power frequencies and selectivity of a series resonance circuit. (10 Marks)
 b. For the parallel resonant circuit shown in Fig.Q10(b), find I_0 , I_L , I_C , f_0 and dynamic resistance.

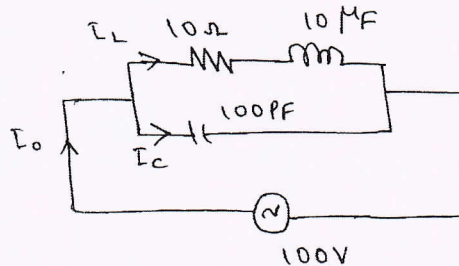


Fig.Q10(b)

(10 Marks)

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18EC33

Third Semester B.E. Degree Examination, Feb./Mar. 2022 Electronic Devices

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain classification of semiconductor insulator and metals using energy band diagram. (08 Marks)
- b. Explain different types of bonding forces in solids. (04 Marks)
- c. What are intrinsic and extrinsic materials? Explain briefly by taking suitable example. (08 Marks)

OR

- 2 a. Define Hall effect in semiconductor. Obtain an expression for mobility in terms of Hall coefficient and resistivity. (08 Marks)
- b. Consider a semiconductor bar with width $w = 0.1$ mm, thickness $t = 10$ μ m, length $L = 5$ mm. For $B = 10$ KG (1 KG = 10^{-5} wb/cm²) and current of 1 mA. We have $V_{AB} = -2$ mV and $V_{CD} = 100$ mV. Find the type, concentration and mobility of the majority carrier. [Refer Fig.Q2(b)]

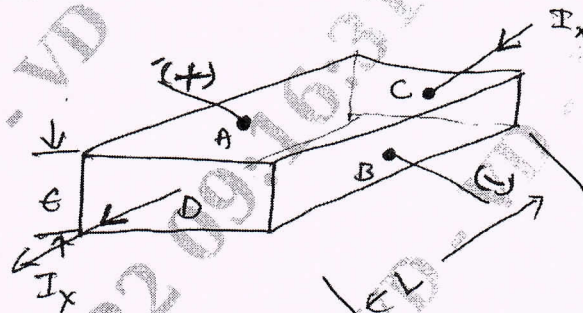


Fig.Q2(b)

- c. Derive an expression for conductivity and mobility from random thermal motion or electron in solid. (08 Marks)

Module-2

- 3 a. Explain the reverse bias p-n junction indicating the minority carrier distribution and variation of quasi fermi levels. (10 Marks)
- b. With a neat diagram, explain in detail Avalanche Breakdown and derive an approximate analysis of avalanche multiplication. (10 Marks)

OR

- 4 a. Derive an expression for current and voltage for an illuminated junction of photodiode and discuss the operation in various quadrants in I-V characteristic. (08 Marks)
- b. Explain the structure and operation of solar cell. Indicate the significance of Fill Factor. (08 Marks)
- c. A solar cell has a short circuit current of 100 mA and open circuit voltage of 0.8 V under full solar illumination fill factor is 0.7. What is maximum power delivered to load by this cell? (04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-3

- 5 a. Explain the summary of hole flow and electron flow in p-n-p transistor with proper biasing and list three dominant mechanism which accounts for I_B . (10 Marks)
b. Explain the process flow for double polysilicon self aligned BJT Fabrication. (10 Marks)

OR

- 6 a. Derive Eber's moll modes for Assymmetric Transistor (coupled diode model). (10 Marks)
b. Write short notes on: (i) Base narrowing (ii) Avalanche Breakdown in transistor (10 Marks)

Module-4

- 7 a. Explain the structure and operation of pn JFET by varying V_{GS} and V_{DS} independently. (06 Marks)
b. Write the small signal equivalent circuit of JFET and obtain the expression for transconductance (g_m) and plot the graph with respect to V_{GS} . (06 Marks)
c. Explain the operation of MOS capacitor using energy band diagram for p-type substrate when:
(i) Negative gate bias
(ii) Moderate positive gate bias
(iii) Large positive gate bias (08 Marks)

OR

- 8 a. Explain the ideal capacitance voltage characteristics of an MOS capacitor with p-type substrate. (08 Marks)
b. Explain the operation of n-channel enhancement MOSFET and obtain the current voltage relationship. (08 Marks)
c. Write the different types of MOS structures and symbols for each. (04 Marks)

Module-5

- 9 Explain briefly the various steps involved in the fabrication of p-n junction:
a. Rapid thermal processing (05 Marks)
b. Ion implementation (05 Marks)
c. Chemical Vapor Deposition (CVD) (05 Marks)
d. Photolithography (05 Marks)

OR

- 10 a. Write a note on Integrated Circuit (IC) and its advantages and types of ICs. (10 Marks)
b. Explain the fabrication of CMOS twin well process. (10 Marks)

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18EC34

Third Semester B.E. Degree Examination, Feb./Mar. 2022
Digital System Design

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define and explain the combinational logic circuit along with block diagram. (06 Marks)
 b. Develop the canonical minterm and maxterm forms in decimal notation for the following Boolean functions:
 i) $X = f(a, b, c, d) = \bar{a}b + c\bar{d}$
 ii) $Y = f(a, b, c) = (a + b)(b + \bar{c})$ (08 Marks)
 c. Simplify the following function using K-map method and also construct logic circuit for the simplified equation (function).
 $Y = f(a, b, c, d) = \sum(0, 1, 2, 4, 5, 6, 8, 9, 10, 12, 13, 14)$. (06 Marks)

OR

- 2 a. Simplify the following Boolean function by using Q-M method:
 $X = f(a, b, c) = \sum(0, 1, 2, 3, 4, 5, 6)$. (10 Marks)
 b. Design a combinational logic circuit for valid single digit BCD data, the output is 1 whenever a number is greater than 5 appears at the input. (05 Marks)
 c. Identify the PI and EPI for the following function:
 $M = f(a, b, c, d) = \sum(1, 2, 3, 5, 7, 11, 12, 13, 14, 15)$. (05 Marks)

Module-2

- 3 a. Draw and explain the circuit for 3 to 8 decoder. (06 Marks)
 b. Design and implement a full adder circuit using logic gates. (08 Marks)
 c. Write a short notes on PLD's and FPGA. (06 Marks)

OR

- 4 a. Define MUX and explain 4:1 MUX with the help of logic diagram using gates. (06 Marks)
 b. Explain 4-bit carry look-ahead adder with diagram. (08 Marks)
 c. Design and implement 1-bit comparator circuit. (06 Marks)

Module-3

- 5 a. Compare sequential circuit and combinational circuits. (06 Marks)
 b. Write a short notes on SR-latch. (06 Marks)
 c. Illustrate master-slave J-K flip-flop using NAND Gates. (08 Marks)

OR

- 6 a. Distinguish between synchronous and asynchronous counter. (06 Marks)
 b. Explain 4-bit universal shift register along with diagram. (08 Marks)
 c. Explain the working of clocked SR-FF using NAND Gates. (06 Marks)

Module-4

- 7 a. Explain Mealy and Moore model with diagrams. (10 Marks)
- b. Design and develop Mod-6 synchronous counter using T-FF. (10 Marks)

OR

- 8 a. Construct the excitation table, transition table, state table and state diagram for the following sequential circuit. (Refer Fig.Q.8(a)). (14 Marks)

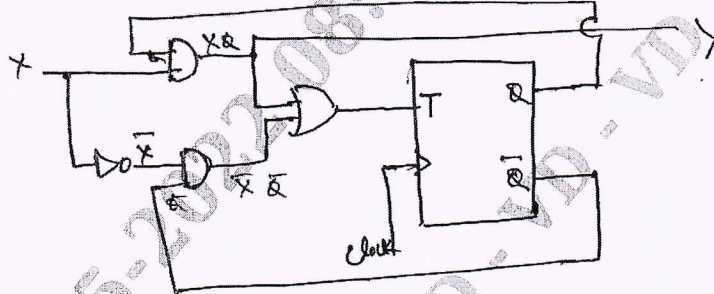


Fig.Q.8(a)

- b. List out the applications of shift registers along with brief explanation. (06 Marks)

Module-5

- 9 a. Explain the operation of serial adder with accumulator. (12 Marks)
- b. Illustrate state assignment rules. (08 Marks)

OR

- 10 a. Write a short notes on:
 - i) Sequential circuit design steps (10 Marks)
 - ii) BCD to Ex-3 code convertor. (10 Marks)
- b. Explain 4-bit Ring and Johnson counter along with diagram. (10 Marks)

CBGS SCHEME

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18EC35

Third Semester B.E. Degree Examination, Feb./Mar. 2022 Computer Organization and Architecture

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain the basic operational concept between the processor and memory with neat block diagram. (08 Marks)
- b. Explain the various parameters affecting the performance of a computer and also provide the basic performance equation. (08 Marks)
- c. Write a short note on single bus structure with neat diagram. (04 Marks)

OR

- 2 a. List out and explain the three systems used for representing signed numbers and also brief about the modular number system concept. (08 Marks)
- b. Explain IEEE standard used for single and double precision floating point number representation with examples. (08 Marks)
- c. Write a short note on Big-endian and little-endian assignment. (04 Marks)

Module-2

- 3 a. What is addressing mode? Explain any four addressing modes with examples. (08 Marks)
- b. What are assembler directives? Explain about the various directives used in the program with example. (08 Marks)
- c. Write a short note on the assembly and execution of programs. (04 Marks)

OR

- 4 a. With neat diagram and program example, explain a simple I/O task between processor, keyboard and display. (10 Marks)
- b. What is subroutine? Illustrate the subroutine function with parameter passing by value and reference with suitable program. (10 Marks)

Module-3

- 5 a. Explain the concept of memory mapped I/O with neat diagram of I/O interface with program example. (10 Marks)
- b. Write short notes on: (i) Interrupt hardware (ii) Interrupt nesting (10 Marks)

OR

- 6 a. What is an interrupt? Explain about various implementation techniques of interrupt. (10 Marks)
- b. Explain how simultaneous interrupt request is handled using the concept of Daisy Chain. (10 Marks)

Module-4

- 7 a. Explain the internal organization of memory chips with example. (08 Marks)
- b. Explain the internal organization of $2M \times 8$ DRAM chip with neat diagram. (08 Marks)
- c. Write a short note on ROM. (04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg, $42+8=50$, will be treated as malpractice.

OR

- 8 a. Discuss about the use of cache memory in the processor system. (08 Marks)
b. What is virtual memory? Explain its organization with neat diagram. (08 Marks)
c. Write a short note on magnetic hard disk. (04 Marks)

Module-5

- 9 a. Explain single-bus organization of the data path inside a processor with neat diagram. (10 Marks)
b. Explain the process of fetching a data word from memory using respective registers of a processor with neat diagram. (10 Marks)

OR

- 10 a. Explain the control signal generation required for proper sequence of instructions in the processor. (10 Marks)
b. What is microprogrammed control? Explain its basic organization with suitable diagram and example. (10 Marks)

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CBCS SCHEME

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18EC36

Third Semester B.E. Degree Examination, Feb./Mar. 2022
Power Electronics and Instrumentation

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Mention the different types of power electronic converters. Explain the significance, functions and applications of them. (07 Marks)
- b. Explain the static Anode-Cathode characteristics of SCR with circuit diagram and V-I characteristics. (08 Marks)
- c. Explain the basic operation of the unijunction transistor with basic UJT structure, UJT symbol and equivalent circuit. (05 Marks)

OR

- 2 a. Mention the applications of power electronics in various sectors. (07 Marks)
- b. The latching current of a thyristor circuit is 50mA. The duration of the firing pulse is 50µs. Will the thyristor get fired? (05 Marks)

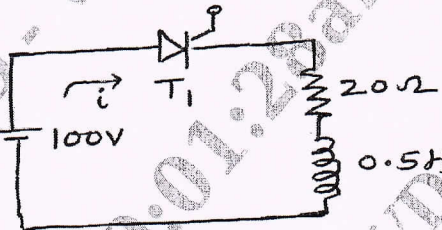


Fig.Q.2(b)

- c. Explain the operation of the resistance firing circuit with associated voltage waveforms. Derive the relevant expressions. (08 Marks)

Module-2

- 3 a. Explain the operation of the single phase half wave controlled rectifier with resistive load using circuit and waveforms. (10 Marks)
- b. Give basic chopper classification with different chopper configurations. (05 Marks)
- c. A dc chopper circuit connected to a 100V dc source supplies an inductive load having 40mH in series with a resistance of 5Ω. A freewheeling diode is placed across the load. The load current varies between the limits of 10A and 12A. Determine the time ratio of the chopper. (05 Marks)

OR

- 4 a. Explain the effect of freewheeling diode with half wave controlled rectifier circuit and waveforms using inductive load. (10 Marks)
- b. Explain the operation of step-up/down choppers with suitable circuit. Derive the relevant expression. (07 Marks)
- c. A step-up chopper is used to deliver load voltage of 500V from a 220V dc source. If the blocking period of the thyristor is 80µs. Compute the required pulse-width. (03 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-3

- 5 a. Explain the operation of the single phase half bridge inverter with RL load. Draw the relevant circuit and waveforms. (10 Marks)
 b. Explain the operation of the isolated forward converter with suitable circuit diagram and relevant waveforms. Mention the advantages and disadvantages. (10 Marks)

OR

- 6 a. Explain the types of errors in measurements. (07 Marks)
 b. Explain the operation of the multirange voltmeter with normal circuit and with multipliers connected in series string circuit. (07 Marks)
 c. A 1mA meter movement having an internal resistance of 100Ω is used to convert into a multirange ammeter having the range 0-10mA, 0-20mA, and 0-30mA. Determine the value of the shunt resistance required. (06 Marks)

Module-4

- 7 a. Explain the operation of dual slope integrating type DVM with basic principles and suitable block-diagram. (08 Marks)
 b. With suitable block diagram, explain the operation of measurement of time briefly. (07 Marks)
 c. A capacitance comparison bridge is used to measure a capacitive impedance at a frequency of 2kHz. This bridge constants at balance are $C_3 = 100\mu\text{F}$, $R_1 = 10\text{K}\Omega$, $R_2 = 50\text{K}\Omega$, $R_3 = 100\text{K}\Omega$. Find the equivalent series circuit of the unknown capacitance. (05 Marks)

OR

- 8 a. With suitable block diagram and table explain the operation of successive approximation DVM. (08 Marks)
 b. With suitable block diagram approach explain the operation of the digital frequency meter. (07 Marks)
 c. Find the equivalent parallel resistance and capacitance that causes a Wien bridge to null with the following component values $R_1 = 3.1\text{K}\Omega$, $C_1 = 5.2\mu\text{F}$, $R_2 = 25\text{K}\Omega$, $f = 2.5\text{kHz}$, $R_4 = 100\text{K}\Omega$. (05 Marks)

Module-5

- 9 a. Explain the operation of the resistive position transducer with construction and electrical equivalent circuit. (07 Marks)
 b. In the differential instrumentation amplifier using transducer bridge, $R_1 = 2.2\text{K}$, $R_F = 10\text{K}$, $R_A = R_B = R_C = 120\text{K}$, $E = +5\text{V}$ and op-amp supply voltage = $\pm 15\text{V}$, the transducer is a transistor with the following specifications. $R_T = 120\text{K}$ at a reference temperature of 25°C . Temperature coefficient of resistance = $-1\text{K}/^\circ\text{C}$. Determine the output voltage at 0°C and 100°C . (06 Marks)
 c. Explain the PLC structure with block diagram. And also explain the PLC operation with PLC operation diagram. (07 Marks)

OR

- 10 a. Explain the operation of the LVDT with construction, various core positions of it, and variation of output voltage vss displacement. (10 Marks)
 b. What is the significance of analog weight scale? Using strain gauge bridge circuit for analog weight scale explain its operation briefly. (05 Marks)
 c. With Bell circuit diagram, explain the operation of the Programmable Logic Controller (PLC) relays. (05 Marks)

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Question Paper Version : B

**Third/Fourth Semester B.E. Degree Examination, Feb./Mar. 2022
Constitution of India, Professional Ethics and Cyber Law**

(COMMON TO ALL BRANCHES)

Time: 2 hrs.]

[Max. Marks: 100

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the hundred questions, each question carries one mark.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners on the OMR sheets are strictly prohibited.**

1. Which one of the following does not take part in the Election of the President?
a) Elected Members of Lok - Sabha b) Elected Members of Rajya - Sabha
c) Members of the Legislative Council d) None of these
2. The President can be removed by impeachment procedure on the ground of violating the Constitution by
a) The Supreme Court b) The Lok - Sabha only
c) Both Houses of Parliament d) The High Court
3. The Vice - President of India is Elected by the
a) People
b) Members of State Legislative Assembly
c) Members of the Rajya - Sabha
d) Members of both the Houses of Parliament at joint sitting.
4. Who discharges the duties of the President in the event of President and Vice - President being not available?
a) The Prime Minister b) The Chief Justice of India
c) The Speaker of Lok - Sabha d) The Attorney General of India
5. Which one of the following can the President of India declare?
a) Emergency due to threat of War, external aggression or armed rebellion
b) Emergency due to breakdown of constitutional machinery in the State
c) Financial emergency on account of threat to the financial credit of India
d) All the above.
6. Which budget is placed first in the Parliament House
a) Railway b) General budget c) Financial d) Vote of credit

3

18CPC39/49

16. The Judges of the Supreme Court after retirement are not permitted to carry on practice before
- The Supreme Court
 - The High Courts
 - The District and Session Courts
 - Any of the above
17. Which of the following Jurisdiction of the Supreme Court of India has been wrongly listed
- Original Jurisdiction
 - Appellate Jurisdiction
 - Advisory Jurisdiction
 - None of the above
18. Generally, the Governor belongs to
- The State where he is posted
 - The Indian Administrative Service
 - Some other State
 - None of the above
19. Which of the following Legislative Powers is enjoyed by the Governor of a State?
- He can summon or prorogue the State Legislature
 - He can appoint one sixth of the members of the Legislative Council.
 - He can nominate certain member of the Anglo Indian Community to the Legislative Assembly.
 - All of above powers.
20. Engineering Ethics is a
- Preventive Ethics
 - Natural Ethics
 - Developing
 - Scientifically developed Ethics.
21. Professional Ethics is
- Set of Rules relating to personal character of Professionals
 - Traditional Rules observed since a long time.
 - Set of Rules passed by Professional bodies.
 - Set of standards adopted by Professionals.
22. Tight couple means
- Binding two beams tightly
 - Erecting two pillars side by side
 - Process tightly coupled
 - Strong adhesive material
23. An Engineer may not be held legally liable or causing harm. When the harm is caused
- Intentionally
 - Ignorantly
 - Negligently
 - Recklessly
24. A compound measure of the probability and magnitude of the adverse effect is known as.
- Risk
 - Benefit
 - Compensation
 - Both (b) and (c)
25. Engineers shall issue public statements only
- In subjective manner
 - In objective manner
 - On their personal responsibility
 - Based on the reports sent by higher Officers.
26. Attackers commonly target _____ for fetching IP address of a target or victim user.
- Website
 - Web pages
 - IP tracker
 - Emails
27. _____ is the first phase of Ethical hacking
- DNS Poisoning
 - Foot printing
 - ARP – Poisoning
 - Enumeration

VER – B - 3 of 10

18CPC39/49

28. Which of the following do not comes under the intangible skills of hackers?
- Creative thinking
 - Problem solving capability
 - Persistence
 - Smart attacking potential
29. Why programming language is important for ethical hackers and Security Professionals?
- Only to write malware.
 - For solving problems and building tool and programs
 - To teach programming
 - To develop program to harm others.
30. Understanding of _____ is also important for gaining access to a system through networks.
- OS
 - Email servers
 - Networking
 - Hardware
31. The Constitution of India was enacted by a Constituent Assembly set up
- Under the Cabinet Mission Plan 1946
 - Under the Indian Independence Act 1947
 - Under a resolution of the Provisional Government.
 - By the Indian National Congress.
32. The Members of the Constituent Assembly are
- Directly elected by the people
 - Nominated by various Political Parties
 - Nominated by rulers of the Indian States
 - Elected by the Provincial Assemblies
33. The Federal feature of the Indian Constitution provides for
- Distribution of Legislative powers between the Union Government and the State Government.
 - Division of powers between the Executive and Judiciary.
 - Distribution of powers between the P.M and Cabinet.
 - None of these
34. The Governor of State is
- Directly Elected by the people
 - Elected by the State Legislature
 - Appointed by the President
 - Nominated by the Parliament.
35. The source of Authority of the Indian Constitution is
- The Government of India
 - The People of India
 - The President
 - The Parliament
36. The Preamble was amended by
- 24th Amendment
 - 42nd Amendment
 - 39th Amendment
 - None of the above
37. Fraternity means
- Spirit of brotherhood
 - Fatherly treatment
 - Unity and integrity
 - Elimination of Economic Justice
38. In the final form of the Constitution adopted by the Constituent Assembly, how many Articles and Schedules were there?
- 397 Articles and 7 Schedules
 - 395 Articles and 4 Schedules
 - 400 Articles and 10 Schedules
 - 395 Articles and 8 Schedules

VER – B - 4 of 10

39. The Preamble of the Indian Constitution does not contain concept of
 a) Democratic b) Adult Franchise c) Sovereignty d) Fraternity
40. The strength of the Constituent Assembly, after the withdrawal of the Muslim League, was reduced to
 a) 299 members b) 329 member c) 331 members d) 359 members
41. The Fundamental Rights of a Citizen can be suspended
 a) By the Parliament through a Law enacted by two – third majority
 b) By the President during a National emergency
 c) By the Supreme Court d) None of these
42. Which authority can a Citizen approach for securing Right of Personal freedom
 a) The Parliament b) The President
 c) Supreme Court alone d) Both Supreme Court and High Court
43. The main objective of the Fundamental Rights is to
 a) Ensure Independence of Judiciary b) Promote a Socialist Pattern of Society
 c) Ensure Individual liberty d) Ensure all the above
44. Under which section of IT Act, stealing any digital asset or information is written a cyber crime
 a) 65 b) 65 - D c) 67 d) 70
45. Fundamental duties of the Indian Citizen, were
 a) Enshrined in the original Constitution
 b) Added to the Constitution by the 42nd Amendment.
 c) Added to the Constitution by the 44th Amendment.
 d) Added to the Constitution in the wake the Supreme Court Judgment Keshavananda Bharati case with consent of all the Political parties.
46. Which one of the following Fundamental Right has been subject of maximum litigation since the inauguration of the Constitution?
 a) Right to Freedom of Speech b) Right to Constitutional Remedies
 c) Right to Property d) Right against Exploitation
47. The Fundamental Rights of Citizens were
 a) Incorporated in the original Constitution b) Confined in an Act of Parliament in 1952
 c) Incorporated by the 42nd Amendment d) Incorporated by the 44th Amendment
48. The Fundamental Rights of Indian Citizen have been criticized on the ground that
 a) They are hemmed in by too many restrictions.
 b) They are hemmed in language beyond the comprehension of ordinary citizen
 c) They are absolute d) Both (a) and (b).
49. Respite means
 a) Death due to drowning b) Awarding lesser punishment
 c) Death due to strangulation d) Painless death
50. The Governor recommends the imposition of Presidents rule in the State
 a) On the recommendation of the State Legislature
 b) On the recommendation of the C.M.
 c) On the recommendation of Council of Minister
 d) If he is satisfied that the State Government cannot be carried on his accordance with the provision of the Constitution.

51. Who of the following acted as the Constitutional Advisor of the Constituent Assembly
 a) Dr. B.R. Ambedkar b) Dr. Babu Rajendra Prasad
 c) B.N. Rao d) Dr. Sachidanand Sinha
52. Which one of the following provisions of the Constitution came into force soon after its adoption on 26th November 1949?
 a) Provision relating to Citizenship b) Elections
 c) Provisional Parliament d) All the above
53. The three types of Justice referred in our Preamble are
 a) Social, Economic and Social b) Economic, International and Political
 c) Economic, Religious and Social d) Religious, Social and Political
54. What was the exact Constitutional status of the Indian Republic on January 26, 1950, when the Constitution was inaugurated?
 a) A Democratic Republic b) Sovereign Democratic Republic
 c) A Sovereign Secular Democratic Republic
 d) A Sovereign Socialist Secular Democratic Republic.
55. Right to against Exploitation seeks to protect the weaker sections of Society by
 a) Giving equal pay for equal work for men and women.
 b) Prohibiting human trafficking and beggar
 c) Providing compulsory education for children below the age of 14 years
 d) Forcing a person to work against his will without payment
56. Which one of the following Directive principles can be described as Gandhian in nature?
 a) Providing equal pay for equal work for both Men and Women
 b) Workers participation in Management
 c) Organization of Village Panchayats as units of self Government
 d) Separation of Judiciary from the Executive.
57. Who has been vested with the power to decide whether the restrictions imposed on the Fundamental Rights of Indian Citizen are reasonable or not
 a) The Parliament b) The President
 c) The Courts d) None of the above
58. Which one of the following Rights conferred by the Constitution is also available to Non-citizens.
 a) Freedom of speech assembly and association
 b) Freedom to move, reside and settle in any part of the territory of India
 c) Freedom to acquire property or to carry on any occupation, trade or business
 d) Right to Constitutional remedies.
59. Which one of the following has been wrongly listed as a special feature of Fundamental Rights in India
 a) Fundamental Rights are more sacrosanct than rights granted by ordinary laws
 b) Fundamental Rights are subject to reasonable restrictions
 c) Fundamental Rights are Justifiable and can be enforced through the Supreme Court
 d) None of these.

60. The main objective of the Cultural and Educational Rights granted to the Citizen is
 a) To preserve the rich culture heritage of India.
 b) To evolve a single integrated India culture.
 c) To help the minorities to conserve their culture.
 d) All the above.
61. For hacking a database or accessing and manipulating data which of the following language the hacker must know?
 a) SQL b) HTML c) TCL d) F #
62. _____ are piece of programs or scripts that allow hackers to take control over any system.
 a) Exploits b) Antivirus c) Firewall bypassers d) Worms
63. The process of finding vulnerabilities and exploiting them using exploitable scripts or programs are known as
 a) Infiltrating b) Exploitation c) Cracking d) Hacking
64. How many types of exploits are there based on their nature from hackings perspective?
 a) 04 b) 03 c) 02 d) 05
65. A _____ is a set of changes done to any program or its associated data designed for updating fixing or improving it.
 a) Scratch b) Patch c) Fixer d) Resolver
66. Fixing of security vulnerabilities in a system by additional programs is known as _____ patches
 a) Hacking b) Database c) Server d) Security
67. _____ are some very frequent updates that come for every antivirus.
 a) Patch update b) Data update
 c) Code update d) Definition update
68. Cyber – Crime can be categorized into _____ types.
 a) 04 b) 03 c) 02 d) 06
69. Which of the following is not a type of peer to peer cyber – crime.
 a) Phishing b) Injecting Trojan to a target victim
 c) MITM d) Credit card details leak in deep web
70. In which year India's IT Act came into existence?
 a) 2000 b) 2001 c) 2002 d) 2003
71. The Chief Election Commissioner can be removed from his office before the expiry of term by the
 a) Chief Justice of India
 b) Prime Minister on the recommendation of Cabinet
 c) President on the recommendation of Parliament after the impeachment
 d) President on the advice of Chief Justice of India.
72. The quorum of minimum number of members required to hold the meetings of either houses of Parliament is
 a) One - tenth b) One - fifth c) One - third d) 72 hours

73. The advice of the Supreme Court is
 a) Binding of the President
 b) Binding on the President if it is tendered unanimously
 c) Not binding on the President
 d) Binding in certain cases and not binding in other cases
74. The Governor reserves the Right to issue ordinances
 a) When the State Legislature is not in session and he feels that there is an immediate need of action
 b) Whenever the State is under President's Rule
 c) Whenever he likes
 d) None of these
75. The Writ of Certiorari is issued by a Superior Court
 a) To an Inferior Court to stop further proceedings in a particular case
 b) To an Inferior Court to transfer the record of proceedings in a case for its review
 c) To an Office to show his right to hold a particular Office
 d) To a Public authority to produce a person detained by it before the Court within 24 hours.
76. Which one of the following was wrongly listed as a duty of Indian Citizens
 a) To uphold and protect the Sovereign unity and integrity of the Country
 b) To promote harmony and the spirit of common brotherhood among the people of India
 c) To protect and pressure the Natural Environment
 d) To practice Family planning and control population.
77. The Directive Principles Aim at
 a) Ensuring Individual liberty
 b) Ensuring strengthening of the Country's Independence
 c) Providing a social and economic base for a genuine democracy in the Country.
 d) Achieving all the above objectives.
78. The Directive Principles are the
 a) Positive instructions to the Government to work for the attainment of the set objectives
 b) Negative injunctions to the Government to refrain from encroaching on the freedom of the people.
 c) Directive to the State to enhance the International prestige of the Country
 d) Directives to the Government to pursue a policy of non alignment.
79. Which one of the following has been wrongly listed as Directive Principle based on liberal Principles?
 a) Separation of Judiciary and Executive
 b) Provision of a Uniform Civil code for the Country
 c) Protection of monuments and places of artistic or Historical importance
 d) None of the above has been wrongly listed.
80. The Constitution has vested the Executive power of the Union Government in
 a) The President of India
 b) The Prime Minister
 c) The Council of Minister
 d) All the above
81. Cooking Means
 a) Boiling under pressure
 b) Retaining results which fit theory
 c) Making deceptive statements
 d) Misleading the Public about quality of the product.

CBCS SCHEME

USN

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18MAT31

Third Semester B.E. Degree Examination, Feb./Mar. 2022 Transform Calculus, Fourier Series and Numerical Techniques

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Evaluate (i) $L\left\{\frac{\cos 2t - \cos 3t}{t}\right\}$ (ii) $L(t^2 e^{-3t} \sin 2t)$ (06 Marks)
- b. If $f(t) = \begin{cases} t, & 0 \leq t \leq a \\ 2a - t, & a \leq t \leq 2a \end{cases}$, $f(t + 2a) = f(t)$ then show that $L(f(t)) = \frac{1}{s^2} \tanh\left(\frac{as}{2}\right)$ (07 Marks)
- c. Solve by using Laplace Transforms
 $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t}$, $y(0) = 0$, $y'(0) = 0$ (07 Marks)

OR

- 2 a. Evaluate $L^{-1}\left(\frac{4s + 5}{(s+1)^2(s+2)}\right)$ (06 Marks)
- b. Find $L^{-1}\left(\frac{s}{(s^2 + a^2)^2}\right)$ by using convolution theorem. (07 Marks)
- c. Express $f(t) = \begin{cases} \sin t, & 0 \leq t < \pi \\ \sin 2t, & \pi \leq t < 2\pi \\ \sin 3t, & t \geq 2\pi \end{cases}$
 in terms of unit step function and hence find its Laplace Transform. (07 Marks)

Module-2

- 3 a. Obtain fourier series for the function $f(x) = |x|$ in $(-\pi, \pi)$ (06 Marks)
- b. Expand $f(x) = \frac{(\pi - x)^2}{4}$ as a Fourier series in the interval $(0, 2\pi)$ and hence deduce that
 $\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots$ (07 Marks)
- c. Express y as a Fourier series upto the second harmonic given :

x:	0	60	120	180	240	300
y:	4	3	2	4	5	6

(07 Marks)

OR

- 4 a. Find the Half-Range sine series of $\pi x - x^2$ in the interval $(0, \pi)$ (06 Marks)
- b. Obtain fourier expansion of the function $f(x) = 2x - x^2$ in the interval $(0, 3)$. (07 Marks)

c. Obtain the Fourier expansion of y upto the first harmonic given :

x	0	1	2	3	4	5
y	9	18	24	28	26	20

(07 Marks)

Module-3

5 a. If $f(x) = \begin{cases} 1, & |x| < a \\ 0, & |x| > a \end{cases}$, find the Fourier transform of f(x) and hence find the

value of $\int_0^{\infty} \frac{\sin x}{x} dx$ (06 Marks)

b. Find the infinite Fourier cosine transform of e^{-ax} . (07 Marks)

c. Solve using z-transform $y_{n+2} - 4y_n = 0$ given that $y_0 = 0, y_1 = 2$ (07 Marks)

OR

6 a. Find the fourier sine transform of $f(x) = e^{-x^2}$ and

hence evaluate $\int_0^{\infty} \frac{x \sin mx}{1+x^2} dx ; m > 0$. (06 Marks)

b. Obtain the z-transform of $\cos n\theta$ and $\sin n\theta$. (07 Marks)

c. Find the inverse z-transform of

$$\frac{4z^3 - 2z}{z^3 - 5z^2 + 8z - 4}$$

(07 Marks)

Module-4

7 a. Solve $\frac{dy}{dx} = x^2 + y, y(1) = 1$ using Taylor's series method considering up to fourth degree terms and find y(1.1). (06 Marks)

b. Given $\frac{dy}{dx} = 3x + \frac{y}{2}, y(0) = 1$ compute y(0.2) by taking h = 0.2 using Runge - Kutta method of fourth order. (07 Marks)

c. If $\frac{dy}{dx} = 2e^x - y, y(0) = 2, y(0.1) = 2.010, y(0.2) = 2.040$ and $y(0.3) = 2.090$, find y(0.4) correct to 4 decimal places using Adams-Bashforth method. (07 Marks)

OR

8 a. Use fourth order Runge-Kutta method, to find y(0.8) with h = 0.4, given $\frac{dy}{dx} = \sqrt{x+y}, y(0.4) = 0.41$ (06 Marks)

b. Use modified Euler's method to compute y(20.2) and y(20.4) given that $\frac{dy}{dx} = \log_{10} \left(\frac{x}{y} \right)$ with $y(20) = 5$ Taking h = 0.2. (07 Marks)

c. Apply Milne's predictor-corrector formulae to compute y(2.0) given $\frac{dy}{dx} = \frac{x+y}{2}$ with

x	0.0	0.5	1.0	1.5
y	2.000	2.6360	3.5950	4.9680

(07 Marks)

CBCS SCHEME

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18MAT31

**Third Semester B.E. Degree Examination, Feb./Mar. 2022
Transform Calculus, Fourier Series and Numerical
Techniques**

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Evaluate (i) $L\left\{\frac{\cos 2t - \cos 3t}{t}\right\}$ (ii) $L(t^2 e^{-3t} \sin 2t)$ (06 Marks)
- b. If $f(t) = \begin{cases} t, & 0 \leq t \leq a \\ 2a - t, & a \leq t \leq 2a \end{cases}$, $f(t + 2a) = f(t)$ then show that $L(f(t)) = \frac{1}{s^2} \tanh\left(\frac{as}{2}\right)$ (07 Marks)
- c. Solve by using Laplace Transforms
 $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t}$, $y(0) = 0$, $y'(0) = 0$ (07 Marks)

OR

- 2 a. Evaluate $L^{-1}\left(\frac{4s+5}{(s+1)^2(s+2)}\right)$ (06 Marks)
- b. Find $L^{-1}\left(\frac{s}{(s^2+a^2)^2}\right)$ by using convolution theorem. (07 Marks)
- c. Express $f(t) = \begin{cases} \sin t, & 0 \leq t < \pi \\ \sin 2t, & \pi \leq t < 2\pi \\ \sin 3t, & t \geq 2\pi \end{cases}$
in terms of unit step function and hence find its Laplace Transform. (07 Marks)

Module-2

- 3 a. Obtain fourier series for the function $f(x) = |x|$ in $(-\pi, \pi)$ (06 Marks)
- b. Expand $f(x) = \frac{(\pi-x)^2}{4}$ as a Fourier series in the interval $(0, 2\pi)$ and hence deduce that
 $\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots$ (07 Marks)

c. Express y as a Fourier series upto the second harmonic given :

x:	0	60	120	180	240	300
y:	4	3	2	4	5	6

(07 Marks)

OR

- 4 a. Find the Half-Range sine series of $\pi x - x^2$ in the interval $(0, \pi)$ (06 Marks)
- b. Obtain fourier expansion of the function $f(x) = 2x - x^2$ in the interval $(0, 3)$. (07 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- c. Obtain the Fourier expansion of y upto the first harmonic given :

x	0	1	2	3	4	5
y	9	18	24	28	26	20

(07 Marks)

Module-3

- 5 a. If $f(x) = \begin{cases} 1, & x < a \\ 0, & x > a \end{cases}$ find the Fourier transform of $f(x)$ and hence find the

value of $\int_0^{\infty} \frac{\sin x}{x} dx$

(06 Marks)

- b. Find the infinite Fourier cosine transform of e^{-x} .

(07 Marks)

- c. Solve using z-transform $y_{n+2} - 4y_n = 0$ given that $y_0 = 0, y_1 = 2$

(07 Marks)

OR

- 6 a. Find the fourier sine transform of $f(x) = e^{-x^2}$ and

hence evaluate $\int_0^{\infty} \frac{x \sin mx}{1+x^2} dx ; m > 0.$

(06 Marks)

- b. Obtain the z-transform of $\cos n\theta$ and $\sin n\theta$.

(07 Marks)

- c. Find the inverse z-transform of

$$\frac{4z^2 - 2z}{z^3 - 5z^2 + 8z - 4}$$

(07 Marks)

Module-4

- 7 a. Solve $\frac{dy}{dx} = x^2 + y, y(1) = 1$ using Taylor's series method considering up to fourth degree terms and find $y(1.1)$.

(06 Marks)

- b. Given $\frac{dy}{dx} = 3x + \frac{y}{2}, y(0) = 1$ compute $y(0.2)$ by taking $h = 0.2$ using Runge - Kutta method of fourth order.

(07 Marks)

- c. If $\frac{dy}{dx} = 2e^x - y, y(0) = 2, y(0.1) = 2.010, y(0.2) = 2.040$ and $y(0.3) = 2.090$, find $y(0.4)$ correct to 4 decimal places using Adams-Bashforth method.

(07 Marks)

OR

- 8 a. Use fourth order Runge-Kutta method, to find $y(0.8)$ with $h = 0.4$, given $\frac{dy}{dx} = \sqrt{x+y}, y(0.4) = 0.41$

(06 Marks)

- b. Use modified Euler's method to compute $y(20.2)$ and $y(20.4)$ given that $\frac{dy}{dx} = \log_{10}\left(\frac{x}{y}\right)$ with $y(20) = 5$ Taking $h = 0.2$.

(07 Marks)

- c. Apply Milne's predictor-corrector formulae to compute $y(2.0)$ given $\frac{dy}{dx} = \frac{x+y}{2}$ with

x	0.0	0.5	1.0	1.5
y	2.000	2.6360	3.5950	4.9680

(07 Marks)

CBCS SCHEME

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18MATDIP31

Third Semester B.E. Degree Examination, Feb./Mar. 2022

Additional Mathematics – I

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Find the modulus and amplitude of the complex number : $\frac{(2-3i)(2+i)^2}{1+i}$. (07 Marks)
- b. Prove that $\left(\frac{1+\cos\theta+i\sin\theta}{1+\cos\theta-i\sin\theta}\right)^n = \cos n\theta + i\sin n\theta$. (06 Marks)
- c. Show that the vectors $\vec{a}-2\vec{b}+3\vec{c}$, $-2\vec{a}+3\vec{b}-4\vec{c}$, $-\vec{b}+2\vec{c}$ are coplanar. (07 Marks)

OR

- 2 a. Given $\vec{a} = 2\hat{i} + 2\hat{j} - \hat{k}$, $\vec{b} = 6\hat{i} - 3\hat{j} + 2\hat{k}$. Find : i) $\vec{a} \cdot \vec{b}$ ii) $\vec{a} \times \vec{b}$ iii) $|\vec{a} \times \vec{b}|$. (07 Marks)
- b. Determine the value of λ , so that $\vec{a} = 2\hat{i} + \lambda\hat{j} - \hat{k}$, and $\vec{b} = 4\hat{i} - 2\hat{j} - 2\hat{k}$, are perpendicular. (06 Marks)
- c. Express $1 - i\sqrt{3}$ in the polar form and hence find its modulus and amplitude. (07 Marks)

Module-2

- 3 a. Using Euler's theorem, prove that $xu_x + yu_y = -3\cot u$ where $u = \sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$. (07 Marks)
- b. Using Maclaurin's series, prove that $\sqrt{1+\sin 2x} = 1 + x - \frac{x^2}{2} - \frac{x^3}{3} + \frac{x^4}{24} + \dots$. (06 Marks)
- c. If $u = x + 3y^2$, $v = 4x^2yz$, $w = 2z^2 - xy$, evaluate $\frac{\partial(u,v,w)}{\partial(x,y,z)}$ at the point $(1, -1, 0)$. (07 Marks)

OR

- 4 a. Obtain Maclaurin's series expansion for the function e^x upto x^4 . (07 Marks)
- b. If $u = \sin^{-1}\left[\frac{x^3+y^3}{x+y}\right]$ prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 2 \tan u$. (06 Marks)
- c. If $u = f\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$. (07 Marks)

Module-3

- 5 a. A particle moves along the curve $x = (1-t^3)$, $y = (1+t^2)$, $z = (2t-5)$ determine its velocity and acceleration at $t = 1$ sec. (07 Marks)
- b. If $\vec{F} = 2x^2\hat{i} - 3yz\hat{j} + xz^2\hat{k}$, and $\phi = 2z - x^3y$, find $\vec{F} \cdot (\nabla\phi)$ and $\vec{F} \times (\nabla\phi)$ at $(1, -1, 1)$. (06 Marks)
- c. Find the constants a, b, c so that $\vec{f} = (x+2y+az)\hat{i} + (bx-3y-z)\hat{j} + (4x+cy+2z)\hat{k}$ is irrotational. (07 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 6 a. Find the directional derivative of $\phi = x^2yz + 4xz^2$ at $(1, -2, -1)$ along $\hat{a} = 2\hat{i} - \hat{j} - 2\hat{k}$ (07 Marks)
- b. Find curl \vec{f} given that $\vec{f} = xyz^2\hat{i} + xy^2z\hat{j} + x^2yz\hat{k}$. (06 Marks)
- c. If $\vec{f} = x^2\hat{i} + y^2\hat{j} + z^2\hat{k}$ and $\vec{g} = yz\hat{i} + zx\hat{j} + xy\hat{k}$. Show that $\vec{f} \times \vec{g}$ is a solenoidal vector. (07 Marks)

Module-4

- 7 a. Obtain the reduction formula. $I_n = \int \cos^n x dx$, where n is a positive integer. (07 Marks)
- b. Evaluate $\int_0^1 \int_0^1 xy dy dx$. (06 Marks)
- c. Evaluate $\int_0^1 \int_0^1 \int_0^1 (x + y + z) dx dy dz$. (07 Marks)

OR

- 8 a. Evaluate $\int_0^{\pi/2} \sin^n(3x) dx$. (07 Marks)
- b. Evaluate $\int_0^{\pi/2} x \sin^4 x \cos^6 x dx$. (06 Marks)
- c. Evaluate $\int_0^1 \int_0^1 \int_0^1 xyz dx dy dz$. (07 Marks)

Module-5

- 9 a. Solve: $(2x + y + 1) dx + (x + 2y + 1) dy = 0$. (07 Marks)
- b. Solve: $(4xy + 3y^2 - x) dx + (x^2 + 2xy) dy = 0$. (06 Marks)
- c. Solve: $y(2xy + e^x) dx + e^x dy = 0$. (07 Marks)

OR

- 10 a. Solve: $(5x^4 - 3x^2y^3 - 2xy^3) dx + (2x^3y - 3x^2y^2 - 5y^4) dy = 0$. (07 Marks)
- b. Solve: $y(2xy + 1) dx - x dy = 0$. (06 Marks)
- c. Solve: $\frac{dy}{dx} + y \cot x = \cos x$. (07 Marks)

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18EC32

Third Semester B.E. Degree Examination, Feb./Mar. 2022
Network Theory

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Determine current through 12Ω resistor shown in Fig.Q1(a), using source transformation.

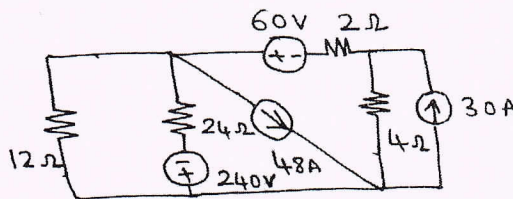


Fig.Q1(a)

(08 Marks)

- b. Find the equivalent resistance of the circuit shown in Fig.Q1(b), using star delta transformation.

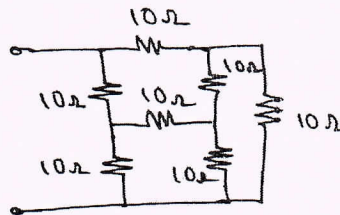


Fig.Q1(b)

(08 Marks)

- c. Discuss the dependent sources. (04 Marks)

OR

- 2 a. Using loop analysis, find the current through 10Ω resistor for the circuit shown in Fig.Q2(a).

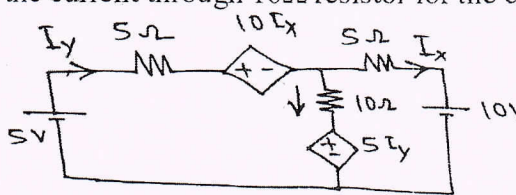


Fig.Q2(a)

(08 Marks)

- b. For the network shown in Fig.Q2(b), determine node voltages V_1, V_2, V_3 and V_4 using nodal analysis.

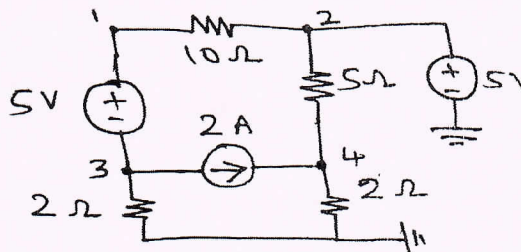


Fig.Q2(b)

(08 Marks)

- c. Explain the super Mesh with example. (04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-2

- 3 a. Using super position theorem, find the current through 20Ω resistor shown in Fig.Q3(a).

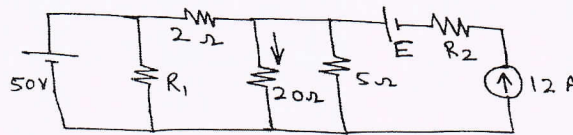


Fig.Q3(a)

(08 Marks)

- b. Using Millman's theorem, determine the current through $(2 + j2)\Omega$ impedance for the network shown in Fig.Q3(b).

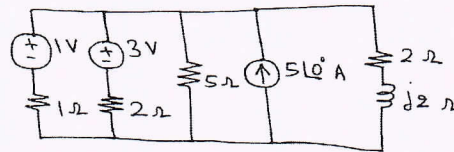


Fig.Q3(b)

(08 Marks)

- c. State the Norton's theorem and also write the procedure to be followed for solving the problem. (04 Marks)

OR

- 4 a. What should be the value of R such that maximum power transfer can take place from the rest of the network to R . Obtain the amount of this power for circuit shown in Fig.Q4(a).

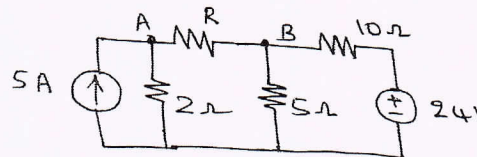


Fig.Q4(a)

(08 Marks)

- b. Obtain the Thevenin's equivalent circuit cross AB for the circuit shown in Fig.Q4(b).

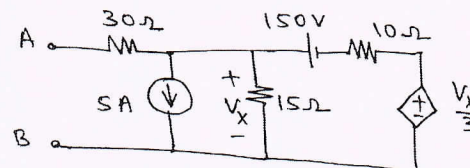


Fig.Q4(b)

(08 Marks)

- c. State the maximum power transfer theorem and also write equation of P_{\max} for both DC and AC circuits. (04 Marks)

Module-3

- 5 a. Explain the transient behavior of the resistance, inductance and capacitor. Also write the procedure for evaluating transient behavior. (10 Marks)

- b. In the network shown in Fig.Q5(b), a steady state is reached with the switch 'K' open. At $t = 0$ the switch is closed. Determine the value of $V_a(0^+)$ and $V_a(0^-)$.

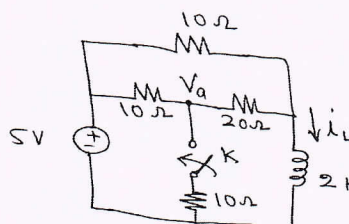


Fig.Q5(b)

(10 Marks)

OR

- 6 a. For the network shown in Fig.Q6(a) $V_1(t) = e^{-t}$ for $t \geq 0$ and is zero for all $t < 0$. If the capacitor is initially uncharged determine the value of $\frac{d^2V_2}{dt^2}$ and $\frac{d^3V_2}{dt^3}$ at $t = 0^+$.

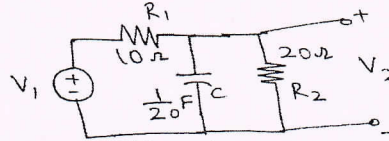


Fig.Q6(a)

(10 Marks)

- b. The switch 'S' is changed from position 1 to position 2 at $t = 0$. Steady state conditions have been reached in position 1. Find the value of i , $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$ for the circuit shown in Fig.Q6(b).

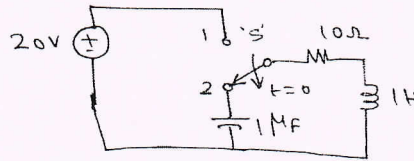


Fig.Q6(b)

(10 Marks)

Module-4

- 7 a. Find the Laplace transform of $f(t)$ shown in Fig.Q7(a).

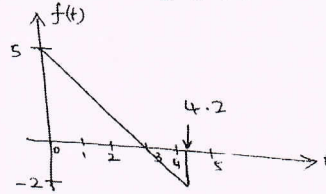


Fig.Q7(a)

(10 Marks)

- b. Find the Laplace transform of the pulse shown in Fig.Q7(b).

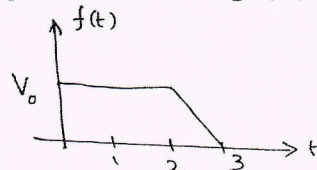


Fig.Q7(b)

(10 Marks)

OR

- 8 a. Find $i(t)$ for the circuit shown in Fig.Q8(a).

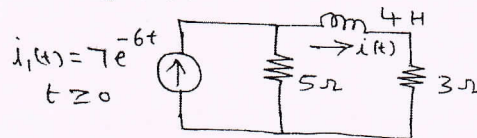


Fig.Q8(a)

(10 Marks)

- b. A voltage pulse of 10 V and $5\ \mu\text{sec}$ duration is applied to the RC network shown in Fig.Q8(b). Find the current $i(t)$.

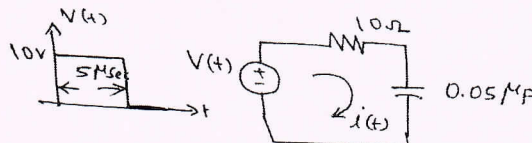


Fig.Q8 (b)

(10 Marks)

Module-5

- 9 a. Obtain y-parameters in terms of z-parameters and h-parameters. (10 Marks)
 b. For the network shown in Fig.Q9(b), find the T-parameters.

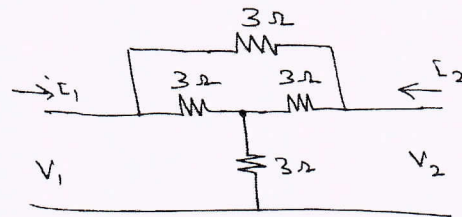


Fig.Q9(b)

(10 Marks)

OR

- 10 a. Derive the expression of bandwidth, half power frequencies and selectivity of a series resonance circuit. (10 Marks)
 b. For the parallel resonant circuit shown in Fig.Q10(b), find I_0 , I_L , I_C , f_0 and dynamic resistance.

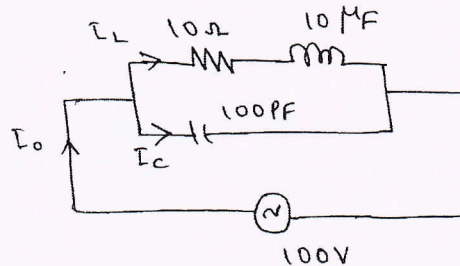


Fig.Q10(b)

(10 Marks)

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18EC33

Third Semester B.E. Degree Examination, Feb./Mar. 2022 Electronic Devices

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- Explain classification of semiconductor insulator and metals using energy band diagram. (08 Marks)
 - Explain different types of bonding forces in solids. (04 Marks)
 - What are intrinsic and extrinsic materials? Explain briefly by taking suitable example. (08 Marks)

OR

- Define Hall effect in semiconductor. Obtain an expression for mobility in terms of Hall coefficient and resistivity. (08 Marks)
 - Consider a semiconductor bar with width $w = 0.1$ mm, thickness $t = 10$ μ m, length $L = 5$ mm. For $B = 10$ KG (1 KG = 10^{-5} wb/cm²) and current of 1 mA. We have $V_{AB} = -2$ mV and $V_{CD} = 100$ mV. Find the type, concentration and mobility of the majority carrier. [Refer Fig.Q2(b)]

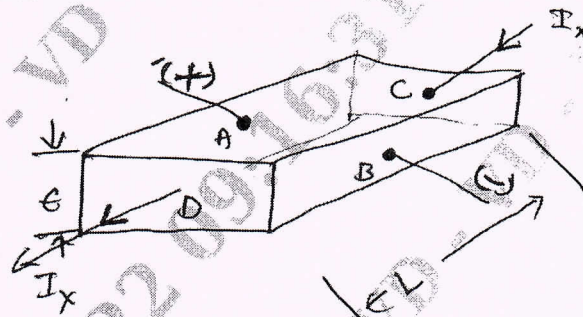


Fig.Q2(b)

- Derive an expression for conductivity and mobility from random thermal motion or electron in solid. (04 Marks) (08 Marks)

Module-2

- Explain the reverse bias p-n junction indicating the minority carrier distribution and variation of quasi fermi levels. (10 Marks)
 - With a neat diagram, explain in detail Avalanche Breakdown and derive an approximate analysis of avalanche multiplication. (10 Marks)

OR

- Derive an expression for current and voltage for an illuminated junction of photodiode and discuss the operation in various quadrants in I-V characteristic. (08 Marks)
 - Explain the structure and operation of solar cell. Indicate the significance of Fill Factor. (08 Marks)
 - A solar cell has a short circuit current of 100 mA and open circuit voltage of 0.8 V under full solar illumination fill factor is 0.7. What is maximum power delivered to load by this cell? (04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8 = 50, will be treated as malpractice.

Module-3

- 5 a. Explain the summary of hole flow and electron flow in p-n-p transistor with proper biasing and list three dominant mechanism which accounts for I_B . (10 Marks)
b. Explain the process flow for double polysilicon self aligned BJT Fabrication. (10 Marks)

OR

- 6 a. Derive Eber's moll modes for Assymmetric Transistor (coupled diode model). (10 Marks)
b. Write short notes on: (i) Base narrowing (ii) Avalanche Breakdown in transistor (10 Marks)

Module-4

- 7 a. Explain the structure and operation of pn JFET by varying V_{GS} and V_{DS} independently. (06 Marks)
b. Write the small signal equivalent circuit of JFET and obtain the expression for transconductance (g_m) and plot the graph with respect to V_{GS} . (06 Marks)
c. Explain the operation of MOS capacitor using energy band diagram for p-type substrate when:
(i) Negative gate bias
(ii) Moderate positive gate bias
(iii) Large positive gate bias (08 Marks)

OR

- 8 a. Explain the ideal capacitance voltage characteristics of an MOS capacitor with p-type substrate. (08 Marks)
b. Explain the operation of n-channel enhancement MOSFET and obtain the current voltage relationship. (08 Marks)
c. Write the different types of MOS structures and symbols for each. (04 Marks)

Module-5

- 9 Explain briefly the various steps involved in the fabrication of p-n junction:
a. Rapid thermal processing (05 Marks)
b. Ion implementation (05 Marks)
c. Chemical Vapor Deposition (CVD) (05 Marks)
d. Photolithography (05 Marks)

OR

- 10 a. Write a note on Integrated Circuit (IC) and its advantages and types of ICs. (10 Marks)
b. Explain the fabrication of CMOS twin well process. (10 Marks)

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18EC34

Third Semester B.E. Degree Examination, Feb./Mar. 2022
Digital System Design

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define and explain the combinational logic circuit along with block diagram. (06 Marks)
 b. Develop the canonical minterm and maxterm forms in decimal notation for the following Boolean functions:
 i) $X = f(a, b, c, d) = \bar{a}b + c\bar{d}$
 ii) $Y = f(a, b, c) = (a + b)(b + \bar{c})$ (08 Marks)
 c. Simplify the following function using K-map method and also construct logic circuit for the simplified equation (function).
 $Y = f(a, b, c, d) = \sum(0, 1, 2, 4, 5, 6, 8, 9, 10, 12, 13, 14)$. (06 Marks)

OR

- 2 a. Simplify the following Boolean function by using Q-M method:
 $X = f(a, b, c) = \sum(0, 1, 2, 3, 4, 5, 6)$. (10 Marks)
 b. Design a combinational logic circuit for valid single digit BCD data, the output is 1 whenever a number is greater than 5 appears at the input. (05 Marks)
 c. Identify the PI and EPI for the following function:
 $M = f(a, b, c, d) = \sum(1, 2, 3, 5, 7, 11, 12, 13, 14, 15)$. (05 Marks)

Module-2

- 3 a. Draw and explain the circuit for 3 to 8 decoder. (06 Marks)
 b. Design and implement a full adder circuit using logic gates. (08 Marks)
 c. Write a short notes on PLD's and FPGA. (06 Marks)

OR

- 4 a. Define MUX and explain 4:1 MUX with the help of logic diagram using gates. (06 Marks)
 b. Explain 4-bit carry look-ahead adder with diagram. (08 Marks)
 c. Design and implement 1-bit comparator circuit. (06 Marks)

Module-3

- 5 a. Compare sequential circuit and combinational circuits. (06 Marks)
 b. Write a short notes on SR-latch. (06 Marks)
 c. Illustrate master-slave J-K flip-flop using NAND Gates. (08 Marks)

OR

- 6 a. Distinguish between synchronous and asynchronous counter. (06 Marks)
 b. Explain 4-bit universal shift register along with diagram. (08 Marks)
 c. Explain the working of clocked SR-FF using NAND Gates. (06 Marks)

Module-4

- 7 a. Explain Mealy and Moore model with diagrams. (10 Marks)
- b. Design and develop Mod-6 synchronous counter using T-FF. (10 Marks)

OR

- 8 a. Construct the excitation table, transition table, state table and state diagram for the following sequential circuit. (Refer Fig.Q.8(a)). (14 Marks)

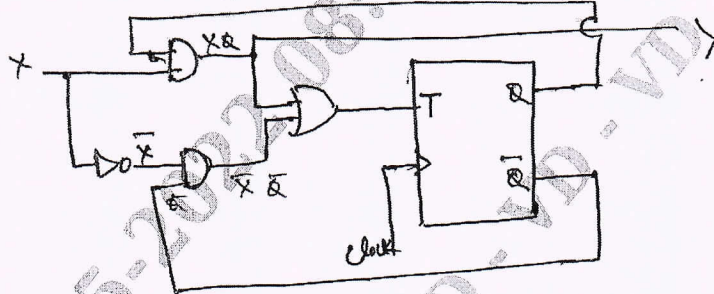


Fig.Q.8(a)

- b. List out the applications of shift registers along with brief explanation. (06 Marks)

Module-5

- 9 a. Explain the operation of serial adder with accumulator. (12 Marks)
- b. Illustrate state assignment rules. (08 Marks)

OR

- 10 a. Write a short notes on:
 - i) Sequential circuit design steps (10 Marks)
 - ii) BCD to Ex-3 code convertor. (10 Marks)
- b. Explain 4-bit Ring and Johnson counter along with diagram. (10 Marks)

CBGS SCHEME

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18EC35

Third Semester B.E. Degree Examination, Feb./Mar. 2022 Computer Organization and Architecture

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain the basic operational concept between the processor and memory with neat block diagram. (08 Marks)
- b. Explain the various parameters affecting the performance of a computer and also provide the basic performance equation. (08 Marks)
- c. Write a short note on single bus structure with neat diagram. (04 Marks)

OR

- 2 a. List out and explain the three systems used for representing signed numbers and also brief about the modular number system concept. (08 Marks)
- b. Explain IEEE standard used for single and double precision floating point number representation with examples. (08 Marks)
- c. Write a short note on Big-endian and little-endian assignment. (04 Marks)

Module-2

- 3 a. What is addressing mode? Explain any four addressing modes with examples. (08 Marks)
- b. What are assembler directives? Explain about the various directives used in the program with example. (08 Marks)
- c. Write a short note on the assembly and execution of programs. (04 Marks)

OR

- 4 a. With neat diagram and program example, explain a simple I/O task between processor, keyboard and display. (10 Marks)
- b. What is subroutine? Illustrate the subroutine function with parameter passing by value and reference with suitable program. (10 Marks)

Module-3

- 5 a. Explain the concept of memory mapped I/O with neat diagram of I/O interface with program example. (10 Marks)
- b. Write short notes on: (i) Interrupt hardware (ii) Interrupt nesting (10 Marks)

OR

- 6 a. What is an interrupt? Explain about various implementation techniques of interrupt. (10 Marks)
- b. Explain how simultaneous interrupt request is handled using the concept of Daisy Chain. (10 Marks)

Module-4

- 7 a. Explain the internal organization of memory chips with example. (08 Marks)
- b. Explain the internal organization of $2M \times 8$ DRAM chip with neat diagram. (08 Marks)
- c. Write a short note on ROM. (04 Marks)

OR

- 8 a. Discuss about the use of cache memory in the processor system. (08 Marks)
b. What is virtual memory? Explain its organization with neat diagram. (08 Marks)
c. Write a short note on magnetic hard disk. (04 Marks)

Module-5

- 9 a. Explain single-bus organization of the data path inside a processor with neat diagram. (10 Marks)
b. Explain the process of fetching a data word from memory using respective registers of a processor with neat diagram. (10 Marks)

OR

- 10 a. Explain the control signal generation required for proper sequence of instructions in the processor. (10 Marks)
b. What is microprogrammed control? Explain its basic organization with suitable diagram and example. (10 Marks)

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CBCS SCHEME

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18EC36

**Third Semester B.E. Degree Examination, Feb./Mar. 2022
Power Electronics and Instrumentation**

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1.
 - a. Mention the different types of power electronic converters. Explain the significance, functions and applications of them. (07 Marks)
 - b. Explain the static Anode-Cathode characteristics of SCR with circuit diagram and V-I characteristics. (08 Marks)
 - c. Explain the basic operation of the unijunction transistor with basic UJT structure, UJT symbol and equivalent circuit. (05 Marks)

OR

2.
 - a. Mention the applications of power electronics in various sectors. (07 Marks)
 - b. The latching current of a thyristor circuit is 50mA. The duration of the firing pulse is 50μs. Will the thyristor get fired? (05 Marks)

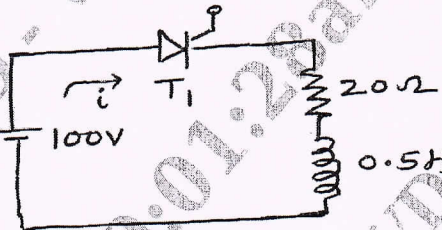


Fig.Q.2(b)

- c. Explain the operation of the resistance firing circuit with associated voltage waveforms. Derive the relevant expressions. (08 Marks)

Module-2

3.
 - a. Explain the operation of the single phase half wave controlled rectifier with resistive load using circuit and waveforms. (10 Marks)
 - b. Give basic chopper classification with different chopper configurations. (05 Marks)
 - c. A dc chopper circuit connected to a 100V dc source supplies an inductive load having 40mH in series with a resistance of 5Ω. A freewheeling diode is placed across the load. The load current varies between the limits of 10A and 12A. Determine the time ratio of the chopper. (05 Marks)

OR

4.
 - a. Explain the effect of freewheeling diode with half wave controlled rectifier circuit and waveforms using inductive load. (10 Marks)
 - b. Explain the operation of step-up/down choppers with suitable circuit. Derive the relevant expression. (07 Marks)
 - c. A step-up chopper is used to deliver load voltage of 500V from a 220V dc source. If the blocking period of the thyristor is 80μs. Compute the required pulse-width. (03 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-3

- 5 a. Explain the operation of the single phase half bridge inverter with RL load. Draw the relevant circuit and waveforms. (10 Marks)
- b. Explain the operation of the isolated forward converter with suitable circuit diagram and relevant waveforms. Mention the advantages and disadvantages. (10 Marks)

OR

- 6 a. Explain the types of errors in measurements. (07 Marks)
- b. Explain the operation of the multirange voltmeter with normal circuit and with multipliers connected in series string circuit. (07 Marks)
- c. A 1mA meter movement having an internal resistance of 100Ω is used to convert into a multirange ammeter having the range 0-10mA, 0-20mA, and 0-30mA. Determine the value of the shunt resistance required. (06 Marks)

Module-4

- 7 a. Explain the operation of dual slope integrating type DVM with basic principles and suitable block-diagram. (08 Marks)
- b. With suitable block diagram, explain the operation of measurement of time briefly. (07 Marks)
- c. A capacitance comparison bridge is used to measure a capacitive impedance at a frequency of 2kHz. This bridge constants at balance are $C_3 = 100\mu\text{F}$, $R_1 = 10\text{K}\Omega$, $R_2 = 50\text{K}\Omega$, $R_3 = 100\text{K}\Omega$. Find the equivalent series circuit of the unknown capacitance. (05 Marks)

OR

- 8 a. With suitable block diagram and table explain the operation of successive approximation DVM. (08 Marks)
- b. With suitable block diagram approach explain the operation of the digital frequency meter. (07 Marks)
- c. Find the equivalent parallel resistance and capacitance that causes a Wien bridge to null with the following component values $R_1 = 3.1\text{K}\Omega$, $C_1 = 5.2\mu\text{F}$, $R_2 = 25\text{K}\Omega$, $f = 2.5\text{kHz}$, $R_4 = 100\text{K}\Omega$. (05 Marks)

Module-5

- 9 a. Explain the operation of the resistive position transducer with construction and electrical equivalent circuit. (07 Marks)
- b. In the differential instrumentation amplifier using transducer bridge, $R_1 = 2.2\text{K}$, $R_F = 10\text{K}$, $R_A = R_B = R_C = 120\text{K}$, $E = +5\text{V}$ and op-amp supply voltage = $\pm 15\text{V}$, the transducer is a transistor with the following specifications. $R_T = 120\text{K}$ at a reference temperature of 25°C . Temperature coefficient of resistance = $-1\text{K}/^\circ\text{C}$. Determine the output voltage at 0°C and 100°C . (06 Marks)
- c. Explain the PLC structure with block diagram. And also explain the PLC operation with PLC operation diagram. (07 Marks)

OR

- 10 a. Explain the operation of the LVDT with construction, various core positions of it, and variation of output voltage vss displacement. (10 Marks)
- b. What is the significance of analog weight scale? Using strain gauge bridge circuit for analog weight scale explain its operation briefly. (05 Marks)
- c. With Bell circuit diagram, explain the operation of the Programmable Logic Controller (PLC) relays. (05 Marks)

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Question Paper Version : B

**Third/Fourth Semester B.E. Degree Examination, Feb./Mar. 2022
Constitution of India, Professional Ethics and Cyber Law**

Time: 2 hrs.]

[Max. Marks: 100

(COMMON TO ALL BRANCHES)

INSTRUCTIONS TO THE CANDIDATES

- Answer all the hundred questions, each question carries one mark.
 - Use only **Black ball point pen** for writing / darkening the circles.
 - For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
 - Darkening two circles for the same question makes the answer invalid.
 - Damaging/overwriting, using whiteners on the OMR sheets are strictly prohibited.**
- Which one of the following does not take part in the Election of the President?
a) Elected Members of Lok - Sabha b) Elected Members of Rajya - Sabha
c) Members of the Legislative Council d) None of these
 - The President can be removed by impeachment procedure on the ground of violating the Constitution by
a) The Supreme Court b) The Lok - Sabha only
c) Both Houses of Parliament d) The High Court
 - The Vice - President of India is Elected by the
a) People
b) Members of State Legislative Assembly
c) Members of the Rajya - Sabha
d) Members of both the Houses of Parliament at joint sitting.
 - Who discharges the duties of the President in the event of President and Vice - President being not available?
a) The Prime Minister b) The Chief Justice of India
c) The Speaker of Lok - Sabha d) The Attorney General of India
 - Which one of the following can the President of India declare?
a) Emergency due to threat of War, external aggression or armed rebellion
b) Emergency due to breakdown of constitutional machinery in the State
c) Financial emergency on account of threat to the financial credit of India
d) All the above.
 - Which budget is placed first in the Parliament House
a) Railway b) General budget c) Financial d) Vote of credit
- VER - B - 1 of 10
- The President can make Laws through ordinances
a) During the recess of the Parliament
b) On certain subjects even when Parliament is in session
c) Only on subjects contained in the concurrent list
d) Under no circumstances.
 - The President can grant pardon in
a) All cases of punishment by Court martial
b) All offences against laws in the Union and Concurrent list
c) All cases involving death sentence
d) All the above cases
 - If State fails to comply with the directives of the Central Government, the President can
a) Declare break - down of Constitutional machinery in the State and assume responsibility for its governance
b) Send reserve police force to secure compliance with directions
c) Dissolve the State legislature and order fresh elections
d) Can do either (a) or (b)
 - Which one of the following has been wrongly listed as Judicial power of the President of India?
a) He appoints the Chief Justice and other Judges of the Supreme Court
b) He can grant pardon, reprieve and respite to a person awarded punishment
c) He can consult the Supreme Court on any question of law or fact.
d) He can remove the Judges of Supreme - Court on ground of misconduct.
 - Who decides disputes regarding disqualification of Members of Parliament?
a) The President b) The Concerned house
c) The Election Commission.
d) The President in consultation with the Election Commission.
 - Who presides over the Lok - Sabha if neither the Speaker nor the Deputy Speaker is not available?
a) A member nominated by the President.
b) A member chosen by the Council of Ministers.
c) A member of the panel of Chairman announced by the Speaker.
d) The Senior most member of the Lok - Sabha.
 - Lok Sabha is superior to the Rajya Sabha because
a) It is directly elected b) It alone controls the Finances
c) It can oust the Council of Ministers through a Vote of no - Confidence
d) of all the above reasons.
 - The Supreme Court of India was setup
a) By the Constitution b) Under the Indian Independence Act 1947
c) Through an Act of Parliament in 1950 d) Under the Government of India Act 1935
 - The Judges of the Supreme Court are
a) Elected by the Parliament.
b) Appointed by the President on the advice of the Parliament.
c) Appointed by the President on the advice of the P.M.
d) Appointed by the President on the advice of the Chief Justice of India.
- VER - B - 2 of 10

18CPC39/49

16. The Judges of the Supreme Court after retirement are not permitted to carry on practice before
- The Supreme Court
 - The High Courts
 - The District and Session Courts
 - Any of the above
17. Which of the following Jurisdiction of the Supreme Court of India has been wrongly listed
- Original Jurisdiction
 - Appellate Jurisdiction
 - Advisory Jurisdiction
 - None of the above
18. Generally, the Governor belongs to
- The State where he is posted
 - The Indian Administrative Service
 - Some other State
 - None of the above
19. Which of the following Legislative Powers is enjoyed by the Governor of a State?
- He can summon or prorogue the State Legislature
 - He can appoint one sixth of the members of the Legislative Council.
 - He can nominate certain member of the Anglo Indian Community to the Legislative Assembly.
 - All of above powers.
20. Engineering Ethics is a
- Preventive Ethics
 - Natural Ethics
 - Developing
 - Scientifically developed Ethics.
21. Professional Ethics is
- Set of Rules relating to personal character of Professionals
 - Traditional Rules observed since a long time.
 - Set of Rules passed by Professional bodies.
 - Set of standards adopted by Professionals.
22. Tight couple means
- Binding two beams tightly
 - Erecting two pillars side by side
 - Process tightly coupled
 - Strong adhesive material
23. An Engineer may not be held legally liable or causing harm. When the harm is caused
- Intentionally
 - Ignorantly
 - Negligently
 - Recklessly
24. A compound measure of the probability and magnitude of the adverse effect is known as.
- Risk
 - Benefit
 - Compensation
 - Both (b) and (c)
25. Engineers shall issue public statements only
- In subjective manner
 - In objective manner
 - On their personal responsibility
 - Based on the reports sent by higher Officers.
26. Attackers commonly target _____ for fetching IP address of a target or victim user.
- Website
 - Web pages
 - IP tracker
 - Emails
27. _____ is the first phase of Ethical hacking
- DNS Poisoning
 - Foot printing
 - ARP – Poisoning
 - Enumeration

VER – B - 3 of 10

18CPC39/49

28. Which of the following do not comes under the intangible skills of hackers?
- Creative thinking
 - Problem solving capability
 - Persistence
 - Smart attacking potential
29. Why programming language is important for ethical hackers and Security Professionals?
- Only to write malware.
 - For solving problems and building tool and programs
 - To teach programming
 - To develop program to harm others.
30. Understanding of _____ is also important for gaining access to a system through networks.
- OS
 - Email servers
 - Networking
 - Hardware
31. The Constitution of India was enacted by a Constituent Assembly set up
- Under the Cabinet Mission Plan 1946
 - Under the Indian Independence Act 1947
 - Under a resolution of the Provisional Government.
 - By the Indian National Congress.
32. The Members of the Constituent Assembly are
- Directly elected by the people
 - Nominated by various Political Parties
 - Nominated by rulers of the Indian States
 - Elected by the Provincial Assemblies
33. The Federal feature of the Indian Constitution provides for
- Distribution of Legislative powers between the Union Government and the State Government.
 - Division of powers between the Executive and Judiciary.
 - Distribution of powers between the P.M and Cabinet.
 - None of these
34. The Governor of State is
- Directly Elected by the people
 - Elected by the State Legislature
 - Appointed by the President
 - Nominated by the Parliament.
35. The source of Authority of the Indian Constitution is
- The Government of India
 - The People of India
 - The President
 - The Parliament
36. The Preamble was amended by
- 44th Amendment
 - 39th Amendment
 - 42nd Amendment
 - None of the above
37. Fraternity means
- Spirit of brotherhood
 - Fatherly treatment
 - Unity and integrity
 - Elimination of Economic Justice
38. In the final form of the Constitution adopted by the Constituent Assembly, how many Articles and Schedules were there?
- 397 Articles and 7 Schedules
 - 395 Articles and 4 Schedules
 - 400 Articles and 10 Schedules
 - 395 Articles and 8 Schedules

VER – B - 4 of 10

39. The Preamble of the Indian Constitution does not contain concept of
 a) Democratic b) Adult Franchise c) Sovereignty d) Fraternity
40. The strength of the Constituent Assembly, after the withdrawal of the Muslim League, was reduced to
 a) 299 members b) 329 member c) 331 members d) 359 members
41. The Fundamental Rights of a Citizen can be suspended
 a) By the Parliament through a Law enacted by two – third majority
 b) By the President during a National emergency
 c) By the Supreme Court d) None of these
42. Which authority can a Citizen approach for securing Right of Personal freedom
 a) The Parliament b) The President
 c) Supreme Court alone d) Both Supreme Court and High Court
43. The main objective of the Fundamental Rights is to
 a) Ensure Independence of Judiciary b) Promote a Socialist Pattern of Society
 c) Ensure Individual liberty d) Ensure all the above
44. Under which section of IT Act, stealing any digital asset or information is written a cyber crime
 a) 65 b) 65 - D c) 67 d) 70
45. Fundamental duties of the Indian Citizen, were
 a) Enshrined in the original Constitution
 b) Added to the Constitution by the 42nd Amendment.
 c) Added to the Constitution by the 44th Amendment.
 d) Added to the Constitution in the wake the Supreme Court Judgment Keshavananda Bharati case with consent of all the Political parties.
46. Which one of the following Fundamental Right has been subject of maximum litigation since the inauguration of the Constitution?
 a) Right to Freedom of Speech b) Right to Constitutional Remedies
 c) Right to Property d) Right against Exploitation
47. The Fundamental Rights of Citizens were
 a) Incorporated in the original Constitution b) Confined in an Act of Parliament in 1952
 c) Incorporated by the 42nd Amendment d) Incorporated by the 44th Amendment
48. The Fundamental Rights of Indian Citizen have been criticized on the ground that
 a) They are hemmed in by too many restrictions.
 b) They are hemmed in language beyond the comprehension of ordinary citizen
 c) They are absolute d) Both (a) and (b).
49. Respite means
 a) Death due to drowning b) Awarding lesser punishment
 c) Death due to strangulation d) Painless death
50. The Governor recommends the imposition of Presidents rule in the State
 a) On the recommendation of the State Legislature
 b) On the recommendation of the C.M.
 c) On the recommendation of Council of Minister
 d) If he is satisfied that the State Government cannot be carried on his accordance with the provision of the Constitution.

51. Who of the following acted as the Constitutional Advisor of the Constituent Assembly
 a) Dr. B.R. Ambedkar b) Dr. Babu Rajendra Prasad
 c) B.N. Rao d) Dr. Sachidanand Sinha
52. Which one of the following provisions of the Constitution came into force soon after its adoption on 26th November 1949?
 a) Provision relating to Citizenship b) Elections
 c) Provisional Parliament d) All the above
53. The three types of Justice referred in our Preamble are
 a) Social, Economic and Social b) Economic, International and Political
 c) Economic, Religious and Social d) Religious, Social and Political
54. What was the exact Constitutional status of the Indian Republic on January 26, 1950, when the Constitution was inaugurated?
 a) A Democratic Republic b) Sovereign Democratic Republic
 c) A Sovereign Secular Democratic Republic
 d) A Sovereign Socialist Secular Democratic Republic.
55. Right to against Exploitation seeks to protect the weaker sections of Society by
 a) Giving equal pay for equal work for men and women.
 b) Prohibiting human trafficking and beggar
 c) Providing compulsory education for children below the age of 14 years
 d) Forcing a person to work against his will without payment
56. Which one of the following Directive principles can be described as Gandhian in nature?
 a) Providing equal pay for equal work for both Men and Women
 b) Workers participation in Management
 c) Organization of Village Panchayats as units of self Government
 d) Separation of Judiciary from the Executive.
57. Who has been vested with the power to decide whether the restrictions imposed on the Fundamental Rights of Indian Citizen are reasonable or not
 a) The Parliament b) The President
 c) The Courts d) None of the above
58. Which one of the following Rights conferred by the Constitution is also available to Non-citizens.
 a) Freedom of speech assembly and association
 b) Freedom to move, reside and settle in any part of the territory of India
 c) Freedom to acquire property or to carry on any occupation, trade or business
 d) Right to Constitutional remedies.
59. Which one of the following has been wrongly listed as a special feature of Fundamental Rights in India
 a) Fundamental Rights are more sacrosanct than rights granted by ordinary laws
 b) Fundamental Rights are subject to reasonable restrictions
 c) Fundamental Rights are Justifiable and can be enforced through the Supreme Court
 d) None of these.

60. The main objective of the Cultural and Educational Rights granted to the Citizen is
 a) To preserve the rich culture heritage of India.
 b) To evolve a single integrated India culture.
 c) To help the minorities to conserve their culture.
 d) All the above.
61. For hacking a database or accessing and manipulating data which of the following language the hacker must know?
 a) SQL b) HTML c) TCL d) F #
62. _____ are piece of programs or scripts that allow hackers to take control over any system.
 a) Exploits b) Antivirus c) Firewall bypassers d) Worms
63. The process of finding vulnerabilities and exploiting them using exploitable scripts or programs are known as
 a) Infiltrating b) Exploitation c) Cracking d) Hacking
64. How many types of exploits are there based on their nature from hackings perspective?
 a) 04 b) 03 c) 02 d) 05
65. A _____ is a set of changes done to any program or its associated data designed for updating fixing or improving it.
 a) Scratch b) Patch c) Fixer d) Resolver
66. Fixing of security vulnerabilities in a system by additional programs is known as _____ patches
 a) Hacking b) Database c) Server d) Security
67. _____ are some very frequent updates that come for every antivirus.
 a) Patch update b) Data update
 c) Code update d) Definition update
68. Cyber – Crime can be categorized into _____ types.
 a) 04 b) 03 c) 02 d) 06
69. Which of the following is not a type of peer to peer cyber – crime.
 a) Phishing b) Injecting Trojan to a target victim
 c) MITM d) Credit card details leak in deep web
70. In which year India's IT Act came into existence?
 a) 2000 b) 2001 c) 2002 d) 2003
71. The Chief Election Commissioner can be removed from his office before the expiry of term by the
 a) Chief Justice of India
 b) Prime Minister on the recommendation of Cabinet
 c) President on the recommendation of Parliament after the impeachment
 d) President on the advice of Chief Justice of India.
72. The quorum of minimum number of members required to hold the meetings of either houses of Parliament is
 a) One - tenth b) One - fifth c) One - third d) 72 hours

73. The advice of the Supreme Court is
 a) Binding of the President
 b) Binding on the President if it is tendered unanimously
 c) Not binding on the President
 d) Binding in certain cases and not binding in other cases
74. The Governor reserves the Right to issue ordinances
 a) When the State Legislature is not in session and he feels that there is an immediate need of action
 b) Whenever the State is under President's Rule
 c) Whenever he likes
 d) None of these
75. The Writ of Certiorari is issued by a Superior Court
 a) To an Inferior Court to stop further proceedings in a particular case
 b) To an Inferior Court to transfer the record of proceedings in a case for its review
 c) To an Office to show his right to hold a particular Office
 d) To a Public authority to produce a person detained by it before the Court within 24 hours.
76. Which one of the following was wrongly listed as a duty of Indian Citizens
 a) To uphold and protect the Sovereign unity and integrity of the Country
 b) To promote harmony and the spirit of common brotherhood among the people of India
 c) To protect and pressure the Natural Environment
 d) To practice Family planning and control population.
77. The Directive Principles Aim at
 a) Ensuring Individual liberty
 b) Ensuring strengthening of the Country's Independence
 c) Providing a social and economic base for a genuine democracy in the Country.
 d) Achieving all the above objectives.
78. The Directive Principles are the
 a) Positive instructions to the Government to work for the attainment of the set objectives
 b) Negative injunctions to the Government to refrain from encroaching on the freedom of the people.
 c) Directive to the State to enhance the International prestige of the Country
 d) Directives to the Government to pursue a policy of non alignment.
79. Which one of the following has been wrongly listed as Directive Principle based on liberal Principles?
 a) Separation of Judiciary and Executive
 b) Provision of a Uniform Civil code for the Country
 c) Protection of monuments and places of artistic or Historical importance
 d) None of the above has been wrongly listed.
80. The Constitution has vested the Executive power of the Union Government in
 a) The President of India
 b) The Prime Minister
 c) The Council of Minister
 d) All the above
81. Cooking Means
 a) Boiling under pressure
 b) Retaining results which fit theory
 c) Making deceptive statements
 d) Misleading the Public about quality of the product.

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82. Which one is not a Trade Secret?
 a) Theorem b) Equipment c) Formulae d) Pattem
83. The codes of Ethics can be taken as guidelines by the Engineers to
 a) Resolve the conflicts b) Formulate problems
 c) Overcome the work pressure d) Escape from the responsibility
84. A Fault tree is used to
 a) Assess the risk involved b) Claim compensation
 c) Take free consent d) Improve safety
85. Risk of harm equal to probability of producing benefit is
 a) Inevitable Risk b) Acceptable Risk
 c) Risk which cannot be avoided d) None of these
86. One of the Aims of studying Engineering Ethics is to
 a) Inspire Engineers to acquire in depth knowledge in their field
 b) Acquire new skills in Engineering testing
 c) Stimulate moral imaginations
 d) Make Engineers self – confident in discharging their duties.
87. Which one is not an impediment to responsibility?
 a) Group think b) Microscopic vision
 c) Trademark d) Egocentric tendencies
88. Being safe or blaming others is type of attitude of responsibility of Engineers
 a) Minimalist b) Reasonable care c) Good works d) None of these
89. To overcome an impediment 'Uncritical Acceptance', what step an Engineer has to take?
 a) Accept and Analyse b) Analyse and Accept
 c) Always say Yes Boss d) None of these
90. Engineering Ethics,
 a) Stimulates the moral imagination
 b) Provides up – to – date knowledge in the field of Engineering.
 c) Stimulates to Conduct Research d) Stresses on Time Management.
91. Impediment proceedings can be initiated against the President in either House of Parliament only if a resolution signed by members of the House is moved
 a) 10 percent of total b) 25 percent of total
 c) 20 percent of total d) 15 percent of total
92. Which one of the following functions of Prime – Minister has been wrongly listed?
 a) He presides over the meeting of the Cabinet
 b) He prepares the agenda for the meeting of the Cabinet.
 c) He coordinates the working of various department
 d) He chairs the meeting of the various standing and ad-hoc committees of Parliament.
93. A motion of no – confidence against the Council Ministers can be moved in the Lok – Sabha, if it is supported by atleast
 a) 50 members b) 55 members
 c) 100 members.
 d) One – third of the total members of Lok – Sabha
94. The President can call a Joint session of the two Houses of Parliament
 a) If a bill passed by one house is rejected by the other
 b) If the amendment proposed to the bill by one house is not acceptable to the other house.
 c) If the house does not take any action for six months on a bill remitted by the other house.
 d) Under all the above conditions.
95. The Members of the Rajya – Sabha except the nominated ones are
 a) Directly elected by the people b) Elected by local Self – Governing bodies
 c) Elected by the Legislative Assemblies of the States.
 d) Elected partially by Legislative Assemblies and partially by the Local Self Governing bodies.
96. The President who is the head of the State under the Parliamentary system prevailing in India.
 a) Enjoys absolute powers b) Enjoys limited but real powers
 c) Enjoys only nominal powers d) Enjoys no powers
97. The Vice – President is the Ex – Office Chairman of
 a) The Rajya Sabha b) The National Development Council
 c) The Planning Commission d) None of the above
98. The Speaker of the Lok – Sabha is
 a) Appointed by the President.
 b) Appointed by the President on the recommendations of the P.M.
 c) Elected by the members of the two houses at a joint sitting.
 d) Elected by the members of the Lok – Sabha.
99. The Rajya – Sabha is a permanent House but
 a) One – third of its members retire every two years
 b) One – half of its members retire every three years
 c) One – fifth of its members retire every year
 d) One – half of its member retire every two years.
100. The power to control the expenditure of the Government of India rests exclusively with
 a) The Parliament b) The President
 c) The Comptroller and Auditor General d) The Union Finance Minister

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18EC36

Third Semester B.E. Degree Examination, July/August 2022
Power Electronics and Instrumentation

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. List and briefly explain the different types of power electronic converters. (10 Marks)
 b. Explain the different turn-on methods of thyristor. (10 Marks)

OR

- 2 a. With neat circuit diagram and waveforms, explain class-A and class-B commutation methods of a thyristor. (10 Marks)
 b. With neat diagram, explain static anode-cathode characteristics of SCR. Define latching current and holding current. (10 Marks)

Module-2

- 3 a. With the help of neat circuit diagram and waveforms describe the operation of a 1 ϕ FWCR for B-2 connection for R-load. Derive expressions for rms and average output voltages and for rms and average output currents. (10 Marks)
 b. A single phase half-wave converter is operated from a 120V, 60Hz supply. The load is resistive with $R = 10\Omega$. If the average output voltage is 75% of maximum possible average output voltage, determine: i) Firing angle ii) rms and average output currents iii) average and rms SCR currents. (06 Marks)
 c. Explain different control techniques of phase control converters. (04 Marks)

OR

- 4 a. What is dc-dc converter? What are its applications? Explain the classification of chopper. (06 Marks)
 b. Explain the operation of step-up chopper with neat circuit diagram and waveforms. (08 Marks)
 c. For a chopper shown in Fig.Q.4(c), dc source voltage = 230V, load resistance = 10. Consider voltage drop of 2V across chopper when it is on. For a duty cycle of 0.4, calculate: i) Average and rms value of output voltage ii) Chopper efficiency. (06 Marks)

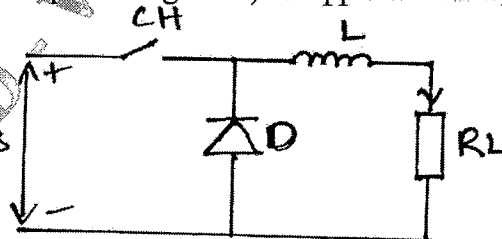


Fig.Q.4(c)

Module-3

- 5 a. Explain the operation of single-phase half bridge voltage source inverter with resistive load. Draw associated circuit diagram and waveforms. Derive the expressions for RMS output voltage and instantaneous output voltage. (10 Marks)
- b. With the help of circuit diagram and waveforms explain the operation of flyback converter in discontinuous mode. Also list the advantages and disadvantages. (10 Marks)

OR

- 6 a. Explain different types of errors, and how to minimize them. (06 Marks)
- b. Explain with a diagram how a PMMC can be used as an ammeter. How can a basic ammeter be converted into a multirange ammeter? (08 Marks)
- c. Calculate the value of multiplier resistance for the multiple range dc voltmeter circuit shown in Fig.Q.6(c). (06 Marks)

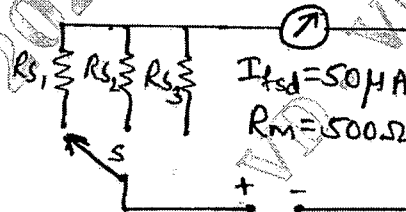


Fig.Q.6(c)

Module-4

- 7 a. Explain with the help of diagram and equations, the working principle of dual slope type DVM. (10 Marks)
- b. With neat diagram, explain the operation of SAR type DVM. (10 Marks)

OR

- 8 a. Explain with the help of block diagram the operation of a function generator. (06 Marks)
- b. Explain Wien's bridge with diagram. And derive the two balance conditions for a Wien bridge. (06 Marks)
- c. If the sensitivity of the galvanometer in the circuit of Fig.Q.8(c) is 10mm/μA, and its internal resistance = 150Ω. Determine its deflection. (08 Marks)

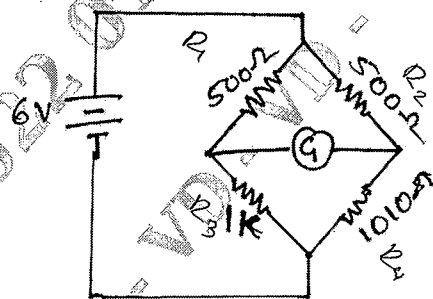


Fig.Q.8(c)

Module-5

- 9 a. State the various parameters and advantages of electrical transducer. (06 Marks)
- b. Explain the working principle of thermistor. (06 Marks)
- c. Explain with diagrams the structure and operation of a PLC. (08 Marks)

OR

- 10 a. Explain in brief bonded strain gauge. (10 Marks)
- b. Explain how the strain gauge bridge circuit is used as analog weight scale. (10 Marks)

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18EC35

Third Semester B.E. Degree Examination, July/August 2022
Computer Organization and Architecture

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. With a neat diagram, describe the functional units of a computer. (08 Marks)
 b. Illustrate single bus structure of a computer. (06 Marks)
 c. Explain Little-endian and Big-endian byte address assignment. (06 Marks)

OR

- 2 a. Explain the following with an example:
 i) Three-address instruction
 ii) Two-address instruction
 iii) One-address instruction. (09 Marks)
 b. List the functions of system software in computer. (06 Marks)
 c. Discuss IEEE standard for single precision and double precision floating point numbers with standard notations. (05 Marks)

Module-2

- 3 a. Define addressing mode. Discuss the following addressing modes with example:
 i) Register ii) Direct iii) Indirect iv) Index. (10 Marks)
 b. Explain various assembler directives used in assembly language program. (06 Marks)
 c. List the operations performed by call and return instructions. (04 Marks)

OR

- 4 a. With example illustrate logical and arithmetic shift and rotate instructions. (10 Marks)
 b. Explain stack operation with example. (10 Marks)

Module-3

- 5 a. Illustrate interrupt priority schemes, with neat diagram. (08 Marks)
 b. Describe the bus arbitration schemes, with neat diagram. (12 Marks)

OR

- 6 a. Explain use of DMA controllers in a computer system, with neat diagram. (08 Marks)
 b. What are interrupts? Explain various ways of enabling and disabling interrupts. (08 Marks)
 c. Write an explanatory note on interrupt hardware. (04 Marks)

Module-4

- 7 a. Illustrate internal organization of a $2M \times 8$ dynamic memory chip. (08 Marks)
 b. What are mapping functions? Explain direct mapping scheme, with neat diagram. (06 Marks)
 c. With neat diagram, explain virtual memory organization. (06 Marks)

OR

- 8 a. Explain principle of working of magnetic disk, with neat diagram. (06 Marks)
b. Discuss A single transistor dynamic memory cell. (06 Marks)
c. Explain different types of non-volatile memory concepts. (08 Marks)

Module-5

- 9 a. Illustrate multiple Bus organization concept, with neat diagram. (10 Marks)
b. Describe basic organization of a micro programmed control unit. Give an example of microinstructions. (10 Marks)

OR

- 10 a. Develop the complete control sequence for the execution of instruction Add (R3), R1. (06 Marks)
b. Discuss Hardwired control unit organization with relevant diagram. (08 Marks)
c. Illustrate the connection and control signals for register MDR with neat diagram. (06 Marks)

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18EC34

Third Semester B.E. Degree Examination, July/August 2022
Digital System Design

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Convert the following Boolean function into minterm canonical or maxterm canonical form:
 - (i) $y = \overline{ox} + y\overline{z}$ (ii) $(A + \overline{B} + C)(\overline{A} + D)$ (06 Marks)
- b. Simplify the Boolean function and identify the prime and essential prime implicants:
 - (i) $f(a, b, c, d) = \sum m(1, 5, 7, 8, 9, 10, 11, 13, 15)$
 - (ii) $f(a, b, c, d) = \pi M(0, 2, 3, 8, 9, 10, 12, 14)$ (06 Marks)
- c. Simplify the given Boolean function using Quine-Mc Cluskey method.
 $f(a, b, c, d) = \sum m(0, 1, 2, 3, 6, 7, 8, 9, 14, 15)$ (08 Marks)

OR

- 2 a. Design a combinational logic circuit that has three input variables and produces a logic 1 output when more than one input variables are logic 1. (06 Marks)
- b. Simplify the following Boolean function using K-map.
 - (i) $f(w, x, y, z) = \pi(2, 3, 8, 9, 10, 11, 12, 13, 14, 15)$
 - (ii) $f(w, x, y, z) = \sum m(6, 7, 9, 10, 13) + \sum d(1, 4, 5, 11, 15)$ (06 Marks)
- c. Simplify the given Boolean function using Quine-Mc Cluskey method.
 $f(w, x, y, z) = \sum m(1, 3, 13, 15) + \sum d(8, 9, 10, 14)$ (08 Marks)

Module-2

- 3 a. Design a combinational circuit using 3 : 8 decoder (IC - 74138) that generates a logic 1 output when majority of 4 inputs are true. (06 Marks)
- b. Explain 4-bit carry look ahead adder with neat diagram. (08 Marks)
- c. Implement a full adder using PAL. (06 Marks)

OR

- 4 a. Implement $f(w, x, y, z) = \sum m(0, 1, 2, 4, 5, 7, 8, 9, 12, 13)$ using 8 : 1 MUX with w, x, y as select lines. (06 Marks)
- b. Design 2-bit magnitude comparator. (08 Marks)
- c. Explain the Basic Architecture of a Xilinx XCR3064XL CPLD. (06 Marks)

Module-3

- 5 a. Explain the working of Master Slave JK Flip-Flop with function table and timing diagram. (08 Marks)
- b. Differentiate between Flip Flops and Latches. (04 Marks)
- c. Design an universal shift Register using positive edge triggered DFF having the behavior as specified.

Mode	Operation
00	Hold
01	Shift right
10	Shift left
11	Parallel load

(08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 6 a. Explain positive edge Triggered D Flip Flop with the help of circuit diagram and waveform. (08 Marks)
- b. Obtain the characteristic equation for the following Flip Flop (i) J.K. (ii) S.R. - (06 Marks)
- c. Design a mod-8 asynchronous upcounter using negative edge triggered JK FF. (06 Marks)

Module-4

- 7 a. Design a synchronous mod-6 counter using clocked JK Flip Flop for the sequence 0-2-3-6-5-1 (08 Marks)
- b. Distinguish between Moore and Melay model with necessary block diagram. (06 Marks)
- c. Analyze the following synchronous circuit. (Refer Fig. Q7 (c))

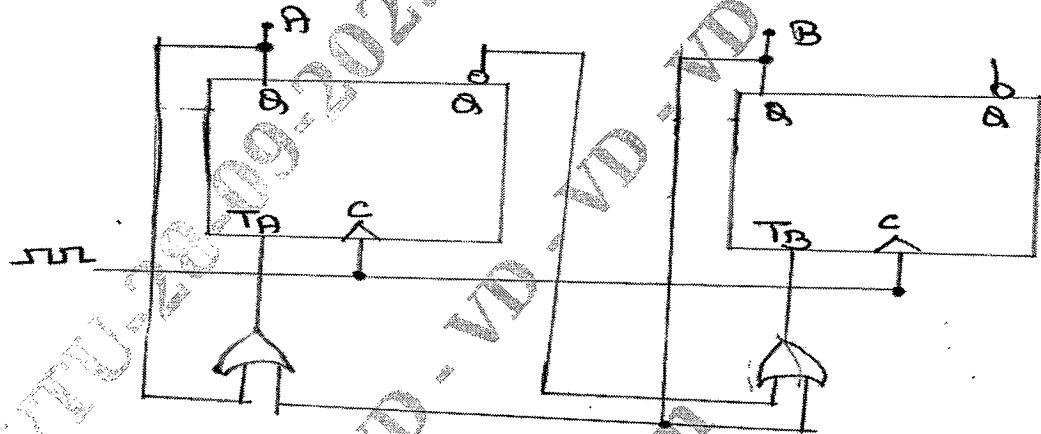


Fig. Q7 (c)

(06 Marks)

OR

- 8 a. Design a synchronous mod-6 counter using clocked T-Flip Flop for the sequence, 0-2-3-6-5-1. (06 Marks)
- b. Draw the state diagram, for the sequential circuit shown. (Refer Fig. Q8 (b))

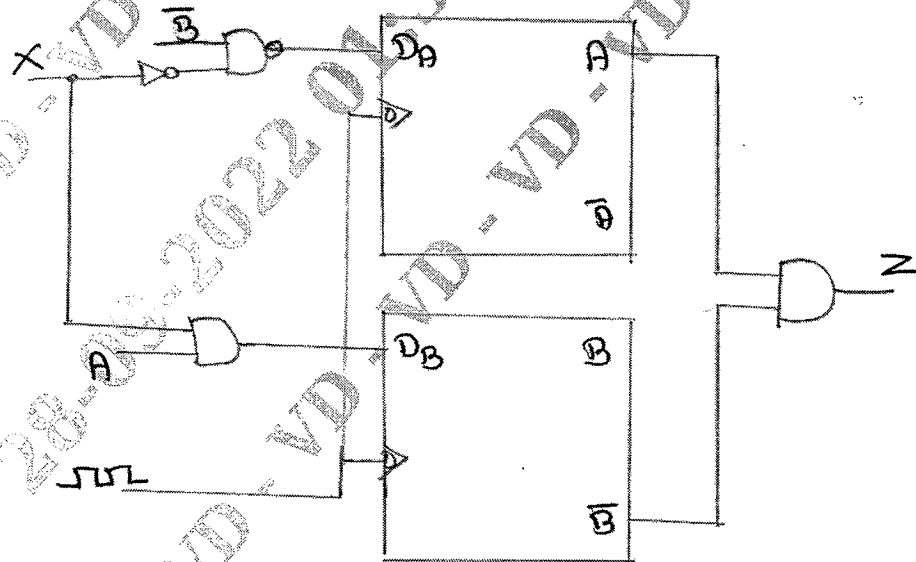


Fig. Q8 (b)

(06 Marks)

c. Analyze the given synchronous sequential circuit. (Refer Fig. Q8 (c))

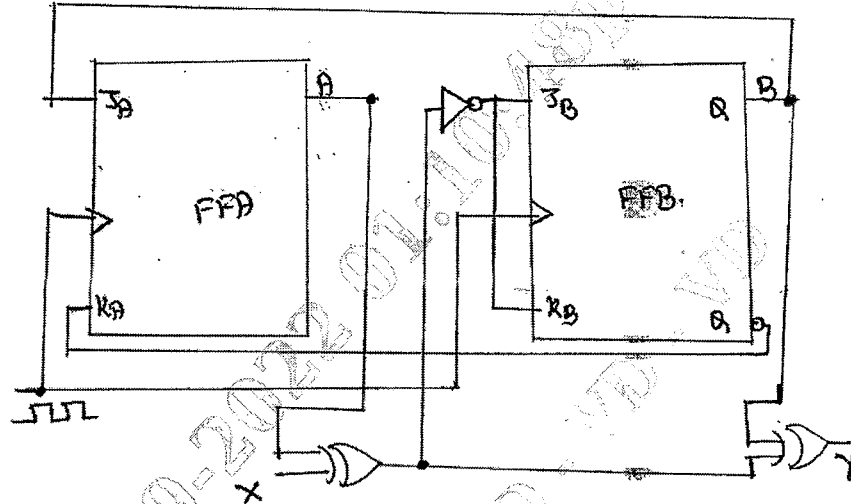


Fig. Q8 (c)

(08 Marks)

Module-5

- 9 a. Design a Mealy type sequence detector to detect a serial input sequence of 101. (08 Marks)
 b. List the guidelines for construction of state graphs. (06 Marks)
 c. With the help of neat block diagram, explain serial adder with accumulator. (06 Marks)

OR

- 10 a. Design a Moore type sequence detector to detect a serial input sequence of 101. (08 Marks)
 b. Construct Moore and Mealy state diagram, that will detect input sequence 10110, when input pattern is detected, z is asserted high. Give state diagrams for each state. (06 Marks)
 c. With the help of neat block diagram, explain parallel binary divider. (06 Marks)

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18EC33

Third Semester B.E. Degree Examination, July/August 2022
Electronic Devices

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. In a filled band, what is the net current density and if a hole is created, what is the net current generated? Describe the superposition of the (E,K) band structure for a semiconductor in an electric field. (10 Marks)
- b. A Si bar 4 cm long and $500 \mu\text{m}^2$ in cross sectional area is doped with $2.5 \times 10^{18} / \text{cm}^3$ phosphorus. Find the current at 300°K with 22 V applied voltage. How long it take an average electron to drift 4 cm in pure silicon at an electric field of 70 V/cm. Calculate the time required at 10^3 V/cm. Assume mobility of the electrons is $0.1675 \text{ m}^2/\text{Vsec}$ and scattering limited velocity (V_s) in 10^7 cm/sec. (10 Marks)

OR

- 2 a. Show the random thermal motion of an electron in a solid and what happens when electric field is applied? Derive the equation which relates the current density and mobility in a semiconductor in an applied electric field. (10 Marks)
- b. Consider a semiconductor bar with width = 0.02 cm, thickness = $15 \mu\text{m}$ and length = 8 mm. For $B_z = 15 \text{ kg}$ and a current of 3.5 mA, $V_{AB} = -5 \text{ V}$, $V_{CD} = 400 \text{ mV}$, find the type, concentration and mobility of the majority carrier. (10 Marks)

Module-2

- 3 a. Analyze the effect of a bias at a pn junction on electric field, potential particle flow and current direction at (i) Equilibrium (ii) Forward bias (iii) Reverse bias. (12 Marks)
- b. Explain the operation of pin photodetector. (08 Marks)

OR

- 4 a. What type of breakdown occurs in a lightly doped pn junction? Show the energy band diagram of a pn junction in a reverse bias, single ionizing collision by an incoming electron in the depletion region and primary, secondary and tertiary collisions. (10 Marks)
- b. Obtain the relationship between the open circuit voltage and optical generation rate starting from the expression for the optically generated illuminated pn junction. (10 Marks)

Module-3

- 5 a. Derive the Ebers-Moll equations for the thermal currents in a transistor and represent the same. (14 Marks)
- b. When the base narrowing effect occur in a transistor? (06 Marks)

OR

- 6 a. Illustrate the hole and electron flow in a pnp transistor with proper biasing. (10 Marks)
- b. Show the switching effects in a common emitter transistor circuit. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-4

- 7 a. Show the electric field direction, charge flow and induced charge region in a MOS capacitor with P-type substrate and n-type substrate when a moderate positive gate bias is applied. (08 Marks)
- b. Represent the energy-band diagram through a MOS capacitor structure with P-type as a semiconductor and differential charge distribution for a differential change in gate voltage in the depletion and inversion mode. (12 Marks)

OR

- 8 a. Represent the energy band diagram of a MOS capacitor for the following cases :
(i) Negative gate bias in a MOS capacitor with ptype substrate.
(ii) Positive gate bias in a MOS capacitor with ntype as substrate. (10 Marks)
(iii) Large negative gate bias in a MOS capacitor with n type as substrate. (10 Marks)
- b. Show the channel formation in the MOS structure and I_D versus V_{DS} curve for the following cases :
(i) $V_{gs} > V_t$ and small V_{DS} value.
(ii) $V_{gs} > V_t$ and large V_{DS} value.
(iii) $V_{gs} > V_t$ and $V_{DS} = V_{DS}(\text{sat})$. (10 Marks)

Module-5

- 9 a. Write the names of the different fabrication steps in a pn junction. (08 Marks)
- b. Explain the evolution of ICs over the years. (12 Marks)

OR

- 10 a. Draw a neat sketch showing the ion implantation system in the fabrication of a pn junction and explain. (10 Marks)
- b. Write the structure of a CMOS inverter and show the formation of p-channel and n-channel devices together. (10 Marks)

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18EC32

Third Semester B.E. Degree Examination, July/August 2022
Network Theory

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Briefly explain the classification of electrical networks. (10 Marks)
- b. Three resistance are connected in delta obtain the star equivalent of the network. (05 Marks)
- c. Find the equivalent resistance between any 2 corners. (Ref. Fig Q1(c))

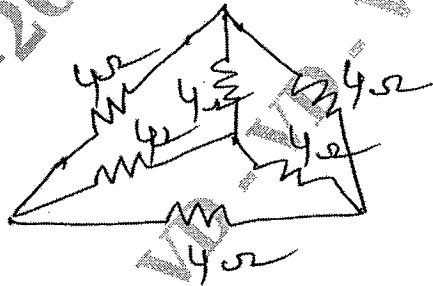


Fig Q1(c)

(05 Marks)

OR

- 2 a. Using Mesh current analysis, find the currents in various branches in the circuit. (Ref. Fig Q2(a))



Fig Q2(a)

(10 Marks)

- b. Find the current through the branches using Nodal analysis. (Ref. Fig Q2(b)).

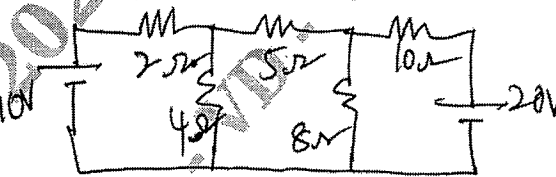


Fig Q2(b)

(10 Marks)

Module-2

- 3 a. State and explain Thevenin's theorem. (10 Marks)
- b. Find the Norton's equivalent for the given Fig Q3(b).

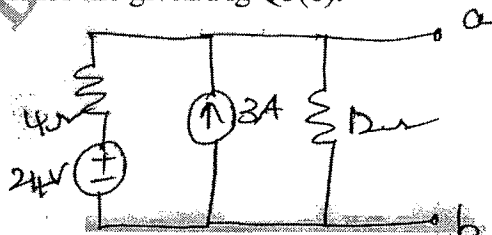


Fig Q3(b)

(10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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- 4 a. State and explain maximum power transfer when load impedance consisting of variable resistance and variable reactant. (10 Marks)
- b. Using Millman's theorem, find the current flowing through $(4+j3) \Omega$ of the circuit as in Fig Q4(a).

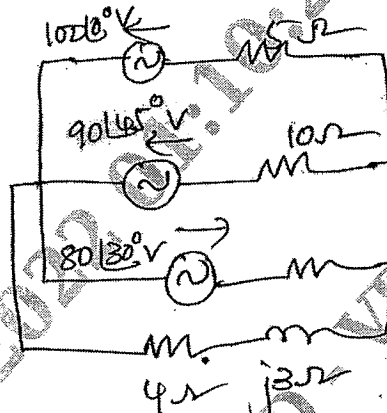


Fig Q4(a)

(10 Marks)

Module-3

- 5 a. Discuss the initials and final conditions in inductor, capacitor and resistor. (10 Marks)
- b. Find $V_c(0^+)$. Assume that the switch was in closed state for a long time. (Ref. Fig Q5(b))

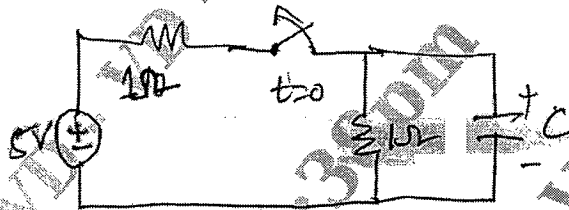


Fig Q5(b)

(10 Marks)

OR

- 6 a. In the given network, K is closed at $t = 0$ with zero current in the inductor. Find the values of i , $\frac{di}{dt}$, $\frac{d^2i}{dt^2}$ at $t = 0^+$, if $R = 8\Omega$ and $L = 0.2H$. (Ref. Fig Q6(a))

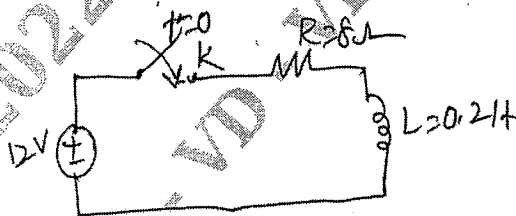


Fig Q6(a)

(10 Marks)

- b. In circuit shown in Fig Q6(b). The switch K is changed from position 1 to position 2 at $t = 0$. Steady state condition having been reached at position. Find the values of i , $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$.

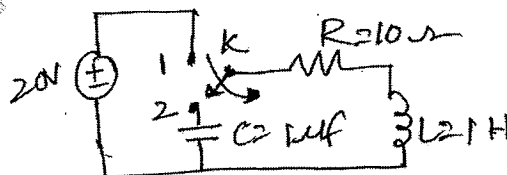


Fig Q6(b)

(10 Marks)

Module-4

- 7 a. Obtain the Laplace transform of
 i) Unit step function ii) Unit Ramp function iii) Unit impulse function. (10 Marks)
 b. Find the Laplace transform of following :
 (i) $x(t) = 2t u(t) - \frac{4d}{dt}\delta(t)$ ii) $x(t) = 5u(t/3)$ iii) $x(t) = 5e^{-t/2}u(t)$ (10 Marks)

OR

- 8 a. Find the Laplace transform for the given Figure Q8(a).

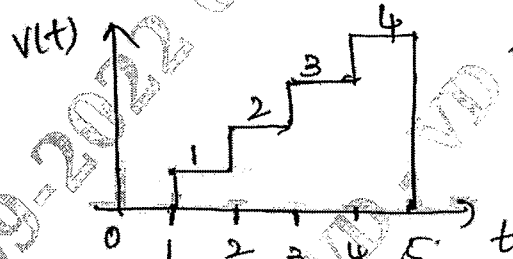


Fig Q8(a)

(10 Marks)

- b. Find the Laplace transform for the Fig Q8(b)

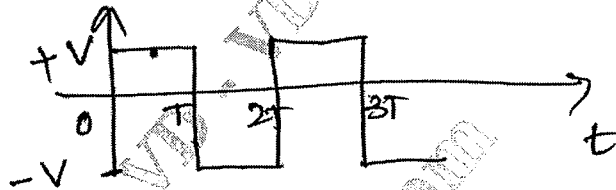


Fig Q8(b)

(10 Marks)

Module-5

- 9 a. What is resonance? Derive an expression for half power frequencies in series RLC circuit. Define Q-factor, selectivity and Bandwidth. (10 Marks)
 b. Find the value of R_1 for which, circuit shown below in Fig Q9(b), is resonant.

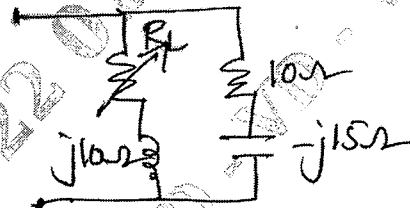


Fig Q9(b)

(10 Marks)

OR

- 10 a. Find Y and Z parameters for the network (Ref. Fig Q10(a)).

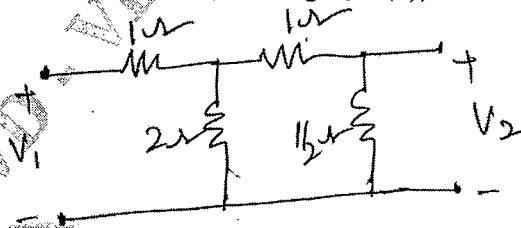


Fig Q10(a)

(10 Marks)

- b. Derive Y parameters in terms of ABCD parameters. (10 Marks)

CBCS SCHEME

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18EC46

Fourth Semester B.E. Degree Examination, July/August 2022 Microcontrollers

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Write the block diagram of 8051 and explain its main features. (08 Marks)
- b. What is an embedded system and write its characters. (06 Marks)
- c. Write the starting address and ending address of internal RAM used in 8051 and how it is classified. (06 Marks)

OR

- 2 a. Show how 8K RAM and 8K EPROM can be interfaced to 8051 micro controller. Assume the EPROM starts from address 0000H. (08 Marks)
- b. How many ports are present in 8051 and explain the different functions of each port. (06 Marks)
- c. Compare microprocessor and micro controllers. (06 Marks)

Module-2

- 3 a. How the instruction set of 8051 is classified depending on the addressing mode and explain all of them with example. (08 Marks)
- b. List the different SFR's present in 8051 and also write the address of them. (04 Marks)
- c. Write an assembly level program to multiply the number present in external memory location 800AH and 8050H. Store the lower byte of result obtained in R0 and higher byte in R1. (08 Marks)

OR

- 4 a. Explain the different rotate instructions present in 8051 μ C with an example. Also explain the working of SWAP instruction. (08 Marks)
- b. Explain the working of the following instructions and also find the time required to execute each instruction :
 - i) `MOVC A, @A+PC` XTAL = 12 MHz used
 - ii) `XCHD A, @R1` XTAL = 11.0592 MHz used
 - iii) `ADDC A, R5` XTAL = 10MHz used
 - iv) `DIV AB` XTAL = 11.0592MHz.
- c. Write an assembly level program to set the bits 1, 4, 6, 7 of port 0 use bit level instructions to set the bits. (04 Marks)

Module-3

- 5 a. Explain the working of PUSH and POP instruction with necessary diagram. (04 Marks)
- b. Write a program to toggle all bits of P1 every 200ms. Assume crystal frequency is 11.0592MHz. Show all the calculations. (08 Marks)
- c. Write an assembly level program to count the number 1's and 0's present in the content of external memory location 8000H. Store the count of number 1's in reg. R0 and count of number of 0's in reg. R1. (08 Marks)

OR

- 6 a. What is the need of subroutine and explain the instructions associated with subroutine. (08 Marks)
- b. Write an assembly level program to mutually exchange the 10 bytes of data stored in external memory location starting from 8000H and 8020H. (06 Marks)
- c. Find the delay produced in the 8051 program.
Delay : MOVR3, # 200
Here : NOD
NOP
DJN2 R3, here
RET
Assume XTAL used 11.0592 MHz. (06 Marks)

Module-4

- 7 a. Explain all the bits of TMOD and TCON register. (08 Marks)
- b. Assuming XTAL frequency as 11.0592MHz, write a program to generate 4 KHz square wave on P2.1. Use timer 0 in model show all the calculations. (08 Marks)
- c. Write the steps to program the timer of 8051 in mode 2. (04 Marks)

OR

- 8 a. In asynchronous method of communication how the framing is done explain with necessary diagram. Also mention the different pins of DB – 9 pin connector. (08 Marks)
- b. A switch is connected to pin 2.0 monitor the status of the switch if SW = 0. Write an 8051C program to send the message 'READ' and if SW = 1 send the message 'WRITE' XTAL frequency = 11.0592MHz. (08 Marks)
- c. Compare parallel and serial data transfer. (04 Marks)

Module-5

- 9 a. Name the external hardware interrupts present in 8051 and how the activation of them will be done. (06 Marks)
- b. Write a program to read the data from port P1 and send it to P2 continuously. While incoming data from the serial port is sent to P0. Assume XTAL = 11.0592MHz set the baud rate at 2400. (06 Marks)
- c. Write the interrupt priority upon reset in 8051. Also explain how the priority of the interrupts can be set using IP register. (08 Marks)

OR

- 10 a. Write a table to find the digital value to be send to DAC for generating sine wave in steps of 30°. Using the table write an assembly level program to generate a sine wave using DAC interfaced to microcontroller 8051. Assume full scale voltage for DAC is 10V and XTAL = 11.0592MHz. (10 Marks)
- b. How draw the diagram to inter face a stepper motor to 8051MC. Also write a program to monitor the status of switch connected to port P2.7. If SW = 0. The stepper should rotate clockwise else it should rotate in anticlockwise direction. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

GBOS SCHEME

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18EC45

Fourth Semester B.E. Degree Examination, July/August 2022

Signals and Systems

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Differentiate between Energy and Power signals. Identify whether $u(t)$ is energy or power signals. Compute its energy / power. (08 Marks)
- b. Given the signals $x(t)$ & $y(t)$ in the Fig. Q1(b), sketch
 - i) $x(t - 2) + y(1 - t)$ (08 Marks)
 - ii) $x(t) - y(t + 2)$.

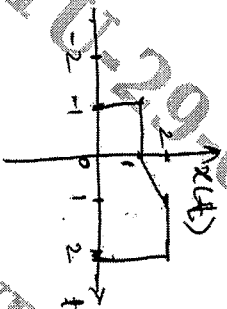
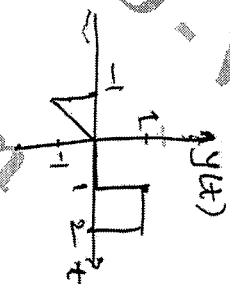


Fig. Q1(b)



- c. Sketch the signal $Z(t) = r(t + 2) - r(t + 1) - 2u(t) + u(t - 1)$. (04 Marks)

OR

- 2 a. For the signal shown in Fig. Q2(a), sketch its Even and Odd components. (06 Marks)

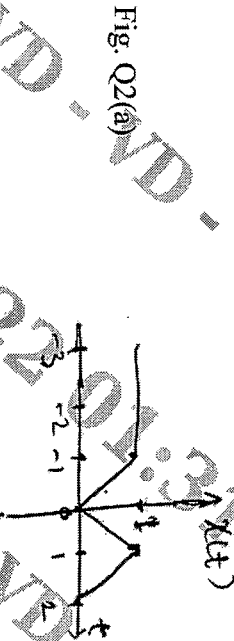


Fig. Q2(a)

- b. Identify whether the following signals are periodic or not? If Periodic what is the period of it?
 - i) $x(t) = \cos \sqrt{2} t + \sin 2 \pi t$
 - ii) $x(t) = \cos 8 \pi t$
 - iii) $x(n) = \sin \frac{\pi}{6} n + \sin \frac{\pi}{3} n$. (08 Marks)
- c. Sketch the signals:
 - i) $u(t - 2) - 2u(t) + u(t + 2)$
 - ii) $e^{2t} \{u(t) - u(t - 2)\}$. (06 Marks)

Module-2

- 3 a. Check whether the following system is linear, time variant, causal, static and stable. (08 Marks)
 $Y[n] = 2x[1 - n] + 2$.
- b. Compute the following convolutions :
 - i) $y(t) = x(t) * h(t)$, where $x(t) = u(t + 2)$ and $h(t) = e^{-2t} u(t)$.
 - ii) $y(t) = x(t) * h(t)$, where $x(t) = e^{-t+1}$ and $h(t) = u(t)$. (12 Marks)

OR

- 4 a. The system is described by the differential equation

$$\frac{dy(t)}{dt} = 2x(t) + \frac{d}{dt} x(t).$$
 State whether this system is linear, time variant, causal and static. (08 Marks)

- b. i) Evaluate $y(n) = x(n) * h(n)$, if $x(n) = \alpha^n u(n)$ $\alpha < 1$ & $h(n) = u(n)$.
 ii) Evaluate $y(t) = x(t) * h(t)$, if $x(t)$ & $h(t)$ are as shown in Fig. Q4(b(ii)). (12 Marks)

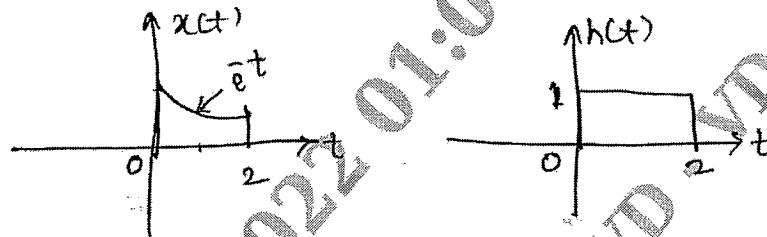


Fig. Q4(b(ii))

Module-3

- 5 a. Impulse responses of the various systems are described below. Identify whether these systems are memoryless, causal and stable.
 i) $h(n) = 2\delta(n)$ ii) $h(t) = e^{-2t} u(t+2)$ iii) $h(t) = 2 \{u(t) - u(t-2)\}$. (10 Marks)
 b. Obtain the Fourier representations of the signals :
 i) $x(n) = \cos 2\pi n + \sin 4\pi n$ with $\Omega_0 = 2\pi$ ii) $x(t)$ shown in Fig. Q5(b(ii)). (10 Marks)

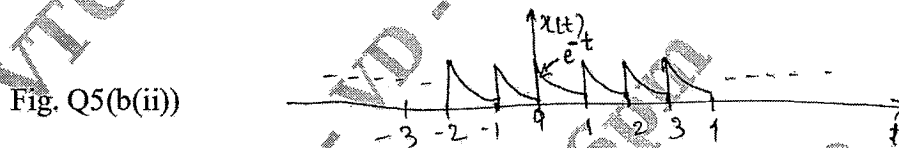
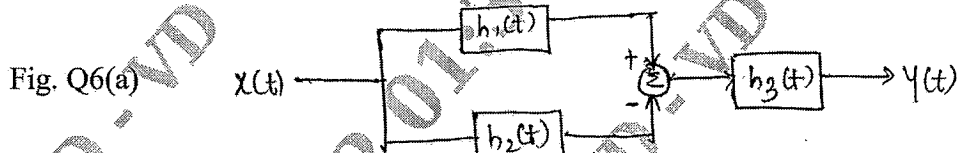


Fig. Q5(b(ii))

OR

- 6 a. Find the overall impulse response of the system shown in Fig. Q6(a). (08 Marks)



where $h_1(t) = u(t+1)$, $h_2(t) = u(t-2)$, $h_3(t) = e^{-3t} u(t)$.

- b. State and prove time shift property of Fourier Series. (06 Marks)
 c. Obtain DTFS coefficients of $x(n)$ if $\Omega_0 = 3\pi$. (06 Marks)
 i) $x(n) = \sin 6\pi n$ ii) $x(n) = \cos 3\pi n + \sin 9\pi n$.

Module-4

- 7 a. State and prove Convolution property of DTFT. (06 Marks)
 b. Find F.T. of the signal shown in Fig. Q7(b). (06 Marks)

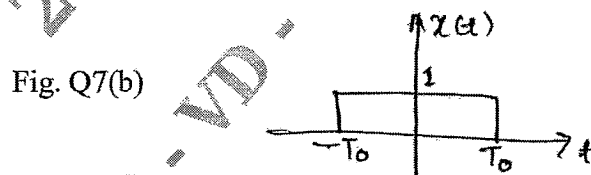


Fig. Q7(b)

- c. Find the time domain signal $x(t)$ if its F.T. $X(j\omega)$ given below : (08 Marks)
 i) $X(j\omega) = \frac{j\omega}{(j\omega)^2 + 5j\omega + 6j\omega}$ ii) $X(j\omega) = \frac{1-j\omega}{1+\omega^2}$

18EC45

- 8 a. State and prove Parseval's theorem for Fourier transform. (06 Marks)
 b. Using properties, find the DTFT of the signals.
 i) $x(n) = (\frac{1}{2})^n u(n+2)$ ii) $x(n) = n \cdot a^n u(n)$. (06 Marks)
 c. Obtain the signal $x(t)$, if its Fourier transform is
 i) $X(j\omega) = \frac{1}{2 + j(\omega - 3)}$ ii) $X(j\omega) = e^{-j3\omega} \frac{1}{j\omega + 2}$ (08 Marks)

Module-5

- 9 a. Find the Z-transform of the signals.
 i) $x(n) = (\frac{1}{2})^n u(n) - (\frac{3}{2})^n u(-n-1)$ ii) $x(n) = (-\frac{1}{3})^n u(n)$. (07 Marks)
 b. State and prove differentiation in the Z-domain property of Z-transform. (06 Marks)
 c. Use Partial fraction expansion to find the inverse Z-transform of

$$X(z) = \frac{z^2 - 3z}{z^2 - \frac{3}{2}z - 1} \quad \left| \frac{1}{2} \right| < |z| < |2|$$

(07 Marks)

OR

- 10 a. Use properties to find Z-transform of the following signals :
 i) $x(n) = 3^n u(n-2)$ ii) $x(n) = n \sin\left(\frac{\pi}{2}n\right) u(n)$ (08 Marks)
 b. Find the Inverse Z-transform.
 i) $X(z) = \frac{1}{1 - \frac{1}{2}z^{-1}} + \frac{2}{1 - 2z^{-1}} \quad |z| > |2|$
 ii) $X(z) = \frac{2+z^{-1}}{1 - \frac{1}{2}z^{-1}} \quad |z| < \left|\frac{1}{2}\right|$, Use Power Series Expansion method. (12 Marks)

CBCS SCHEME

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18EC44

Fourth Semester B.E. Degree Examination, July/August 2022 Engineering Statistics and Linear Algebra

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define an uniform random variable. Obtain the characteristic function of an uniform random variable and using the characteristic function derive its mean and variance. (08 Marks)
- b. If the probability density function of a random variable is given by

$$f_X(x) = \begin{cases} C \exp(-x/4), & 0 \leq x < 1 \\ 0, & \text{otherwise} \end{cases}$$

Find the value that C must have and evaluate $F_X(0.5)$. (06 Marks)

- c. The density function of a random variable is given as

$$f_X(x) = a e^{-bx} \quad x \geq 0$$

Find the characteristic function and the first two moments. (06 Marks)

OR

- 2 a. Define a Poisson random variable. Obtain the characteristic function of a Poisson random variable and hence find mean and variance using the characteristic function. (08 Marks)
- b. Suppose 'X' is a general discrete random variable with following probability distribution. Calculate mean and variance for X.

X	0	1	3	5	7
P(X)	0.05	0.2	0.6	0.1	0.05

- c. The number of defects in a thin copper wire follows Poisson distribution with mean of 2.3 defects per millimeter. Determine the probability of exactly two defects per millimeter of wire. (06 Marks)

Module-2

- 3 a. Define and explain Central Limit theorem and show that the sum of the two independent Gaussian random variables is also Gaussian. (08 Marks)
- b. Let 'X' and 'Y' be exponentially distributed random variable with

$$f_X(x) = \begin{cases} \lambda e^{-\lambda x} & x \geq 0 \\ 0 & x < 0 \end{cases}$$

Then obtain the characteristic function and Pdf of $W = X + Y$. (06 Marks)

- c. Determine a constant b such that the given function is a valid joint density function.

$$f_{XY}(x, y) = \begin{cases} b(x^2 + 4y^2) & 0 \leq |x| < 1 \text{ and } 0 \leq y < 2 \\ 0 & \text{elsewhere} \end{cases}$$

OR

- 4 a. Explain briefly the following random variables :
 - (i) Chi-square Random Variable
 - (ii) Rayleigh Random Variable.

(04 Marks)

- b. The joint density function of two random variables X and Y is

$$f_{X,Y}(x,y) = \begin{cases} \frac{(x+y)^2}{40}, & -1 < x < 1 \text{ and } -3 < y < 3 \\ 0, & \text{elsewhere} \end{cases}$$

Find (i) the variances of X and Y (ii) the correlation coefficient. (08 Marks)

- c. Gaussian random variables X_1 and X_2 whose $\bar{X}_1 = 2$, $\sigma_{X_1}^2 = 9$, $\bar{X}_2 = -1$, $\sigma_{X_2}^2 = 4$ and

$C_{X_1X_2} = -3$ are transformed to new random variables Y_1 and Y_2 such that

$$\begin{aligned} Y_1 &= -X_1 + X_2 \\ Y_2 &= -2X_1 - 3X_2 \end{aligned}$$

Find (i) \bar{X}_1^2 (ii) \bar{X}_2^2 (iii) $\rho_{X_1X_2}$ (iv) $\sigma_{Y_1}^2$ (v) $\sigma_{Y_2}^2$ (vi) $C_{Y_1Y_2}$ (vii) $\rho_{Y_1Y_2}$ (08 Marks)

Module-3

- 5 a. With the help of an example, define Random process and discuss distribution and density functions of a random process. Mention the differences between Random variable and Random process. (08 Marks)

- b. Define the Autocorrelation function of the random process X(t) and discuss its properties. (06 Marks)

- c. A stationary ergodic random process has the autocorrelation function with periodic components as $R_{XX}(\tau) = 25 + \frac{4}{1+6\tau^2}$

Find the mean and variance of X(t). (06 Marks)

OR

- 6 a. The autocorrelation function of a wide sense stationary process

$$R_X(\tau) = \begin{cases} 1 - \frac{|\tau|}{T}, & -T \leq \tau \leq T \\ 0, & \text{elsewhere} \end{cases}$$

Obtain the Power Spectral Density of the process. (06 Marks)

- b. Show that the random process $X(t) = A \cos(\omega_c t + \theta)$ is wide sense stationary. Here θ is uniformly distributed in the range $-\pi$ to π . (08 Marks)

- c. X(t) and Y(t) are independent, jointly wide-sense stationary random processes given by

$$\begin{aligned} X(t) &= A \cos(\omega_1 t + \theta_1) \\ Y(t) &= B \cos(\omega_2 t + \theta_2) \end{aligned}$$

If $W(t) = X(t) \cdot Y(t)$ then find the Autocorrelation function $R_W(\tau)$. (06 Marks)

Module-4

- 7 a. Define vector subspaces and explain the four fundamental subspaces. (06 Marks)
 b. Show that the vectors (1, 2, 1), (2, 1, 0), (1, -1, 2) form a basis of R^3 . (06 Marks)
 c. Apply Gram-Schmidt process to the vectors $v_1 = (2, 2, 1)$, $v_2 = (1, 3, 1)$, $v_3 = (1, 2, 2)$ to obtain an orthonormal basis for $v_3(R)$ with the standard inner product. (08 Marks)

OR

- 8 a. Determine the null space of each of the following matrices:

(i) $A = \begin{bmatrix} 2 & 0 \\ -4 & 10 \end{bmatrix}$

(ii) $\begin{bmatrix} 1 & -7 \\ -3 & 21 \end{bmatrix}$

(06 Marks)

- b. Determine whether the vectors $(2, -2, 4)$, $(3, -5, 4)$ and $(0, 1, 1)$ are linearly dependent or independent. (06 Marks)
- c. Find the QR-decomposition for the matrix

$$A = \begin{bmatrix} 2 & 1 & 3 \\ -1 & 0 & 7 \\ 0 & -1 & -1 \end{bmatrix}$$

and write the result in the form of $A = QR$.

(08 Marks)

Module-5

9 a. If $A = \begin{bmatrix} 4 & 2 & -2 \\ -5 & 3 & 2 \\ -2 & 4 & 1 \end{bmatrix}$

find eigen values and corresponding eigen vectors for matrix A.

(08 Marks)

- b. Diagonalize the following matrix:

$$A = \begin{bmatrix} 1 & 3 & 3 \\ -3 & -5 & -3 \\ 3 & 3 & 1 \end{bmatrix}$$

Find an invertible matrix P and a diagonal matrix D such that $A = PDP^{-1}$.

(08 Marks)

- c. What is the positive definite matrix? Mention the methods of testing positive definiteness. (04 Marks)

OR

- 10 a. Factorize the matrix A into $A = U \Sigma V^T$ using SVD.

$$A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \\ -1 & 1 \end{bmatrix}$$

(08 Marks)

- b. If $A = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$ show that A is positive definite matrix.

(04 Marks)

- c. Find a matrix P, which transforms the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ to diagonal form.

(08 Marks)

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18EC43

Fourth Semester B.E. Degree Examination, July/August 2022

Control Systems

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- What is Control System? Distinguish between open loop and closed loop system. Give one example for each. (08 Marks)
 - Write the differential equations governing the mechanical system shown in Fig.Q.1(b). Draw the force-voltage and force-current electrical analogous circuits. (12 Marks)

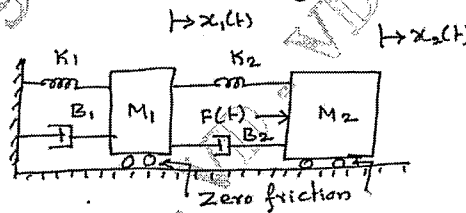


Fig.Q.1(b)

OR

- Write the differential equations governing the mechanical rotational system shown in Fig.Q.2(a). Obtain the transfer function of the system. (10 Marks)



Fig.Q.2(a)

- Write the differential equations governing the mechanical rotational system shown in Fig.Q.2(b). Draw the torque-voltage analogous circuit. (10 Marks)

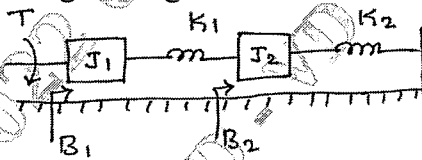


Fig.Q.2(b)

Module-2

- Determine the overall transfer function $\frac{C(S)}{R(S)}$ for the system shown in Fig.Q.3(a) using block diagram reduction technique. (10 Marks)

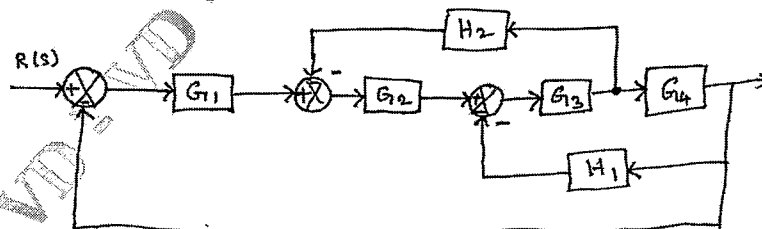


Fig.Q.3(a)

Important Note: 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8 = 50, will be treated as malpractice.

- b. Find the overall T.F by Mason's gain formula for the SFG given in the Fig.Q.3(b).

(10 Marks)

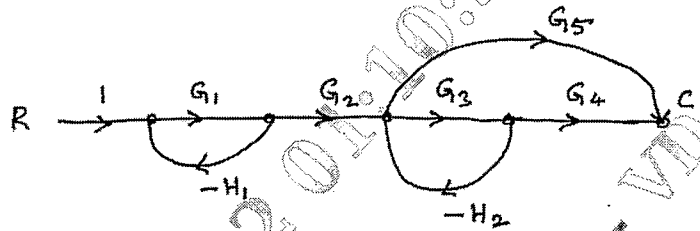


Fig.Q.3(b)

OR

- 4 a. Draw the SFG and obtain the FF transfer function for a system which is described by the set of following algebraic equations.

$$y_2 = a_{12}y_1 + a_{32}y_3$$

$$y_3 = a_{23}y_2 + a_{43}y_4$$

$$y_4 = a_{24}y_2 + a_{34}y_3 + a_{44}y_4$$

$$y_5 = a_{25}y_2 + a_{45}y_4$$

(10 Marks)

- b. Find out the transfer function shown in Fig.Q.4(b) using Mason's gain formula.

(10 Marks)

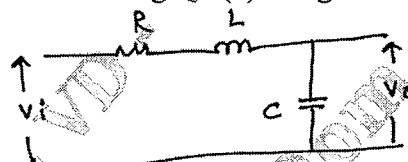


Fig.Q.4(b)

Module-3

- 5 a. Derive the expression of response of first order system for unit step input. (10 Marks)
 b. With neat graph explain the time domain specifications of second order system. (10 Marks)

OR

- 6 a. Obtain the response of unity feed back system whose open loop transfer function $G(S) = \frac{4}{S(S+5)}$ and when input is unit step. (10 Marks)

- b. A unity feed back system with $G(S) = \frac{100}{S^2(S+1)(S+2)}$

i) What is the type of system?

ii) Find static error coefficients.

iii) Find steady state error if the input is $r(t) = 2t^2 + 5t + 1$.

(10 Marks)

Module-4

- 7 a. Derive the expression for condition of stability of control system. (05 Marks)
 b. Explain Routh-Hurwitz criterion for stability of the system and what are its limitations. (05 Marks)
 c. Find the range of K so that the system with characteristic equation as: $s^4 + 25s^3 + 15s^2 + 20s + k = 0$ is stable. Also find frequency of oscillation at marginal value of K. (10 Marks)

OR

- 8 a. Sketch the root Locus plot for all values of K ranging from 0 to ∞ for a negative feed back control system characterized by $GH(S) = \frac{K(S+6)}{S(S+1)(S+2)}$. (10 Marks)
- b. Plot the Bode diagram for open loop transfer function $G(S) = \frac{10}{S(1+0.4s)(1+0.1s)}$ and obtain the gain and phase cross over frequencies. (10 Marks)

Module-5

- 9 a. Using Nyquist stability criterion, investigate the stability of a closed loop system whose OLTF is given by $G(S)H(S) = \frac{K}{(S+1)(S+2)}$. (10 Marks)
- b. Distinguish between classical method and state space approach. (10 Marks)

OR

- 10 a. A negative feed back control system is characterized by an open loop transfer function. $GH(S) = \frac{5}{S(S+1)}$
Investigate the closed loop stability of the system using Nyquist stability criterion. (10 Marks)
- b. Write a state model for differential equation $4 \frac{d^3}{dt^3} y + 8 \frac{d^2}{dt^2} y + 24 \frac{dy}{dt} + 4y = 32 U(t)$
Using phase variable canonical form. (10 Marks)

CBCS SCHEME

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18EC42

Fourth Semester B.E. Degree Examination, July/August 2022
Analog Circuits

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain the working of voltage dividing bias circuit using BJT. (08 Marks)
- b. Design MOSFET drain to gate feedback circuit to establish $I_D = 0.5 \text{ mA}$ and $V_{DD} = 5V$. MOSFET parameters are : $V_t = 1 \text{ V}$, $K'_n(W/L)=1 \text{ mA/V}^2$ and $\lambda = 0$. Use Standard resistor values and actual values obtained for I_D and V_D . (06 Marks)
- c. Derive an expression for voltage gain A_v of small signal CE BJT amplifier. (06 Marks)

OR

- 2 a. Explain with neat circuit diagram the MOSFET drain to gate feedback resistor biasing. (06 Marks)
- b. Design a voltage divider bias network using a supply of 24V, $\beta = 110$ and $I_{CQ} = 4 \text{ mA}$, $V_{CEQ} = 8V$. Choose $V_E = V_{CC} / 8$. (08 Marks)
- c. Explain with neat circuit diagram MOSFET circuit using fixing V_G . (06 Marks)

Module-2

- 3 a. Derive the expression for characterizing parameters of CS MOSFET amplifier without source resistor using hybrid- π equivalent circuit. (06 Marks)
- b. A phase shift oscillator is to be designed with FET having $g_m = 5000 \mu\text{s}$, $r_d = 40 \text{ k}\Omega$ while the resistance in the feedback circuit is $9.7 \text{ k}\Omega$. Select the proper value of C and R_D to have the frequency of oscillations as 5 kHz . (08 Marks)
- c. Write a note on three basic configurations of MOSFET amplifier. (06 Marks)

OR

- 4 a. State Barkhausen criteria. (04 Marks)
- b. A Quartz crystal has constants $L = 50 \text{ mH}$, $C_1 = 0.02 \text{ pF}$, $R = 500\Omega$ and $C_2 = 12 \text{ pF}$. Find the values of series and parallel resonant frequencies. Also if the external capacitance across the crystal changes from 5 pF to 6 pF , find the change in frequency of oscillations. (08 Marks)
- c. Draw and explain the frequency response characteristics of CS MOSFET amplifier. (08 Marks)

Module-3

- 5 a. Briefly explain the four basic feedback topologies with necessary block diagram. (10 Marks)
- b. Show that the maximum efficiency of series fed, directly coupled class A power amplifier is 25%. (06 Marks)
- c. An amplifier without negative feedback has a voltage gain of 400 with a distortion of 10%. Determine the amplifier voltage gain and distortion, when a negative feedback is applied with feedback ratio of 0.01. (04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 6 a. With neat circuit diagram, explain the operation of a class B pushpull amplifier with relevant waveforms. Show that the maximum conversion efficiency of class B pushpull amplifier is 78.5%. (10 Marks)
- b. For a class C tuned amplifier with load resistance of $10\text{ k}\Omega$ and $V_{CC} = 30\text{V}$. Calculate
 (i) Output power if the output voltage is 30 V_{pp} .
 (ii) DC input power if current drain is 0.5 mA .
 (iii) Efficiency. (04 Marks)
- c. Derive the expression for input resistance for a voltage shunt feedback amplifier. (06 Marks)

Module-4

- 7 a. State the ideal characteristics of op-Amp. (08 Marks)
- b. For a Schmitt trigger shown in the Fig.Q7(b) calculate threshold voltage levels and hysteresis. Assume $V_{sat} = 0.9 V_c$.

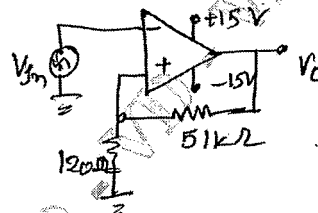


Fig.Q7(b)

- c. Draw a practical inverting amplifier and derive the expression for closed loop voltage gain, input resistance and output resistance. (08 Marks)

OR

- 8 a. Draw the circuit of 3 op-Amp instrumentation amplifier and derive expression for its output voltage. (08 Marks)
- b. Explain the working of zero crossing detector. (06 Marks)
- c. For a non-inverting amplifier, the values of R_1 and R_f are $1\text{ k}\Omega$ and $10\text{ k}\Omega$ respectively. The various op-Amp parameters are, open loop gain $= 2 \times 10^5$, Input resistance $= 2\text{M}\Omega$, Output resistance $= 75\Omega$, Single break frequency $= 5\text{ Hz}$, Supply voltages $= \pm 12\text{V}$, Calculate the closed loop gain, input resistance, output resistance with feedback and bandwidth with feedback. (06 Marks)

Module-5

- 9 a. Draw and explain the working of precision full wave rectifier. (08 Marks)
- b. Design a low pass filter using op-Amp at a cutoff frequency of 1 kHz with pass gain of 2. (06 Marks)
- c. Explain the working of pulse width modulator using IC555 with waveforms. (06 Marks)

OR

- 10 a. Explain the functional block diagram of IC555. (08 Marks)
- b. Design a monostable 555 timer circuit to produce an output pulse of 10 sec wide. Draw the circuit diagram. (04 Marks)
- c. Explain with neat circuit diagram the operation of R-2R digital to analog converter. (08 Marks)
