CBCS Scheme

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15EC32

Third Semester B.E. Degree Examination, June/July 2018
Analog Electronics

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Derive an expression for A_v, Z_i and Z_0 for CE–fixed bias using r_e-equivalent model. **(08 Marks)**

b. Define h-parameters and derive h-parameters model of CE-BJT. **(08Marks)**

OR

2 a. For the emitter-follower network of Fig.Q2(a). Determine : i) r_e ii) Z_i iii) Z_0 iv) A_V. **(08 Marks)**

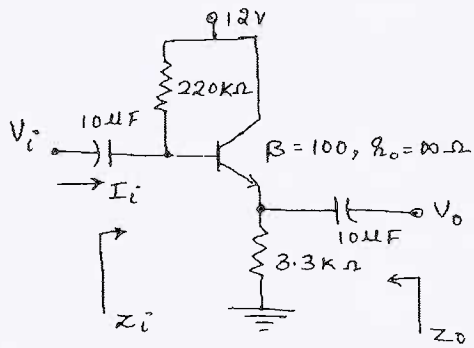

Fig.Q2(a)

b. With a neat circuit explain the high frequency transistor small-signal AC equivalent circuit. **(08 Marks)**

Module-2

3 a. Briefly explain the construction, operation and characteristics of n-channel D-type MOSFET. **(08 Marks)**

b. The fixed-bias configuration of Fig.Q3(b) has an operating point defined by $V_{GS_Q} = -2V$ and $I_{D_Q} = 5.625mA$, with $I_{DSS} = 10mA$ and $V_P = -8V$.

Determine : i) g_m ii) r_d iii) Z_i iv) Z_0 v) A_V. **(08 Marks)**

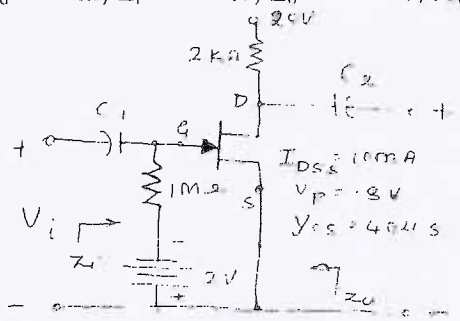

Fig.Q3(b)

OR

4 a. Explain the small signal model of the FET. **(06 Marks)**

b. Compare JFET and MOSFET. **(03 Marks)**

c. Draw the JFET common drain configuration circuit. Drive Z_i, Z_0 and A_V using small signal model. **(07 Marks)**

Module-3

5 a. The input power to a device is 10,000W at a voltage of 1000V. The output power is 500W and the output impedance is 20Ω

i) Find a power gain in decibels

ii) Find the voltage gain in decibels

iii) Find input impedance. **(06 Marks)**

b. Describe Miller's effect and derive an equation for Miller input and output capacitance. **(06 Marks)**

c. Discuss the effect of various capacitors on low-frequency response of BJT amplifier. **(04 Marks)**

OR

6 a. An amplifier rated 40W output is connected to a 10Ω speaker.

i) Calculate the input power required for full power output if the power gain is 25dB.

ii) Calculate the input voltage for rated output if the amplifier voltage gain 40dB. **(04 Marks)**

b. Determine the high-cutoff frequencies of JFET amplifier for the following specification:

$C_G = 0.01\mu F$, $C_C = 0.5\mu F$, $C_S = 2\mu F$,

$R_{sig} = 10\ K\Omega$, $R_G = 1m\Omega$, $R_D = 4.7K\Omega$, $R_S = 1K\Omega$, $R_L = 2.2K\Omega$,

$I_{DSS} = 8mA$, $V_P = -4V$, $r_d = \infty\Omega$, $V_{DD} = 20V$,

$C_{gd} = 2\ PF$, $C_{gs} = 4\ PF$, $C_{ds} = 0.5\ PF$, $C_{wi} = 5\ PF$, $C_{W0} = 6\ PF$ and $A_V = -3$. **(06 Marks)**

c. Explain the effect of multistage frequency of an amplifier. **(06 Marks)**

Module-4

7 a. Mention the types of feedback connections. Draw their block diagrams indicating input and output signal. **(08 Marks)**

b. With a neat circuit diagram, explain the working principle of FET phase–shift oscillator, with relevant equations. **(08 Marks)**

OR

8 a. What are the effects of negative feedback in an amplifier? Show how bandwidth of an amplifier increases with negative feedback. **(06 Marks)**

b. With a neat circuit and waveforms, explain the working operation of UJT relaxation oscillator. **(05 Marks)**

c. Determine the voltage gain, input and output impedance with feedback for voltage – series feedback having $A = -100$, $R_i = 10\ K\Omega$ and $R_0 = 20\ k\Omega$ for feedback factor $\beta = -0.1$. **(05 Marks)**

Module-5

9 a. With a neat circuit diagram, explain the operation of a series –fed class A power amplifier and prove that $\eta = 25\%$. **(08 Marks)**

b. Calculate the output voltage and the zener current in the regulator circuit of Fig.Q9(b) with $R_L = 1K\Omega$. **(04 Marks)**

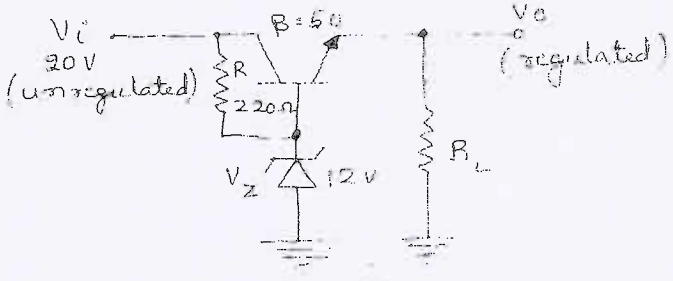

Fig.Q9(b)

c. Calculate the harmonic distortion components for an output signal with fundamental amplitude of 2.5V, second harmonic amplitude of 0.25, third harmonic amplitude of 0.1 V and fourth harmonic amplitude of 0.05V. Also find total harmonic distortion. **(04 Marks)**

OR

10 a. Explain the operation of a transformer coupled, push-pull class –B amplifier and derive its conversion efficiency. **(07 Marks)**

b. Explain the fold –back current limiting circuit of voltage series regulator. **(05 Marks)**

c. Determine the regulated voltage and currents of shunt regulation of Fig.Q10(C). **(04 Marks)**

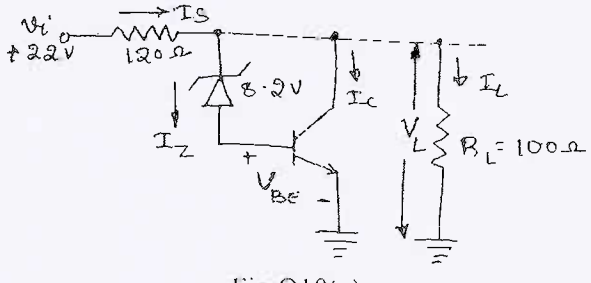

Fig.Q10(c)

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CBCS Scheme

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15EC33

Third Semester B.E. Degree Examination, June/July 2018
Digital Electronics

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Given, F = A(B + C) + D. obtain : i) minimal SOP ii) minimal POS iii) canonical SOP iv) canonical POS. **(08 Marks)**

b. Realize a circuit for Ex-NOR using only four NOR gates. **(02 Marks)**

c. Simplify the function using K-map. :

$Y = f(a,b,c,d) = \sum_m (0,1,2,3,5,6,8,10,15)$.

Write the simplified SOP expression. **(06 Marks)**

OR

2 a. Simplify the following function using Quine – McClusky method :

$P = f(a, b, c, d) = \Sigma_m(0, 2, 3, 5, 8, 10, 11, 13)$. **(06 Marks)**

b. Reduce the following Boolean function using K-map and realize the simplified expression using NOR gates.

$T = f(a, b, c, d) = \Sigma_m(0, 2, 3, 5, 6, 7, 8, 9) + \Sigma_d(10, 11, 12, 13, 14, 15)$. **(06 Marks)**

c. Prove that, $ABC + AB\overline{C} + A\overline{B}C + \overline{A}BC = AB + BC + CA$ **(04 Marks)**

Module-2

3 a. Design a binary full subtractor using logic gates. Write a truth table Implement the logic circuit using basic gates. **(06 Marks)**

b. Define magnitude comparator. Design a two bit binary comparator and implement with suitable logic gates. **(10 Marks)**

OR

4 a. Implement full adder using 4 : 1 multiplexer (MUX). **(08 Marks)**

b. With a neat logic diagram, explain carry look ahead adder. **(08 Marks)**

Module-3

5 a. Obtain the characteristic equation for D and T flip-flop. **(04 Marks)**

b. Explain the working of a master–slave SR flip-flop with the help of a logic diagram, function table, logic symbol and timing diagram. **(08 Marks)**

c. Differentiate sequential logic circuit and combinational logic circuit. **(04 Marks)**

OR

6 a. Explain the working of master slave JK flip-flops with functional table and timing diagram. Show how race around condition is over come. **(08 Marks)**

b. Discuss the difference between a flip-flop and latch. **(04 Marks)**

c. Derive the characteristic equations of SR and JK flip-flops. **(04 Marks)**

Module-4

7 a. Design a synchronous mod-5 counter using JK flip-flops and implement it. **(08 Marks)**

b. Design synchronous mod-6 counter using D flip-flop to generate the count sequence, (0, 2, 3, 6, 5, 1, 0). **(08 Marks)**

OR

8 a. Design divide by 6 synchronous counter using T – flip-flops. Write state table and reduce the expression using K-map. **(06 Marks)**

b. Compare synchronous and asynchronous counters. **(04 Marks)**

c. Design mod-6 ripple counter using T flip-flops. **(06 Marks)**

Module-5

9 a. Design a Moore type sequence detector to detect a serial input sequence of 101. **(08 Marks)**

b. Design a synchronous counter using JK – flip-flops to count the sequence 0, 1, 2, 4, 5, 6, 0, 1, 2. Use state diagram and state table. **(08 Marks)**

OR

10 a. Explain the Mealy model and Moore model of a clocked synchronous sequential network. **(08 Marks)**

b. Design a Mealy type sequence detector to detect a serial input sequence of 101. **(08 Marks)**

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CBCS SCHEME

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15EC34

Third Semester B.E. Degree Examination, June/July 2018
Network Analysis

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Determine the equivalent resistance across XY shown in Fig.Q1(a) **(05 Marks)**

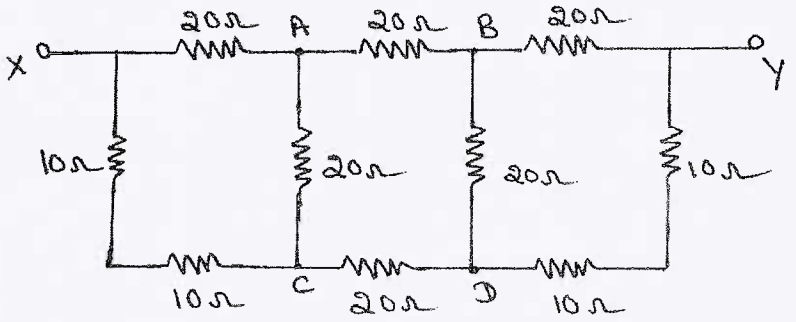

Fig.Q1(a)

b. Calculate the voltage across the 6Ω resistor using source shifting and transformation technique shown in Fig.Q1(b). **(05 Marks)**

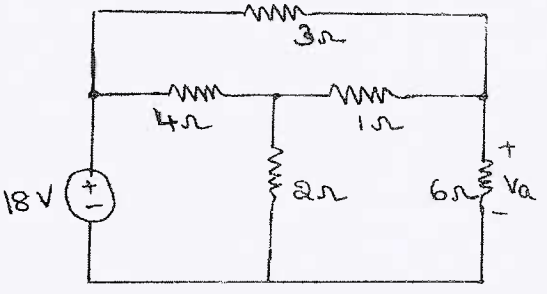

Fig.Q1(b)

c. Determine the power supplied by the dependent source of Fig.Q1(c) shown. **(06 Marks)**

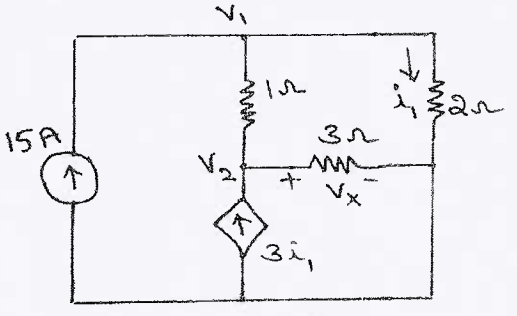

Fig.Q1(c)

OR

2 a. Using Mesh current analysis, find the current through 24Ω in the circuit shown in Fig.Q2(a). **(08 Marks)**

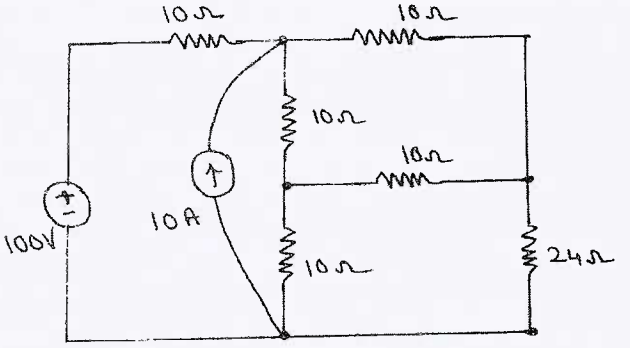

Fig.Q2(a)

b. For the network of Fig.Q2(b) determine the node voltage by nodal analysis. **(08 Marks)**

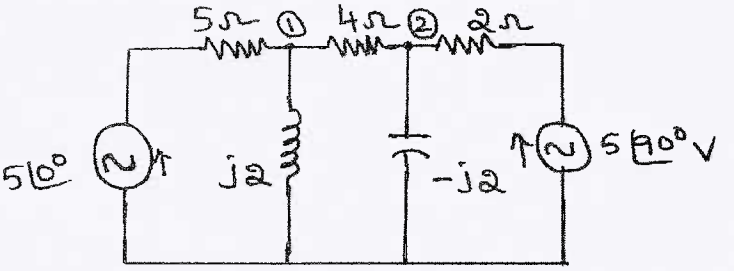

Fig.Q2(b)

Module-2

3 a. State superposition theorem. In the circuit of Fig.Q3(a), use the superposition principle to determine the value of i_x. **(08 Marks)**

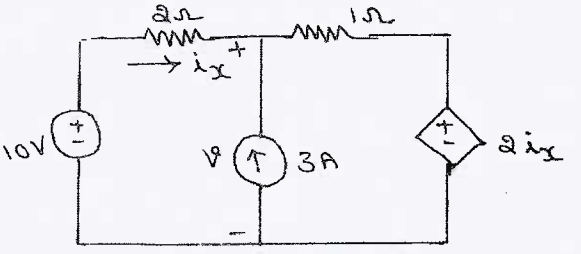

Fig.Q3(a)

b. Obtain the Thevenin and Norton equivalent circuits at terminals AB for the network shown in Fig.Q3(b). **(08 Marks)**

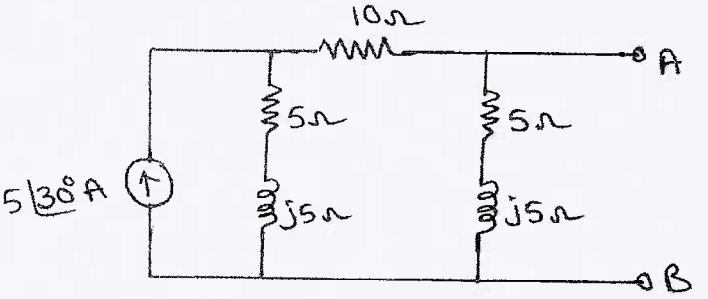

Fig.Q3(b)

OR

4 a. Using Millman's theorem, find I_L through R_L for the network shown in Fig.Q4(a). **(06 Marks)**

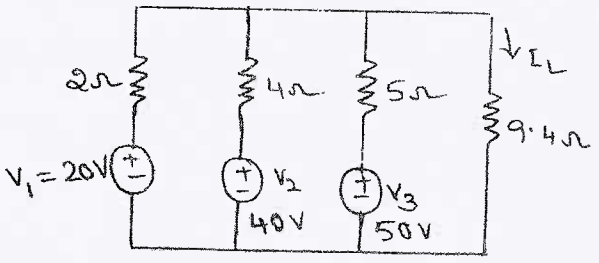

Fig.Q4(a)

b. Verify reciprocity theorem for the circuit shown in Fig.Q4(b). **(06 Marks)**

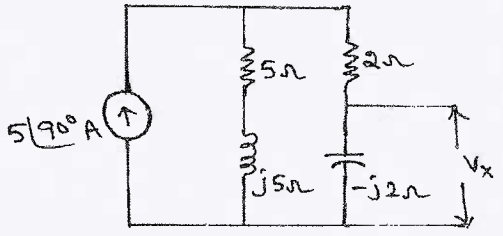

Fig.Q4(b)

c. State and explain maximum power transfer theorem. **(04 Marks)**

Module-3

5 a. In the circuit shown in Fig.Q5(a), the switch K is changed from position 1 to position 2 at t = 0, the steady state has been reached before switching. Find the values of i, $\frac{di}{dt}$ and $\frac{di^2}{dt^2}$ at $t = 0$. **(08 Marks)**

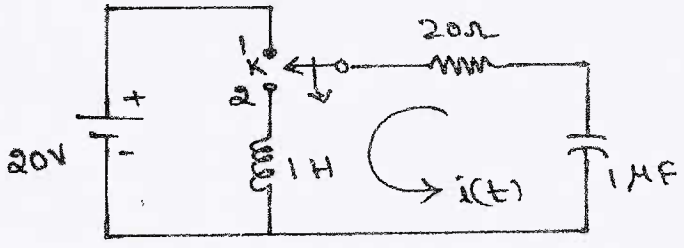

Fig.Q5(a)

b. The switch in the network shown in Fig.Q5(b) is closed at t = 0. Determine the voltage across the capacitor. Use Laplace transform. **(08 Marks)**

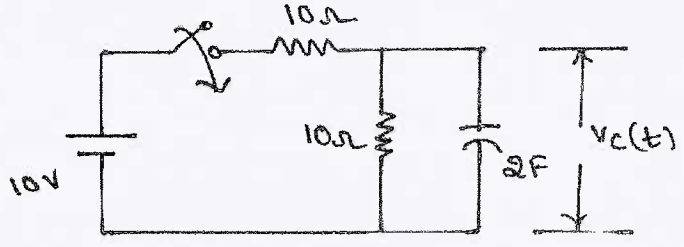

Fig.Q5(b)

OR

6 a. In the network shown in Fig.6(a), the switch K is opened at t = 0. At $t = 0^+$, solve for the values of v, $\frac{dv}{dt}$ and $\frac{d^2v}{dt^2}$ if I = 2A, R = 200Ω and L = 1H. **(08 Marks)**

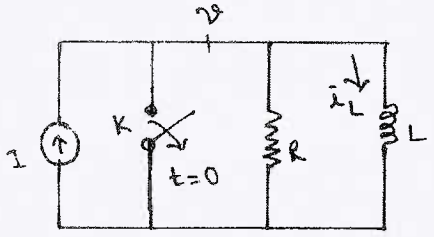

Fig.Q6(a)

b. Determine the Laplace transform of the periodic saw tooth waveform of Fig.Q6(b). Use gate function. **(08 Marks)**

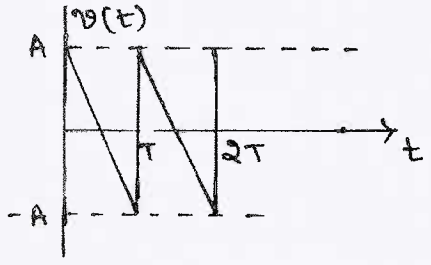

Fig.Q6(b)

Module-4

7 a. Derive for a resonant circuit, the resonant frequency $f_0 = \sqrt{f_1 f_2}$, where f_1 and f_2 are the two half power frequencies. **(07 Marks)**

b. Find the value of L for which the circuit shown in Fig.Q7(b) is resonant at a frequency of w = 5000 rad/sec. **(06 Marks)**

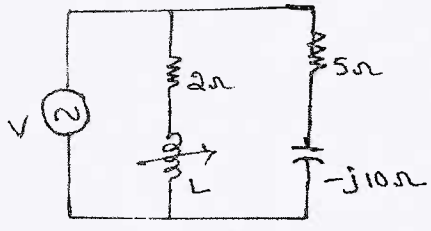

Fig.Q7(b)

c. A series RLC circuit has R = 10Ω, L = 0.01H and c = 0.01μF and it is connected across 10mV supply. Calculate : i) f_0 ii) Q_0 iii) B.w. **(03 Marks)**

OR

8 a. A series RLC circuit has a resistance of 10Ω, an inductance of 0.3H and a capacitance of 100μF. The applied voltage is 230V. Find : i) Resonant frequency ii) Quality factor iii) Lower and upper cut off frequencies iv) Bandwidth v) Current at resonance vi) currents at f_1 and f_2 vii) voltage across inductance at resonance. **(08 Marks)**

b. Derive an expression for the resonant frequency of a parallel resonant circuit. Also show that the circuit is resonant at all frequencies if $R_L = R_C = \sqrt{\frac{L}{C}}$ where R_L = Resistance in the inductor branch, R_C = resistance in the capacitor branch. **(08 Marks)**

Module-5

9 a. Find Y parameters and Z parameters for the circuit show in Fig.Q9(a). **(08 Marks)**

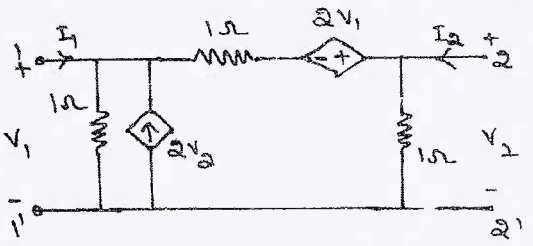

Fig.Q9(a)

b. Express ABCD parameters interms of Y-parameters and h-parameters. **(08 Marks)**

OR

10 a. Determine z parameters for the network shown in Fig.Q10(a). **(08 Marks)**

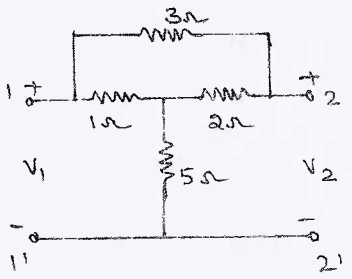

Fig.Q10(a)

b. Express h–parameters interms of Y–parameters. **(08 Marks)**

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CBCS SCHEME

USN | | | | | | | | | | |

15EC35

Third Semester B.E. Degree Examination, June/July 2018
Electronic Instrumentation

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Briefly explain Gross Errors, Absolute error and relative error with examples. **(05 Marks)**

b. Draw the block diagram of a true RMS voltmeter and explain its operation. **(05 Marks)**

c. Design a multirange ammeter using Aryton Shunt for the ranges 0 – 10 mA, 100 mA and 1 A, using a D'Arsonval movement having internal resistance of 1 KΩ and a full scale current of 100 μA. **(06 Marks)**

OR

2 a. Sketch and explain the operation of a multirange ammeter using Aryton shunt. **(05 Marks)**

b. A resistor of 1 KΩ with an accuracy of ±5%, carries a current of 10 mA. The current is measured with an ammeter of 30 mA full scale with an accuracy of ±2% at full scale. Calculate the power dissipiation in the resistor and the accuracy of the power measurement. **(05 Marks)**

c. What is the loading effect of a voltmeter of low sensitivity? A voltage of 100 V dc is applied across a series combination of two resistors R1 and R2 each of 10 KΩ. A voltmeter of sensitivity 1 KΩ/V is used to measure the voltage across R2 in the range of 50 V. Calculate the voltmeter reading and percentage error of reading. **(06 Marks)**

Module-2

3 a. Describe with diagram the operation of a Ramp type DVM. What are its limitations? **(08 Marks)**

b. (i) With the help of a block diagram, explain the operation of a digital time period measurement instrument.

(ii) The lowest range of a $4\frac{1}{2}$ digit DVM is 10 mV full scale. Determine its sensitivity. **(08 Marks)**

OR

4 a. Describe with diagram, the operation of a successive approximation type DVM. **(08 Marks)**

b. (i) With the help of a block diagram, explain the operation of a digital capacitance meter.

(ii) What are the outstanding characteristics of a DVM? **(08 Marks)**

Module-3

5 a. Draw the block diagram of a simple CRO and state the functions of each block. What is the advantage of using –ve HV supply in CRO? **(08 Marks)**

b. Explain with the help of a block diagram of a function generator, how it generates the different waveforms. **(08 Marks)**

OR

6 a. (i) Describe the operation of a digital storage oscilloscope with the help of a block diagram.
(ii) The number of vertical and horizontal tangencies of a Lissajous figure are 2 and 6 respectively. What is the frequency of the signal connected to vertical plates, if horizontal plate signal frequency is 1 kHz. **(08 Marks)**

b. Sketch the block diagram of a square and pulse generator and describe how it generates the square waveform and pulses. **(08 Marks)**

Module-4

7 a. (i) Explain with diagram the working of a phase sensitive detector.
(ii) What is the principle of working of a stroboscope? **(08 Marks)**

b. Draw the circuit of a Wheatstone's bridge and explain how it can be used to measure an unknown resistance. **(05 Marks)**

c. If the two arms of a Wheatstone's Bridge are R_1 = 1 KΩ and R_2 = 10 KΩ. Find the range of the third arm resistance R_3 to be used to measure unknown resistance R4 of the range 1 KΩ to 100 KΩ, in the fourth arm. **(03 Marks)**

OR

8 a. Define Q factor. With diagram, explain the operation of a Q meter to measure Q and inductance of a coil. **(08 Marks)**

b. Draw the diagram of a Maxwell's Bridge and obtain the equations to measure R_x, L_x and Q. **(05 Marks)**

c. A Maxwell's Bridge has components values at balance as C_1 = 0.01 μF, R_1 = 470 KΩ, R_2 = 5.1 KΩ, R_3 = 100 KΩ. Find the value of the inductive impedance connected in the fourth arm (Rx and Lx). **(03 Marks)**

Module-5

9 a. Explain the operation of a resistive position transducer. **(05 Marks)**

b. Describe with diagram the operation of a piezo electric transducer. **(05 Marks)**

c. With circuit diagram, explain the operation of a LVDT the method of measuring displacement. **(06 Marks)**

OR

10 a. (i) Explain with diagram the construction of a Bonded Resistance wire gauge. How does it senses strain/stress?
(ii) How it is used in a bridge arrangement with a dummy gauge and what is the advantages of such an arrangement? **(08 Marks)**

b. Briefly explain the construction and operation of a photoconductive cell and a photo transistor. **(04 Marks)**

c. With a circuit explain how a photo transistor can be used to operate a street light relay. **(04 Marks)**

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CBCS SCHEME

USN | | | | | | | | | | |

15EC36

Third Semester B.E. Degree Examination, June/July 2018
Engineering Electromagnetics

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define electric field intensity and flux density and also establish the relationship between them. **(04 Marks)**

b. State and explain Coulomb's law of force between two print charges. **(06 Marks)**

c. Two uniform line charges of densities 4 nc/m and 6nc/m lying x = 0 plane at y = 5m and y = -6m respectively. Find electric field intensity at P(4, 0, 5)m. **(06 Marks)**

OR

2 a. Derive an expression for electric field intensity due to infinite line charge. **(08 Marks)**

b. A volume charge density $\rho_v = \frac{5k}{r}$, where $r \neq 0$, k = constant exists within a sphere of radius $\frac{a}{2}$. Determine the magnitude of point charge placed at origin which will produce the same electric field at $r = \frac{a}{2}$. **(08 Marks)**

Module-2

3 a. Derive the Maxwell's first equation in electrostatics. **(04 Marks)**

b. Derive the expression for continuity of current. **(06 Marks)**

c. Find the total charge in a volume defined by six planes for which $1 \le x \le 2$; $2 \le y \le 3$; $3 \le z \le 4$. If $\vec{D} = \left[4x\,\hat{a}_x + 3y^2\,\hat{a}_y + 2z^3\,\hat{a}_z\right]$ c/m^2. **(06 Marks)**

OR

4 a. Briefly explain Gauss's divergence theorem. **(06 Marks)**

b. Obtain an expression for the energy expanded in moving a point charge in an electric field. **(06 Marks)**

c. Let $V = \frac{\cos 2\phi}{r}$ in free space in cylindrical system. Find $\vec{E}$ at B(2, 30°, 1). **(04 Marks)**

Module-3

5 a. With the usual notations, deduce the Poisson's and Laplace's equation from the Maxwell's first equation. **(06 Marks)**

b. Determine whether or not the following vector represents a possible electric field. $\vec{E} = 5\cos z\,\hat{a}_z$ V/m. **(04 Marks)**

c. Prove that the line integral of magnetic field intensity $\vec{H}$ around a closed path is exactly equal to current 'I' enclosed by that path. **(06 Marks)**

OR

6 a. Solve Laplace's equation to determine the capacitance of a coaxial cable when the inner radius is 'a' and outer radius is 'b' respectively. **(08 Marks)**

b. State and explain 'stokes theorem'. **(04 Marks)**

c. Given the vector magnetic potential $\vec{A} = x^2 \hat{a}_x + 2yz\,\hat{a}_y + (-x^2)\hat{a}_z$. Find magnetic flux density. **(04 Marks)**

Module-4

7 a. Derive Lorentz force equation and mention the application of solution. **(05 Marks)**

b. A point charge Q = -1.2C has velocity $\vec{V} = (5\hat{a}_x + 2\hat{a}_y - 3\hat{a}_z)$ m/s. Find the magnitude of force exerted on the charge if,

i) $\vec{E} = -18\,\hat{a}_x + 5\,\hat{a}_y - 10\,\hat{a}_z$ V/m

ii) $\vec{B} = -4\,\hat{a}_x + 4\,\hat{a}_y + 3\,\hat{a}_z$ T

iii) Both are present simultaneously. **(06 Marks)**

c. Briefly explain force between differential current elements. **(05 Marks)**

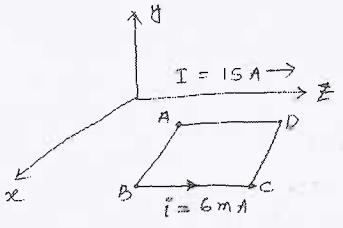
OR

8 a. Discuss the magnetic boundary condition at the interface between two different magnetic materials. **(05 Marks)**

b. Briefly explain potential energy and forces on magnetic materials. **(05 Marks)**

c. A rectangular loop of wire in free space joins A(1, 0, 1), B (3, 0, 1) to C(3, 0, 4) to D (1, 0, 4) to A. The wire carries a current of 6mA flowing in $\hat{a}_z$ direction from B to C. A filamentary current of 15A flows along the entire z-axis in the $\hat{a}_z$ direction as shown in Fig.Q.8(c). Find: i) Force on side BC ii) Force on side AB iii) Total force on loop. **(06 Marks)**

Fig.Q.8(c)



Module-5

9 a. State and explain Faraday's law in point and integral form. **(06 Marks)**

b. Derive Ampere's circuit law in point form and integral form suitable for Time-varying fields. **(07 Marks)**

c. Find the angular frequency at which the conduction current and displacement current are equal in medium with $\sigma = 5.6 \times 10^{-6}$ ℧/m and $\epsilon_r = 40$. **(03 Marks)**

OR

10 a. State and prove Poynting theorem. **(06 Marks)**

b. Briefly explain skin depth and skin effect. **(05 Marks)**

c. A 300MHz uniform plane wave propagation through fresh water for which $\sigma = 0$, $\mu_r = 1$ and $\epsilon_r = 78$. Calculate:

i) Attenuation constant

ii) Phase constant

iii) Wave length

iv) Intrinsic impedance. **(05 Marks)**

* * * * *

6 a. Derive the expression for maximum percentage efficiency for a seriesfed class–A power amplifier. **(08 Marks)**

b. Calculate the second harmonic distortion for an output waveform with $V_{CE_Q} = 10V$, $V_{CE_{min}} = 1V$, $V_{CE_{max}} = 18V$. **(06 Marks)**

c. Draw the circuit of a class-B push-pull amplifier and explain the working. Explain why cross-over distortion occurs in class-B and how it is overcome. **(06 Marks)**

7 a. With a neat circuit diagram, explain the principle of operation of RC phase-shift oscillator with necessary equations. **(08 Marks)**

b. Explain the working of transistor crystal oscillator in series resonant mode. **(06 Marks)**

c. Design a Weinbridge oscillator for a frequency of 4KHz. **(06 Marks)**

8 a. Derive equations for Z_i, Z_0 and A_V for JFET fixed bias configuration, with source resistor bypassed. **(08 Marks)**

b. For JFET amplifier shown in Fig.Q8(b), find Z_i, Z_0 and A_V. **(08 Marks)**

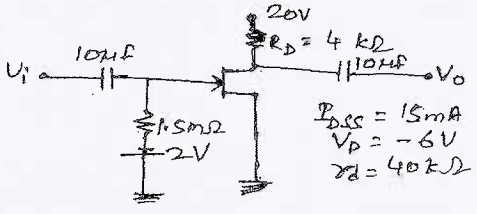


Fig.Q8(b)

c. Explain the graphical determination of g_m. **(04 Marks)**

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10ES33

Third Semester B.E. Degree Examination, June/July 2018
Logic Design

Time: 3 hrs. Max. Marks:100

Note: *Answer FIVE full questions, selecting atleast TWO questions from each part.*

PART – A

1 a. Reduce the following function using K-Map technique and implement using gates :
$J = f(A, B, C, D, E) = \Sigma_m (4, 5, 6, 7, 9, 11, 13, 15, 25, 27, 29, 31)$
$G = f(A, B, C, D) = \pi M(0, 4, 5, 7, 8, 9, 11, 12, 13, 15)$. **(12 Marks)**

b. Fig.Q1(b) shows a BCD counter that produces a 4-bit output representing the BCD code for the number of pulses that have been applied to the counter input. The counter resets to "0000" on the tenth pulse and starts recounting. Design the logic circuit that produces a "High" output whenever the count is 2, 3, or 9. Use K-Mapping and implement the logic circuit using NAND gates. **(08 Marks)**

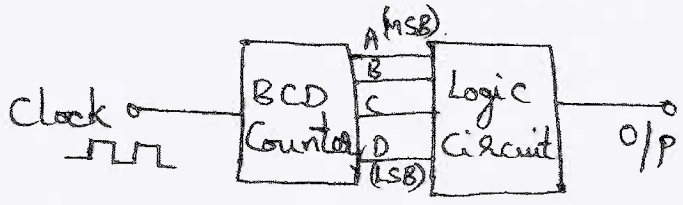

Fig.Q1(b)

2 a. Convert the given Boolean function $f(x, y, z) = [x + \bar{x}\,\bar{z}(y + \bar{z})]$ into maxterm canonical form and hence highlight the importance of canonical formula. **(06 Marks)**

b. Simplify using Quine Mc Cluskey tabulation algorithm.
$v = f(a, b, c, d) = \sum(2, 3, 4, 5, 13, 15) + \sum d(8, 9, 10, 11)$. **(14 Marks)**

3 a. Implement a full subtractor using decoder and write the truth table. **(10 Marks)**

b. What are the problems associated with the basic encoder? Explain how they can be overcone by priority encoder, considering 8 input lines. **(10 Marks)**

4 a. Design a combinational circuit that accepts two unsigned, 2-bit binary number $A = A_1 A_0$ and $B = B_1 B_0$ and provide 3 outputs corresponding to A = B, A > B and A < B. **(08 Marks)**

b. Implement $f(a, b, c, d) = \Sigma m(0, 1, 5, 6, 7, 9, 10, 15)$ using :
i) 8 : 1 MUX with a, b, c as select line
ii) 4 : 1 MUX with a, b as select lines. **(08 Marks)**

c. Explain the terms :
i) Ripple–carry propagation
ii) Look–ahead carry. **(04 Marks)**

PART – B

5 a. What is a flip-flop? Discuss the working principle of S-R flip-flop with its truth table. Also explain the role of S-R latch in switch debouncer circuit. **(08 Marks)**

b. With neat schematic diagram of master slave JK-FF, discuss its operation. Mention the advantages of JK-FF over master slave SR-FF. **(12 Marks)**

6 a. Design a 4-bit universal shift register using positive edge triggered D-flip-flops to operate as shown in table below TableQ6(a). **(12 Marks)**

Select line		Data line selected	Register Operation
S_1	S_0		
0	0	I_0	Hold
0	1	I_1	Shift right
1	0	I_2	Shift left
1	1	I_3	Parallel load

Table Q6(a)

b. Explain the working of a 4-bit asynchronous DeCade counter using JKFF in toggel mode. **(08 Marks)**

7 a. Explain mealy and Moore sequential circuit models. **(04 Marks)**

b. For the state machine M_1 shown in Fig.Q7(b) obtain,

i) State table
ii) Transition table
iii) Excitation table for T flip-flop
iv) Logic circuit for T excitation realization. **(16 Marks)**

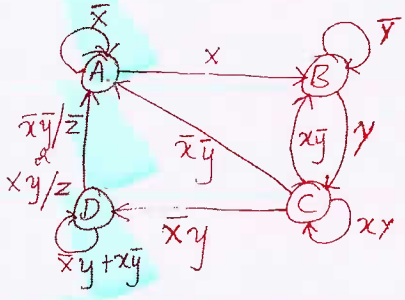

Fig.Q7(b)

8 a. Construct Moore and Mealy state diagram that will detect input sequence 10110, when input pattern is detected Z is asserted high. Give state algorithms for each state. **(10 Marks)**

b. Design a cyclic Mod6, synchronous binary counter using J-K flip-flop. Give the state diagram, transition table and excitation table. **(10 Marks)**

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10ES34

Third Semester B.E. Degree Examination, June/July 2018
Network Analysis

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Determine the current in 12Ω resistor shown in Fig.Q1(a), using source transformation method. **(06 Marks)**

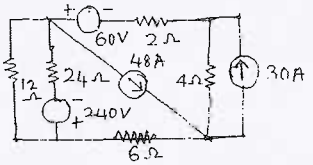

Fig.Q1(a)

b. Write the loop equations for the circuit shown in Fig.Q1(b) and solve for i_1, i_2 and i_3. **(06 Marks)**

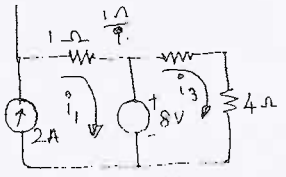

Fig.Q1(b)

c. For the network shown in Fig.Q1(c), find the node voltages V_c and V_d with node 'e' as reference node. **(08 Marks)**

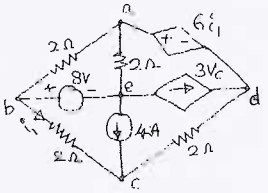

Fig.Q1(c)

2 a. Write a tie-set schedule and then find all the branch currents for the circuit shown in Fig.Q2(a). Assume inner branches as tree branches. **(10 Marks)**

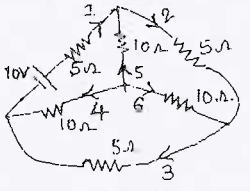

Fig.Q2(a)

b. Draw the dual of the network shown in Fig.2(b). Write the loop equations for the given network and the node equations for its dual, to show that they form dual set of equations. **(10 Marks)**

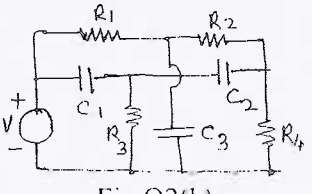

Fig.Q2(b)

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.

3 a. State and explain : i) Reciprocity theorem ii) Millman's theorem as applied to electrical circuits. **(10 Marks)**

b. Find i_0 and i from the circuit of Fig.3(b), using super position theorem. **(10 Marks)**

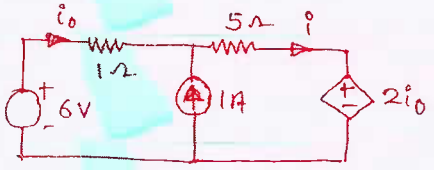

Fig.Q3(b)

4 a. State and explain Thevenin's theorem. **(04 Marks)**

b. Obtain the Thevenin's equivalent circuit of the network shown in Fig.Q4(b). **(08 Marks)**

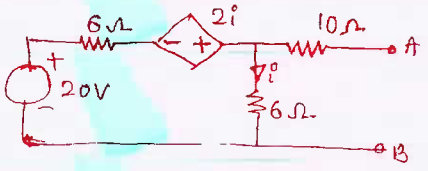

Fig.Q4(b)

c. For the circuit shown in Fig.Q4(c), find resistance value to be connected across AB for maximum power transfer. Find also the value of maximum power. **(08 Marks)**

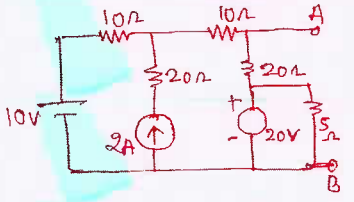

Fig.Q4(c)

PART – B

5 a. For the network shown in Fig.Q5(a), calculate resonant frequency, if a 10volt of frequency equal to resonant frequency is applied to the circuit. Also calculate the value of voltages V_C, V_L across C and L respectively. Find the frequencies at which these voltages V_C and V_L are maximum. **(08 Marks)**

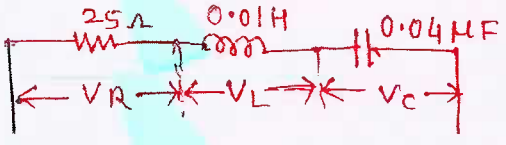

Fig.Q5(a)

b. Derive an expression for the resonance frequency of a resonant circuit consisting of R_L, L in parallel with R_C, C. **(06 Marks)**

c. Determine the value of 'L' for which the circuit shown in Fig.5(c) is resonant at a frequency of w = 500rad/sec. **(06 Marks)**

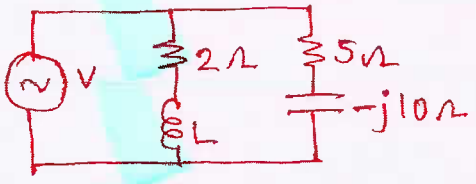

Fig.Q5(c)

6 a. Explain the behavior of R, L, C elements of the time of switching at t = 0, both at t = 0^+ and t = ∞. **(06 Marks)**

b. In the network shown in Fig.Q6(b), switch K is changed from position a to b, at t = 0. Solve for i, $\frac{di}{dt}, \frac{d^2i}{dt^2}$ at t = 0+. Assume that the capacitor is initially unchanged. **(08 Marks)**

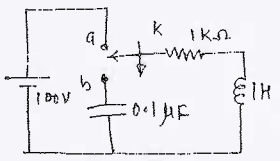

Fig.Q6(b)

c. In the network shown in Fig.Q6(C), the switch K is opened at t = 0. Solve for the values of V, $\frac{dv}{dt}, \frac{d^2v}{dt^2}$ at t = 0+. **(06 Marks)**

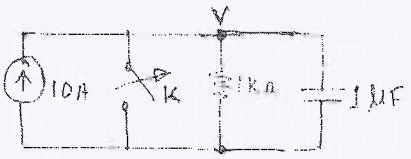

Fig.Q6(c)

7 a. Find the current in the circuit shown in Fig.Q7(a) at an instant after the opening of the switch if a current of 1 ampere had been passing through the circuit at the instant of opening. **(08 Marks)**

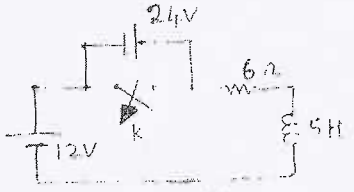

Fig.Q7(a)

b. Using convolution theorem, find f(t) of a function f(s) where $f(s) = \frac{1}{(S^2+4)^2}$. **(06 Marks)**

c. Find the Laplace transform of the periodic waveform of Fig.Q7(c). **(06 Marks)**

Fig.Q7(c)

8 a. Define 'Z' parameters. **(04 Marks)**

b. Obtain the relationship between T and h parameters. **(06 Marks)**

c. Obtain the Y-parameters of the two port network shown in Fig.Q8(c). **(10 Marks)**

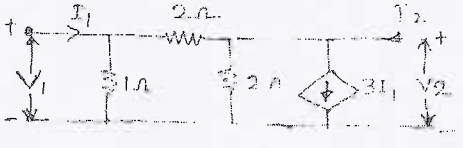

Fig.Q8(c)

* * * 3 of 3 * * *

CBCS Scheme

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15EC42

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Microprocessor

Time: 3 hrs. Max. Marks: 80

Note: *Answer FIVE full questions, choosing one full question from each module.*

Module-1

1 a. Define Microprocessor. Describe architecture of 8086, with neat block diagram. **(10 Marks)**

b. Explain the significance of following pins of 8086 :
i) ALE ii) RESET iii) $\overline{TEST}$ iv) M/ $\overline{IO}$. **(04 Marks)**

c. Explain the physical Address formation in 8086. **(02 Marks)**

OR

2 a. Explain the following addressing modes of 8086 :
i) Register Addressing mode ii) Based Indexed Addressing mode
iii) Immediate Addressing mode iv) Direct Addressing mode. **(08 Marks)**

b. Explain the significance of following 1 bit indicators in opcodes of 8086 processor. **(04 Marks)**

c. The Opcode for MOV instructions is "100010". Determine machine language code for the following instructions. i) MOV.AL.[BX] ii) MOV 56[SI], CL. **(04 Marks)**

Module-2

3 a. Explain the following instruction with examples :
i) LEA ii) IDIV iii) XLAT. **(06 Marks)**

b. Write a ALP to convert a 4 digit BCD No. into hexadecimal number. **(06 Marks)**

c. Differentiate between the following instructions :
i) AND & TEST ii) SHIFT & ROTATE. **(04 Marks)**

OR

4 a. What are assembler directives? Explain the following assembles directives with examples :
i) ASSUME ii) DUP iii) DB iv) LABEL. **(08 Marks)**

b. Write a ALP to find whether the given number is 2 out of 5 code. **(04 Marks)**

c. Explain the string instructions of 8086. **(04 Marks)**

Module-3

5 a. Explain the stack structure of 8086 in detail. **(06 Marks)**

b. Differentiate between procedure and Macro's. **(06 Marks)**

c. Write a ALP to find factorial of Number. **(04 Marks)**

OR

6 a. Write a programme to generate a delay of 100 m sec using 8086 microprocessor operating on 10MHz frequency. Show calculation for the delay. **(06 Marks)**

b. Explain the Interrupt Acknowledge sequence of 8086 with timing diagram. **(06 Marks)**

c. Explain interrupt response structure of 8086. **(04 Marks)**

Module-4

7 a. Draw and discuss typical maximum mode of 8086. **(08 Marks)**

b. Explain different modes of operation of 8255. **(08 Marks)**

OR

8 a. Interface two 4k × 8 EPROMS and two 4k × 8 RAM chips with 8086. **(06 Marks)**

b. Interface eight seven segment display using 8255 with 8086. **(06 Marks)**

c. Draw the timing diagram for $\overline{RQ}$ / $\overline{GT}$ for maximum mode. **(04 Marks)**

Module-5

9 a. Draw and discuss the interface between 8086 and 8087. **(08 Marks)**

b. Explain the following keyboard handling INT21 DOS function :
i) Function 01h ii) Function 08h. **(03 Marks)**

c. Write an ALP to interface stepper molar to 8086. **(05 Marks)**

OR

10 a. Differentiate between :
i) Harvard and Von Neuman Architecture ii) RISC and CISC Architecture. **(06 Marks)**

b. Explain the significance of different bits of control word. Register format of 8253/54. **(06 Marks)**

c. Write a program to generate triangular wave using DAC 0800. **(04 Marks)**

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CBCS Scheme

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15EC43

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Control Systems

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define control system. Distinguish between open loop and closed loop systems with examples. **(05 Marks)**

b. Write the differential equations for the mechanical system shown in Fig.Q1(b) and obtain F-V and F-I analogous electrical networks. **(05 Marks)**

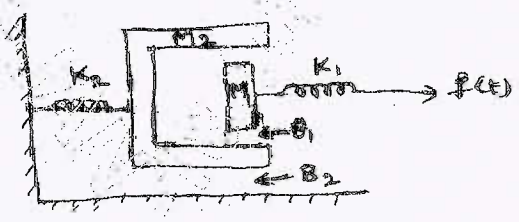

Fig.Q1(b)

c. Using Mason's gain formula, find the gain of the system shown in Fig.Q1(c). **(06 Marks)**

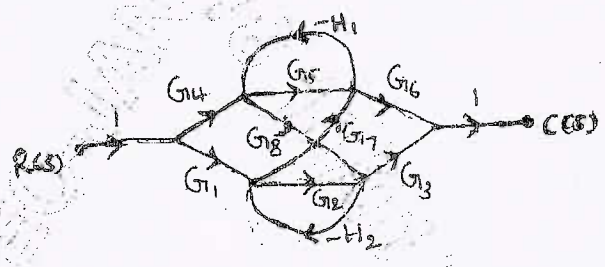

Fig.Q1(c)

OR

2 a. Write the Mason's gain formula for signal flow graph. Indicate what each term represents. **(04 Marks)**

b. Show that two systems shown in Fig.Q2(a) are analogous systems, by comparing their functions. **(06 Marks)**

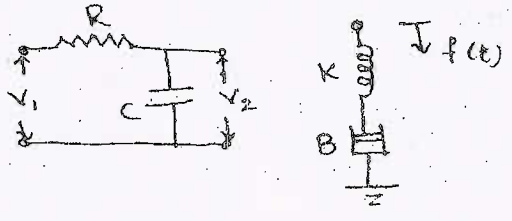

Fig.Q2(b)

c. Reduce the block diagram shown in Fig.Q2(c) using reduction rules and obtain C(s)/R(s). **(06 Marks)**

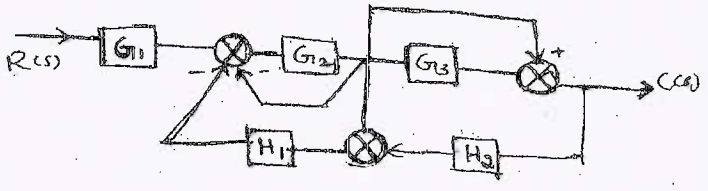

Fig.Q2(c)

Module-2

3 a. Obtain an expression for time response of the first order system subjected to unit step input. **(04 Marks)**

b. Explain proportional + integral + differential controller and their effect on stability. **(06 Marks)**

c. A unity feedback system is characterized by an open loop transfer function $G(s) = \frac{K}{s(s+10)}$.

Determine the gain K so that system will have a damping ratio of 0.5. For this value of K, find settling time (2% criterion), peak overshoot and time to peak overshoot for a unit step input. **(06 Marks)**

OR

4 a. With a neat sketch explain all the time domain specifications. **(10 Marks)**

b. For the system shown in Fig.Q4(b). Determine the value of 'a' which gives damping factor 0.7. What is the steady state error to unit ramp input for value of 'a'. **(06 Marks)**

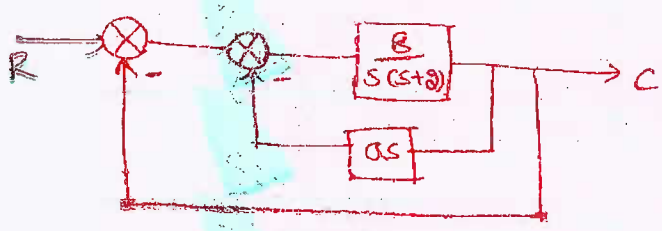

Fig.4Q(b)

Module-3

5 a. State and explain Routh-Hurwitz criterion. **(05 Marks)**

b. List the advantages of Root Locus method. **(05 Marks)**

c. Using RH criterion determine the stability of the system having the characteristic equation :

$s^6 + 2s^5 + 5s^4 + 8s^3 + 8s^2 + 8s + 4 = 0$. **(06 Marks)**

OR

6 a. By applying Routh criterion, discuss the stability of the closed loop system as a function of K for the following open loop transfer function :

$$G(s)H(s) = \frac{K(s+1)}{s(s-1)(s^2+4s+16)}.$$ **(06 Marks)**

b. The open loop transfer function of a control system is given by $G(s) = \frac{k}{s(s+2)(s^2+6s+2s)}$.

Sketch the complete root locus as k is varied from zero to infinity. **(10 Marks)**

Module-4

7 a. The open loop transfer function of a system is $G(s) = \frac{K}{s(1+0.5s)(1+0.2s)}$ using Bode plot.

Find K so that : i) Gain margin is 6dB ii) Phase margin is 25°. **(12 Marks)**

b. What is Nyquist plot? State the Nyquist stability criterion. **(04 Marks)**

OR

8 a. The open loop transfer function of a control system is $G(s)H(s) = \frac{!}{s^2(s+2)}$. Sketch the Nyquist plot, path and ascertain the stability. **(10 Marks)**

b. Write a note on lead compensator. **(06 Marks)**

Module-5

9 a. What is signal reconstruction? Explain it with sample and hold circuit. **(08 Marks)**

b. Consider the circuit of Fig.Q9(b). Identify suitable state variables and write its state vector matrix equation. Note that there are two inputs. **(08 Marks)**

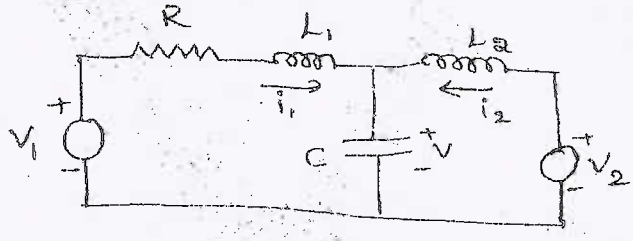

Fig.Q9(b)

OR

10 a. List the properties of state transition matrix. **(06 Marks)**

b. A single input single output system has the state and output equations :

$$\dot{x} = \begin{bmatrix} 0 & 1 \\ -6 & -5 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} r$$

$$y = [5 \quad 0]\, x$$

i) Determine its transfer function

ii) Find its state transition matrix. **(08 Marks)**

c. What is sampled data control system? **(02 Marks)**

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CBCS Scheme

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15EC44

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Signals and Systems

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Find odd and even components of the following signals.
i) $x(t) = 1 + t\cos t + t^2 \sin t + t^3 \cos^2 t \sin t$
ii) $x(t) = 1 + t^2 \cos^2 t + t^3 \sin^3 t + t^4 \cos t$. **(08 Marks)**

b. For the signal x(t) shown in Fig.Q1(b) find and plot.
i) x(–2t – 4) ii) x(–3t + 2) iii) x(2(–t –1)). **(08 Marks)**

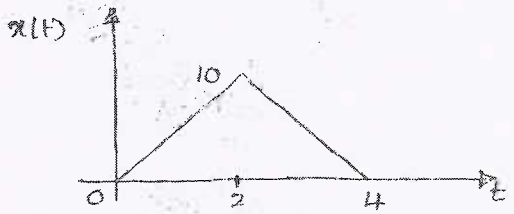

Fig.Q1(b)

OR

2 a. Determine whether the system described by the following input/output relationship is memoryless, causal, time – invariant or linear.

i) $y(n) = e^{x(n)}$ ii) $y(t) = \frac{1}{C}\int_{-\infty}^{t} x(\tau)d\tau$. **(08 Marks)**

b. Given the signal x(n) = (8 – n) [u(n) – u(n – 8)]. Find and sketch
i) $y_1(n) = x[4 - n]$ ii) $y_2(n) = x[2n - 3]$. **(08 Marks)**

Module-2

3 a. Find the convolution integral of $x_1(t) = e^{-2t}u(t)$ and $x_2(t) = u(t - 2)$. **(08 Marks)**

b. Find $y(n) = \beta^n u(n) * \alpha^n u(n)$. Given : $|\beta| < 1$ and $|\alpha| < 1$. **(04 Marks)**

c. Find $y(n) = x_1(n) * x_2(n)$

Where $x_1(n) = \left\{1, \underset{\uparrow}{2}, 3\right\}$ and

$x_2(n) = \left\{1, 2, \underset{\uparrow}{3}, 4\right\}$. **(04 Marks)**

OR

4 a. Convolute the two continuous time signals $x_1(t)$ and $x_2(t)$ given below :
$x_1(t) = \cos \pi t[u(t + 1) - u(t - 3)]$ and $x_2(t) = u(t)$. **(08 Marks)**

b. Evaluate $y(n) = \beta^n u(n) * u(n - 3)$ given: $|\beta| < 1$. **(04 Marks)**

c. Show that : i) $x(n) * \delta(n) = x(n)$ ii) $x(n) * \delta(n - n_0) = x(n - n_0)$. **(04 Marks)**

Module-3

5 a. Check the following systems for memory less, causality and stability :
i) $h(n) = (-0.25)^{|n|}$ ii) $h(t) = e^{2t}\, u(t-1)$. **(06 Marks)**

b. Find the step response of an LTI system whose impulse response is defined by $h(n) = \frac{1}{3}\sum_{k=0}^{2} \delta(n-k)$. **(04 Marks)**

c. Evaluate the DTFS representation for the signal $x(n) = \sin\left(\frac{4\pi}{21}n\right) + \cos\left(\frac{10\pi}{21}n\right) + 1$. Also draw its magnitude and phase spectra. **(06 Marks)**

OR

6 a. Find the step response of an LTI system whose impulse response is given by
i) $h(t) = e^{-|t|}$ ii) $h(t) = t^2 u(t)$. **(06 Marks)**

b. State any six properties of DTFS. **(06 Marks)**

c. Determine DTFS of the signal $x(n) = \cos\left(\frac{\pi}{3}n\right)$. Also draw its spectra. **(04 Marks)**

Module-4

7 a. Obtain the Fourier transform of the signal $x(t) = e^{-at}u(t)$; $a > 0$. Also draw its magnitude and phase spectra. **(06 Marks)**

b. Find the DTFT of the signal $x(n) = \alpha^n u(n)$; $|\alpha| < 1$. Also draw its magnitude spectra. **(04 Marks)**

c. Find the FT representation for the periodic signal $x(t) = \cos \omega_0 t$ and also draw its spectrum. **(06 Marks)**

OR

8 a. Find the FT of the signum function $x(t) = sgn(t)$. Draw the magnitude and phase spectra. **(06 Marks)**

b. Find the DTFT of $\delta(n)$ and draw the spectrum. **(04 Marks)**

c. Find the FT of the periodic impulse train $\delta_{T_0}(t) = \sum_{k=-\infty}^{\infty} \delta(t - kT_0)$ and draw the spectrum. **(06 Marks)**

Module-5

9 a. Find Z.T of the following sequences and als sketch their RoC :
i) $x(n) = \sin\Omega_0 n\, u(n)$ ii) $x(n) = (\frac{1}{2})^n u(n) + (-2)^n u(-n-1)$. **(08 Marks)**

b. Find IZT of the following sequence $x(z) = \dfrac{\left(\frac{1}{4}\right)z^{-1}}{\left(1-\frac{1}{2}z^{-1}\right)\left(1-\frac{1}{4}z^{-1}\right)}$ with RoC $\frac{1}{4} < |z| < \frac{1}{2}$. **(08 Marks)**

OR

10 a. State and prove the following properties of ZT
i) Time reversal property ii) differentiation property. **(08 Marks)**

b. Find IZT of the following sequence using partial fraction expansion method :

$$x(z) = \frac{z\left[z - \frac{3}{2}\right]}{z^2 - \frac{3}{2}z + \frac{1}{2}}$$

Given : i) RoC : $|z| < \frac{1}{2}$; ii) RoC : $|z| > 1$; iii) RoC : $\frac{1}{2} < |z| < 1$. **(08 Marks)**

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CBCS Scheme

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15EC46

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018

Linear Integrated Circuits

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define following terms with respect to opamp and mention the typical values of opamp 741: (i) PSRR, (ii) CMRR, (iii) Slew rate. (iv) input voltage range and output voltage range. **(08 Marks)**

b. Compare emitter follower with voltage follower. **(04 Marks)**

c. A voltage follower using 741 opamp is connected to signal source with resistance of R_s = 47 KΩ. Calculate suitable value of resistor R_1 and also maximum voltage drop across each resistor and maximum input offset voltage produced by input offset current.

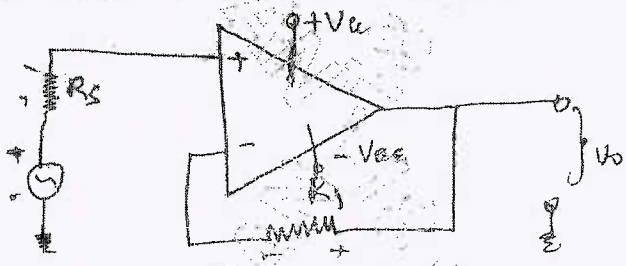

Fig.Q1(c) **(04 Marks)**

OR

2 a. Derive output voltage equation of 3 input non inverting summing circuit and show how it can be converted into averaging circuit. **(08 Marks)**

b. An operational amplifier circuit with closed loop gain is 100 and common mode output voltage is 5 mV and common mode input is 5 mV, determine common mode rejection ratio. **(02 Marks)**

c. Explain the operation of a basic op-amp circuit. **(06 Marks)**

Module-2

3 a. Explain capacitor coupled voltage follower circuit. **(08 Marks)**

b. Design a precision voltage source to provide an output of 9 V the available supply is ±12V allow approximately ±10% tolerance on Zener diode voltage. **(08 Marks)**

OR

4 a. Design an instrumentation amplifier to have an overall gain of 900. The input signal amplitude of 15 mV, 741 opamp is to be used. Supply is ±15V. **(08 Marks)**

b. Explain high Zin capacitor coupled non inverting amplifier with design steps. **(08 Marks)**

Module-3

5 a. Explain precision clipping circuit. **(08 Marks)**

b. Explain log amplifier and derive its output voltage equation. **(08 Marks)**

OR

6 a. Using 741 opamp with supply voltage of ±12V design Schmitt trigger to have trigger points ±2V. **(06 Marks)**

b. Explain sample and hold circuit using of opamp. **(10 Marks)**

Module-4

7 a. Explain second order active low pass filter and also write design equations. **(08 Marks)**

b. Explain the function diagram of 723 general purpose regulator IC. **(08 Marks)**

OR

8 a. Design a second order active high pass filter using 741 opamp with cutoff frequency of 12 kHz. **(06 Marks)**

b. What is meant by line regulation and load regulator with respect to IC regulators and mention the characteristics of 3 terminal IC voltage regulators. **(06 Marks)**

c. Design a first order active low pass filter to have cutoff frequency of 1 kHz. Use 741 opamp. **(04 Marks)**

Module-5

9 a. Explain the operation of a Astable multivibrater using 555 timer. **(08 Marks)**

b. Explain operation of PLL with block diagram. **(08 Marks)**

OR

10 a. Explain the operation of a VCO. **(08 Marks)**

b. Explain analog to digital conversion using successive approximation method. **(08 Marks)**

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10ES42

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Microcontrollers

Time: 3 hrs. Max. Marks:100

Note: *Answer FIVE full questions, selecting at least TWO questions from each part.*

PART – A

1 a. Differentiate between a microprocessor and a microcontroller. **(06 Marks)**

b. With the neat sketch of 8051 architecture, explain the CPU registers. **(08 Marks)**

c. With the help of timing diagram, explain how to interface 8K EPROM and 4K RAM to 8051. **(06 Marks)**

2 a. Write a program to swap the contents of Registers R_7 and R_6 in register block 0, in four different ways. **(06 Marks)**

b. List bit level logical instructions and their operation in 8051. **(08 Marks)**

c. Explain different ranges for Jump instruction available in 8051 microcontroller. **(06 Marks)**

3 a. Write a program to exchange the lower nibble of data present in external memory 6000H and 6001H. **(06 Marks)**

b. An 8-bit code word is stored in location 1000H of external data memory. Code word is valid, if three MSB's are zero and it contains two ones in the remaining five bits. If code word is valid, store FF, else store OO in 1001H. **(08 Marks)**

c. Write a program to blink the LED's alternatively connected to port 0 with a delay of 1 mS. Assume XTAL = 12 MHz. **(06 Marks)**

4 a. Write the circuit diagram for port 0, explain the operations of 8051 using port 0. **(06 Marks)**

b. Show a simple keyboard interface with port of 8051 and explain its operation. **(08 Marks)**

c. Write a program to rotate a stepper motor 64° in the clockwise direction. The motor has a step angle of 2°. **(06 Marks)**

PART – B

5 a. Explain IE and IP registers with its bit pattern. **(06 Marks)**

b. Explain different modes of operation of timer/counter of 8051 with relevant block diagram and steps to program the modes. **(08 Marks)**

c. Write an Assembly (or) C-program to generate a frequency of 100 Hz square wave, using timer 0 in mode-1. Assume crystal frequency = 11.0592 MHz (Assume any pin number). **(06 Marks)**

6 a. Write an 8051 program to send the message of "SAVE POWER" to the serial port continuously. Assume XTAL = 11.0592 MHz, 9600 baud rate, 8-bit data and one stop bit. **(06 Marks)**

b. Explain RS-232 hand shaking signals and specify the purpose of Max – 232 while interfacing. **(08 Marks)**

c. Explain the control word of 8255A. **(06 Marks)**

7 a. Briefly discuss the features of MSP 430 microcontrollers. **(06 Marks)**

b. Explain different addressing modes of MSP 430 with examples. **(08 Marks)**

c. Write a MSP430 assembly program to find the largest in the given array of 'n' bytes. **(06 Marks)**

8 Write short note on with respect to MSP430:

a. Watch dog timer.

b. Real Time Clock (RTC).

c. Significance of Gate in Tmode Register of 8051.

d. Internal RAM structure of 8051. **(20 Marks)**

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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.

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10EC44

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Signals and Systems

Time: 3 hrs. Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast TWO questions from each part.*

PART – A

1 a. Categorize the following signal as energy or power signal. and find the corresponding energy or power of the signal. $x(t) = \cos(\pi t) + \sin(5\pi t)$. **(06 Marks)**

b. For x(n) and y(n) shown in Fig.Q1(b), draw x(n + 1)·y(–2 –n). **(06 Marks)**

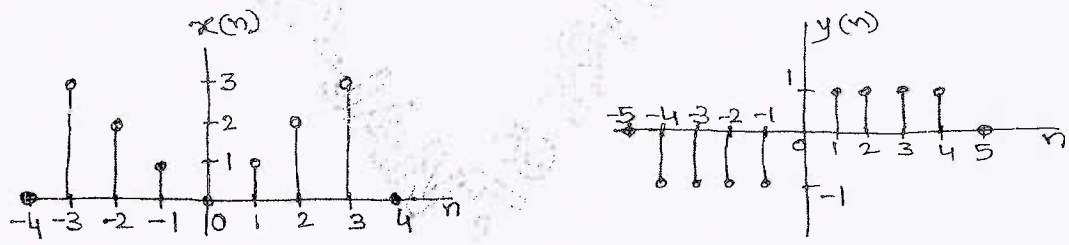

Fig.Q1(b)

c. Determine whether the following signal is periodic or not. If periodic, find its fundamental period. $x(n) = \cos\left(\frac{\pi n}{3}\right) \cdot \sin\left(\frac{\pi n}{5}\right)$. **(04 Marks)**

d. Determine whether the system described by the following input output relation is time – invariant or not $y(t) = \frac{1}{L}\int_{-\infty}^{t} x(\tau)d\tau$. **(04 Marks)**

2 a. The impulse response of a discrete time LTI system is given by $h(n) = a^n[u(n) - u(n-5)]$. Determine the output of the system for the input $x(n) = b^n u(n)$, using convolution sum. **(06 Marks)**

b. Evaluate the continuous time Convolution of the two signals given in Fig.Q2(b). **(06 Marks)**

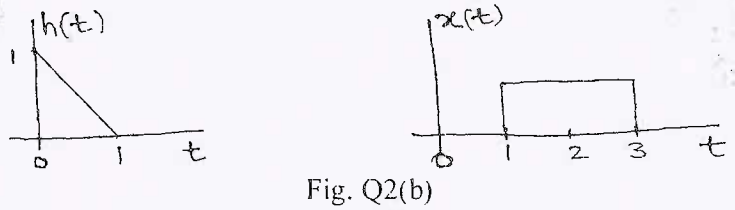

Fig. Q2(b)

c. Compute the discrete time convolution sum of the following two sequences using any method $x_1(n) = \{1, \underset{\uparrow}{2}, 3, 4\}$, $x_2(n) = \{1, 1, \underset{\uparrow}{3}, 2\}$. **(04 Marks)**

d. The impulse response of a continuous time LTI system is given by $h(t) = e^{2t}u(t-1)$. Is the system causal and stable? Give reason for your answer. **(04 Marks)**

3 a. Find the forced response of the system shown in Fig.Q3(a), where x(t) = cos (t). **(06 Marks)**

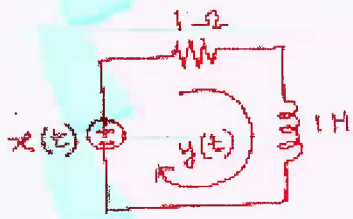

Fig.Q3(a)

b. Draw the direct form I and direct form II implementations of the system described by the following differential equation : $\frac{d^3}{dt^3}y(t) + 2\frac{d}{dt}y(t) + 3y(t) = x(t) + 3\frac{d}{dt}x(t)$. **(06 Marks)**

c. What is the natural response of the system described by the given difference equation?
$y(n) = \frac{1}{16}y(n-1) = x(n-1)$, with $y(-1) = 1$. **(04 Marks)**

d. For the interconnections of the system shown in Fig.Q3(d), obtain the overall impulse response in terms of the individual impulse responses. **(04 Marks)**

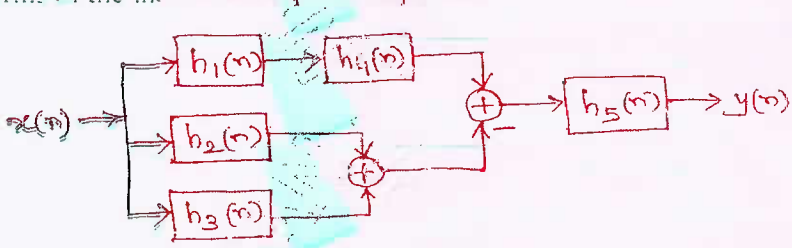

Fig.Q3(d)

4 a. A periodic signal with period 4 sec is described over one fundamental period as $x(t) = 3 - t$, $0 < t < 4$. Find the exponential Fourier series and plot its magnitude spectrum. **(06 Marks)**

b. Determine the discrete time Fourier series representation of the given signal. Draw its magnitude and phase spectra. $x(n) = \cos\left(\frac{6\pi n}{13} + \frac{\pi}{6}\right)$ **(06 Marks)**

c. State and prove frequency shift property with reference to Fourier series of continuous time signals. **(04 Marks)**

d. State and prove Parseval's theorem with reference to DTFS. **(04 Marks)**

PART – B

5 a. Find the inverse Fourier transform and draw the time domain signal for the rectangular spectrum given by $X(j\omega) = \begin{cases} 1, & \frac{-W}{2} < \omega < \frac{W}{2} \\ 0, & |W| > \frac{W}{2} \end{cases}$. **(08 Marks)**

b. A discrete time rectangular pulse is defined as $x(n) = \begin{cases} 1, & |n| \le M \\ 0, & |n| > M \end{cases}$.
Find and plot the DTFT of the signal. **(08 Marks)**

c. Using suitable properties find the inverse DTFT of :
$X(j\Omega) = \frac{1}{1 - ae^{-j(\Omega + \pi/4)}}$, $|a| < 1$. **(04 Marks)**

6 a. A continuous time LTI system produces an output $y(t) = e^{-t}u(t)$ when excited by the input $x(t) = e^{-2t}u(t)$. Evaluate the frequency response and impulse response of the system. **(08 Marks)**

b. Find the impulse response and step response of the LTI system shown in Fig.Q6(b) using Fourier analysis techniques. **(08 Marks)**

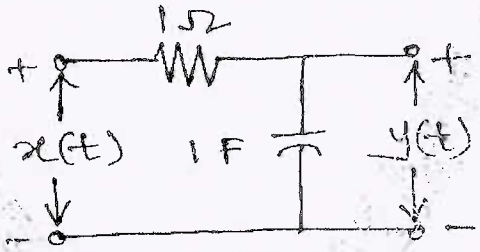

Fig.Q6(b)

c. A continuous time signal is given by $x(t) = 4\cos(100\pi t)$. What is the minimum sampling rate required to avoid aliasing? If the signal is sampled at 200 Hz, then give the expression for the discrete time signal after sampling. **(04 Marks)**

7 a. Using the Z – transform properties, find the Z – transform and RoC of the following signal : $x(n) = n(\frac{1}{2})^n u(n) * (\frac{1}{4})^{-n}u(-n)$. **(08 Marks)**

b. Find the time domain signal corresponding to the given z – transform, using partial fraction expansion approach. $X(z) = \dfrac{z^3 - 10z^2 - 4z + 4}{2z^2 - 2z - 4}$, RoC : $|z| < 1$. **(08 Marks)**

c. Derive the relation between z – transform and discrete time Fourier transform. **(04 Marks)**

8 a. Consider a system described by the difference equation $y(n) - 0.9\,y(n-1) = x(n)$, with initial condition $y(-1) = 2$. Find the step response of the system using unilateral z – transform. **(08 Marks)**

b. The difference equation of a causal and stable system is given by :

$$y(n) - \frac{5}{6}y(n-1) + \frac{1}{6}y(n-2) = x(n) - 2x(n-1)$$

Determine the impulse response of the system. Also find the output if the input is $x(n) = 2^n u(n)$. **(08 Marks)**

c. Determine the transfer function of the inverse of the system, whose difference equation is given by : $y(n) - \frac{1}{4}y(n-2) = 6x(n) - 7x(n-1) + 3x(n-2)$. **(04 Marks)**

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10EC45

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Fundamentals of HDL

Time: 3 hrs. Max. Marks:100

Note: *Answer FIVE full questions, selecting at least TWO questions from each part.*

PART – A

1 a. List different types of description in HDL. Explain structural and behavioral description with example. **(10 Marks)**

b. Given unsigned variables A, B, C with A = 11001011 B = 10110110, C = 00011011 find the value of
i) A ror 1 ii) A NAND C iii) B Sra 1 iv) ~ 1 C **(04 Marks)**

c. Explain scalar data types with syntax. **(06 Marks)**

2 a. Write a Verilog code for 2×2 unsigned combinational array multiplier with diagram. **(08 Marks)**

b. Write a VHDL code in data flow description for two bit magnitude comparator with simplified boolean expression. **(12 Marks)**

3 a. Write a VHDL code for D – Latch using signal and variable assignment statement. With simulation waveforms clearly distinguish between them. **(10 Marks)**

b. Explain for loop, while loop, Next and Exit in VHDL. **(04 Marks)**

c. Write a verilog code for 2×1 multiplexer with tristate output using IF-else statement. **(06 Marks)**

4 a. Write a structural description in VHDL for full adder with simulation waveform. **(08 Marks)**

b. Explain binding between :
i) Entity and Architecture
ii) Entity and component
iii) Library and module. **(06 Marks)**

c. Write a Verilog code for N-bit asynchronous down counter using generate statement. **(06 Marks)**

PART – B

5 a. Write a VHDL code to perform signed vector multiplication using procedure. **(10 Marks)**

b. Write a Verilog function to find greater of two signed number. **(05 Marks)**

c. Write a note on Verilog file processing. **(05 Marks)**

6 a. Explain the implementation of single and two dimensional arrays in VHDL. **(04 Marks)**

b. Write a VHDL code for addition of two 3×3 matrices. **(06 Marks)**

c. With a block diagram and function table write a VHDL code for 16×8 SRAM. **(10 Marks)**

7 a. Explain how to invoke Verilog module from a VHDL module. **(08 Marks)**

b. Write mixed language description of a 3-bit adder with zero flag. **(12 Marks)**

8 a. Describe the synthesis information extraction from entity and module with examples. **(10 Marks)**

b. With an example; explain synthesis of loop statement and show RTL synthesis. **(10 Marks)**

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10EC46

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Linear Integrated Circuits and Applications

Time: 3 hrs. Max. Marks:100

Note: *Answer any FIVE full questions, selecting at least TWO questions from each part.*

PART – A

1 a. Explain the basic circuit of operational amplifier. **(08 Marks)**

b. Draw neat circuit diagram of a direct coupled non-inverting op-Amp and explain the design steps. **(06 Marks)**

c. Design an inverting amplifier using 741 op-Amp for the voltage gain to be 50 and the output voltage amplitude to be 2.5 volts. **(06 Marks)**

2 a. Draw neat circuit diagram of a capacitor coupled voltage follower and give its design steps. **(07 Marks)**

b. With neat circuit diagram, explain the high input impedance capacitor coupled non-inverting amplifier. **(07 Marks)**

c. Using a LF353BIFET op-Amp design a high Z_{in} capacitor coupled non-inverting amplifier to have a low cut off frequency of 200 Hz. The input and output voltages are to be 15 mV and 3V respectively and the minimum load resistance is 12 KΩ. **(06 Marks)**

3 a. Sketch the circuit of a lag and lead compensation network. Explain its operation and show how it affects the frequency response of op-Amp. **(08 Marks)**

b. Write a note on Z_{in} mod compensation. **(06 Marks)**

c. Determine the upper cutoff frequency for a: (i) voltage follower (ii) unity gain inverting amplifier, using a 741 op-Amp, given that UGB of 741 is 800 kHz. **(06 Marks)**

4 a. What are the advantages of Precision Rectifier over Ordinary Rectifier? Explain the working of a precision half wave rectifier. **(06 Marks)**

b. Draw the circuit diagram of instrumentation amplifier using op-Amp. Explain its working and derive the expression of output. **(08 Marks)**

c. With neat circuit diagram explain the working of op-Amp Limiting Circuit. **(06 Marks)**

PART – B

5 a. Draw the op-Amp sample and hold circuit and explain its operation. **(08 Marks)**

b. Explain the working of phase shift oscillator using op-Amp. **(06 Marks)**

c. With a neat circuit diagram, explain the Wein-Bridge oscillator using op-amp. **(06 Marks)**

6 a. Explain the working of inverting Schmitt trigger with the help of circuit diagram and waveform. **(07 Marks)**

b. Draw the circuit and explain op-Amp astable multivibrator. **(06 Marks)**

c. With the help of circuit diagram and frequency response, explain the working of second order lowpass filter. **(07 Marks)**

7 a. Mention the advantages of IC voltage regulator. Draw the series op-Amp regulator and explain its working. **(10 Marks)**

b. Draw the internal schematic diagram of IC 723 regulator and explain its working. **(10 Marks)**

8 a. Draw the internal schematic diagram of 555 IC configuring it for monostable operation. Explain its working. **(08 Marks)**

b. With the help of basic block diagram, explain PLL. **(06 Marks)**

c. Explain the working of D to A converter using R-2R network. **(06 Marks)**

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15EC36

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Engineering Electromagnetics

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. State and explain Coulomb's law in vector form. **(05 Marks)**

b. Find the electric field $\overline{E}$ at origin, if the following charge distributions are present in free space:
   i) Point charge 12 nc at P(2, 0, 6).
   ii) Uniform line charge of linear charge density 3 nc/m at x = 2, y = 3.
   iii) Uniform surface charge of density $P_s = 0.2$ nc/m^2 at x = 2. **(06 Marks)**

c. Define volume charge density. Also find the total charge within each of the indicated volumes.
   i) $0 \le \rho \le 0.1,\ 0 \le \phi \le \pi,\ 2 \le z \le 4;\ \rho_v = \rho^2 z^2 \sin(0.6\phi)$
   ii) Universe : $\rho_v = \dfrac{e^{-2r}}{r^2}$ **(05 Marks)**

OR

2 a. Define Electric flux and flux density. **(04 Marks)**

b. Given a 60 μC point charge located at the origin, find the total electric flux passing through:
   i) That portion of the sphere r = 26 cm bounded by $0 < \theta < \dfrac{\pi}{2}$ and $0 < \phi < \dfrac{\pi}{2}$.
   ii) The closed surface defined by ρ = 26 cm and z = ±26 cm.
   iii) The plane z = 26 cm. **(07 Marks)**

c. Derive the expression for $\overline{E}$ due to infinite line charge of charge density ρ_l (c/m). **(05 Marks)**

Module-2

3 a. State and prove Gauss law for point charge. **(05 Marks)**

b. State and prove divergence theorem. **(05 Marks)**

c. In each of the following parts, find value for div $\overline{D}$ at the point specified:
   i) $\overline{D} = (2xyz - y^2)\overline{a}_x + (x^2z - 2xy)\overline{a}y + x^2y\overline{a}_z$ c/m^2 at P_A(2, 3, -1).
   ii) $\overline{D} = 2\rho z^2 \sin^2\phi\overline{a}_\rho + \rho z^2 \sin 2\phi\overline{a}_\phi + 2\rho^2 z \sin^2\phi\overline{a}_z$ c/m^2 at P_B(ρ = 2, φ = 110°, z = -1). **(06 Marks)**

OR

4 a. Define potential difference and absolute potential. **(04 Marks)**

b. A point charge of 6 nc is located at origin in free space, find potential of point p. if p is located at (0.2, -0.4, 0.4) and
   i) V = 0 at infinity
   ii) V = 0 at (1, 0, 0)
   iii) V = 20 V at (-0.5, 1, -1) **(06 Marks)**

c. Derive point form of continuity equation for current. **(06 Marks)**

Module-3

5 a. Derive the expression for Poisson's and Laplace's equation. **(05 Marks)**

b. Two plates of parallel plate capacitors are separated by distance 'd' and maintained at potential zero and V_0 respectively. Assuming negligible fringing effect, determine potential at any point between the plates. **(06 Marks)**

c. State and prove uniqueness theorem. **(05 Marks)**

OR

6 a. State and explain Biot-Savart law. **(06 Marks)**

b. Find the magnetic flux density at the centre '0' of a square of sides equal to 5m and carrying 10 amperes of current. **(06 Marks)**

c. At a point p(x, y, z), the components of vector magnetic potential $\overline{A}$ are given as $A_x = 4x + 3y + 2z$, $A_y = 5x + 6y + 3z$ and $A_z = 2x + 3y + 5z$. Determine $\overline{B}$ at point P. **(04 Marks)**

Module-4

7 a. Derive Lorentz force equation. **(05 Marks)**

b. Derive an expression for the force on a differential current element placed in a magnetic field. **(06 Marks)**

c. A conductor 4m long lies along the y-axis with a current of 10 amps in the $\overline{a}_y$ direction. Find the force on the conductor if the field is $\overline{B} = 0.005\,\overline{a}_x$ Telsa. **(05 Marks)**

OR

8 a. Define: i) Magnetization, ii) Permeability. **(04 Marks)**

b. Find the magnetization in a magnetic material where

i) $\mu = 1.8 \times 10^5$ (H/m) and 120 (A/m)

ii) $\mu_r = 22$, there are 8.3×10^{28} atoms/m^3 and each atom has a dipole moment of 4.5×10^{-27} (A/m^2) and

iii) B = 300 μT and $\chi_m = 15$. **(06 Marks)**

c. Discuss the boundary conditions at the interface between two media of different permeabilities. **(06 Marks)**

Module-5

9 a. State and explain Faraday's law of electromagnetic induction. **(04 Marks)**

b. Find the frequency at which conduction current density and displacement current are equal in a medium with $\sigma = 2 \times 10^{-4}$ ℧/m and $\varepsilon_r = 81$. **(06 Marks)**

c. List Maxwell's equations in point form and integral form. **(06 Marks)**

OR

10 a. Obtain solution of the wave equation for a uniform plane wave in free space. **(06 Marks)**

b. State and prove Poynting theorem. **(06 Marks)**

c. The depth of penetration in a certain conducting medium is 0.1 m and the frequency of the electromagnetic wave is 1.0 MHz. Find the conductivity of the conducting medium. **(04 Marks)**

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CBCS Scheme

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15EC33

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Digital Electronics

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Identify all prime implicants and essential prime implicants of following function using k – map.
$f(a, b, c, d) = \Sigma m(6, 7, 9, 10\ 13) + d.c(1, 4, 5, 11, 15)$
$f(a, b, c, d) = \pi m(1, 2, 3, 4, 9, 10) + d.c(0, 14, 15)$ **(08 Marks)**

b. Find minimal sum for following Boolean function using Quine –McClusky method :
$f(a, b, c, d) = \Sigma m(7, 9, 12, 13, 14, 15) + d.c(4, 11)$. **(08 Marks)**

OR

2 a. Transform each of following canonical expression into other canonical form in decimal notation.
$f(x, y, z) = \Sigma m(0, 1, 3, 4, 6, 7)$
$f((w, x, y, z) = \pi M(0, 1, 2, 3, 4, 6, 12)$. **(04 Marks)**

b. Find a minimal sum for following Boolean function using decimal QM method and PI table reduction.
$f(a, b, c, d) = \Sigma m(1, 3, 6, 8, 9, 10, 12, 14) + d.c(7, 13)$. **(12 Marks)**

Module-2

3 a. Implement following functions using single 3 : 8 decoder
$f_1(a, b, c) = \pi M(2, 3, 4, 5, 7)$
$f_2(a, b, c) = \Sigma m(1, 3, 5)$. **(04 Marks)**

b. What is magnitude comparator? Design a two bit digital comparator by writing TT, relevant expression and logic diagram. **(12 Marks)**

OR

4 a. Implement $f(a, b, c, d) = \Sigma m(0, 1, 5, 6, 7, 10, 15)$ using
i) 8 : 1 MUX with a, b, c as select lines
ii) 4 : 1 MUX with a, b as select lines. **(08 Marks)**

b. What are the problems associated with basic encoder? Explain how can these problems be overcome by priority encoder considering 8 input lines. **(08 Marks)**

Module-3

5 a. What is flip-flop. Discuss working principle of SR flip-flop with its TT. Also highlight role of SR f/f in switch debouncer circuit. **(08 Marks)**

b. What is significance of edge triggering? Explain working of +ve edge triggered D flip-flop with their functional table. **(08 Marks)**

OR

6 a. Explain the working of M/S JK flip-flop with functional table and timing diagram. Show how race condition is overcome. **(10 Marks)**

b. Obtain characteristic equation for following flip –flops. i) JK ii) SR. **(06 Marks)**

Module-4

7 a. Realize a 3 bit binary synchronous up counter using JK flip-flop. Write excitation table, transition table and logic diagram. **(10 Marks)**

b. Explain SIPO and PISO shift registers with relevant logic diagrams. **(06 Marks)**

OR

8 a. Explain the working principle of 4bit binary ripple counter configured using +ve edge triggered T = F/F. Also draw timing diagram. **(08 Marks)**

b. Explain the operation of universal shift register with a neat diagram. **(08 Marks)**

Module-5

9 a. Distinguish between Moore and Mealy model with necessary block diagram. **(06 Marks)**

b. Construct mealy state diagram that will detect input sequence 10110, when input pattern is detected, z is asserted high. Give state diagram for each state. **(10 Marks)**

OR

10 a. Design a cyclic mod 8 synchronous binary counter using JK flip-flop. Give state diagram, transition table and excitation table. **(08 Marks)**

b. Analyse the following sequential circuit shown in figure and obtain :

i) Flip-flop input and output equation
ii) Transition equation (ch.equ)
iii) Transition table
iv) State table
v) Draw state diagram. **(08 Marks)**

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CBCS Scheme

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15EC35

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Electronic Instrumentation

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define: i) Absolute error ii) Significant Figures. **(04 Marks)**

b. A component manufacturer constructs certain resistors to be anywhere between 1.14kΩ and 1.26kΩ and classifies them as 1.2kΩ resistors. What tolerance should be stated? If the resistance values are specified at 25°C and the resistors have a temperature coefficient of +500ppm/°C, calculate the maximum resistance of one of these components at 75°C. **(06 Marks)**

c. Design a multirange ammeter with range of 0-1A, 5A, and 10A employing individual shunt at each A D'Arsonval movement with an internal resistance of 500Ω and a full scale deflection of 10mA is available. **(06 Marks)**

OR

2 a. Calculate the value of multiplier resistance on the 50V range of a dc voltmeter that uses a 500μA meter movement with an internal resistance of 1kΩ. **(04 Marks)**

b. Explain true RMS voltmeter with a neat diagram. **(06 Marks)**

c. Two different voltmeters are used to measure the voltage across R_b in the circuit of Fig. 2(c). The meters are as follows :
Meter 1 : S = 1kΩ/V, R_m = 0.2k, range 10V
Meter 2 : S = 20kΩ/V, R_m = 1.5k, range 10V
Calculate :
i) Voltage across R_b without any meter across it
ii) Voltage across R_b when the meter 1 is used
iii) Voltage across R_b when the meter 2 is used
iv) Error in the voltmeters.

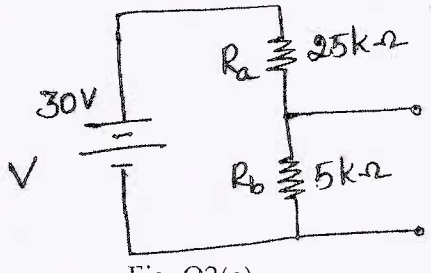

Fig. Q2(c) **(06 Marks)**

Module-2

3 a. Explain the working of successive approximation DVM with the help of block diagram. **(08 Marks)**

b. Draw basic block diagram of a microprocessor based ramp type DVM and explain its operation with waveforms. **(08 Marks)**

OR

4 a. Explain digital frequency meter with the help of block diagram. **(08 Marks)**
b. Explain digital pH meter. **(08 Marks)**

Module-3

5 a. Explain the function of various blocks in CRO with suitable diagram. **(06 Marks)**
b. Explain the working of Time base generator. **(06 Marks)**
c. Discuss frequency measurements with Lissajous figures. **(04 Marks)**

OR

6 a. Explain function generator with suitable diagram. **(08 Marks)**
b. Explain sweep generator with block diagram. **(08 Marks)**

Module-4

7 a. Explain Q-meter with suitable circuit diagram. **(06 Marks)**
b. Explain Basic Megger Circuit. **(06 Marks)**
c. Discuss stroboscope. **(04 Marks)**

OR

8 a. Explain the Wheatstone bridge and using Thevenin's theorem, determines the amount of deflection due to unbalance of Wheatstone Bridge. **(08 Marks)**
b. An inductance comparison bridge is used to measure inductive impedance at a frequency of 5KHz. The bridge constants at balance are L_3 = 10mH, R_1 = 10kΩ, R_2 = 40kΩ, R_3 = 100kΩ. Find the equivalent series circuit of the unknown impendence. **(04 Marks)**
c. Write a note on Wagner's earth connection. **(04 Marks)**

Module-5

9 a. What are the factors to be considered for the selection of better transducer? **(04 Marks)**
b. Derive an expression for gauge factor for Bonded Resistance wire strain Guages. **(08 Marks)**
c. Mention advantages and limitation of thermistor. **(04 Marks)**

OR

10 a. Explain the construction, principle and operation of LVDT. Show characteristics curve. **(10 Marks)**
b. Explain Piezoelectric Transducer. **(06 Marks)**

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CBCS SCHEME

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15EC36

Third Semester B.E. Degree Examination, June/July 2018
Engineering Electromagnetics

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define electric field intensity and flux density and also establish the relationship between them. **(04 Marks)**

b. State and explain Coulomb's law of force between two print charges. **(06 Marks)**

c. Two uniform line charges of densities 4 nc/m and 6nc/m lying x = 0 plane at y = 5m and y = -6m respectively. Find electric field intensity at P(4, 0, 5)m. **(06 Marks)**

OR

2 a. Derive an expression for electric field intensity due to infinite line charge. **(08 Marks)**

b. A volume charge density $\rho_v = \frac{5k}{r}$, where $r \neq 0$, k = constant exists within a sphere of radius $\frac{a}{2}$. Determine the magnitude of point charge placed at origin which will produce the same electric field at $r = \frac{a}{2}$. **(08 Marks)**

Module-2

3 a. Derive the Maxwell's first equation in electrostatics. **(04 Marks)**

b. Derive the expression for continuity of current. **(06 Marks)**

c. Find the total charge in a volume defined by six planes for which $1 \leq x \leq 2$; $2 \leq y \leq 3$; $3 \leq z \leq 4$. If $\bar{D} = \left[4x\,\hat{a}_x + 3y^2\,\hat{a}_y + 2z^3\,\hat{a}_z\right]$ c/m^2. **(06 Marks)**

OR

4 a. Briefly explain Gauss's divergence theorem. **(06 Marks)**

b. Obtain an expression for the energy expanded in moving a point charge in an electric field. **(06 Marks)**

c. Let $V = \frac{\cos 2\phi}{r}$ in free space in cylindrical system. Find $\bar{E}$ at B(2, 30°, 1). **(04 Marks)**

Module-3

5 a. With the usual notations, deduce the Poisson's and Laplace's equation from the Maxwell's first equation. **(06 Marks)**

b. Determine whether or not the following vector represents a possible electric field. $\bar{E} = 5\cos z\,\hat{a}_z$ V/m. **(04 Marks)**

c. Prove that the line integral of magnetic field intensity $\bar{H}$ around a closed path is exactly equal to current 'I' enclosed by that path. **(06 Marks)**

OR

6 a. Solve Laplace's equation to determine the capacitance of a coaxial cable when the inner radius is 'a' and outer radius is 'b' respectively. **(08 Marks)**

b. State and explain 'stokes theorem'. **(04 Marks)**

c. Given the vector magnetic potential $\vec{A} = x^2 \hat{a}_x + 2yz\,\hat{a}_y + (-x^2)\hat{a}_z$. Find magnetic flux density. **(04 Marks)**

Module-4

7 a. Derive Lorentz force equation and mention the application of solution. **(05 Marks)**

b. A point charge Q = -1.2C has velocity $\vec{V} = (5\hat{a}_x + 2\hat{a}_y - 3\hat{a}_z)$ m/s. Find the magnitude of force exerted on the charge if,

i) $\vec{E} = -18\,\hat{a}_x + 5\,\hat{a}_y - 10\,\hat{a}_z$ V/m

ii) $\vec{B} = -4\,\hat{a}_x + 4\,\hat{a}_y + 3\,\hat{a}_z$ T

iii) Both are present simultaneously. **(06 Marks)**

c. Briefly explain force between differential current elements. **(05 Marks)**

OR

8 a. Discuss the magnetic boundary condition at the interface between two different magnetic materials. **(05 Marks)**

b. Briefly explain potential energy and forces on magnetic materials. **(05 Marks)**

c. A rectangular loop of wire in free space joins A(1, 0, 1), B (3, 0, 1) to C(3, 0, 4) to D (1, 0, 4) to A. The wire carries a current of 6mA flowing in $\hat{a}_z$ direction from B to C. A filamentary current of 15A flows along the entire z-axis in the $\hat{a}_z$ direction as shown in Fig.Q.8(c). Find: i) Force on side BC ii) Force on side AB iii) Total force on loop. **(06 Marks)**

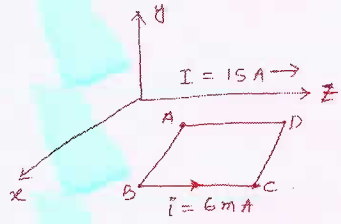

Fig.Q.8(c)

Module-5

9 a. State and explain Faraday's law in point and integral form. **(06 Marks)**

b. Derive Ampere's circuit law in point form and integral form suitable for Time-varying fields. **(07 Marks)**

c. Find the angular frequency at which the conduction current and displacement current are equal in medium with $\sigma = 5.6 \times 10^{-6}$ S/m and $\epsilon_r = 40$. **(03 Marks)**

OR

10 a. State and prove Poynting theorem. **(06 Marks)**

b. Briefly explain skin depth and skin effect. **(05 Marks)**

c. A 300MHz uniform plane wave propagation through fresh water for which $\sigma = 0$, $\mu_r = 1$ and $\epsilon_r = 78$. Calculate:

i) Attenuation constant

ii) Phase constant

iii) Wave length

iv) Intrinsic impedance. **(05 Marks)**

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10ES32

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Analog Electronic Circuits

Time: 3 hrs. Max. Marks:100

Note: *Answer FIVE full questions, selecting at least TWO questions from each part.*

PART – A

1 a. Using Shockley's equation, determine the diode current at 25°C for a silicon diode with $I_S = 20$ pA and $V_D = 0.7$ V. Find the same when $V_D = 0.5$ V. **(04 Marks)**

b. Sketch the output waveform for the following circuit shown in Fig. Q1 (b), and plot the transfer characteristics - **(06 Marks)**

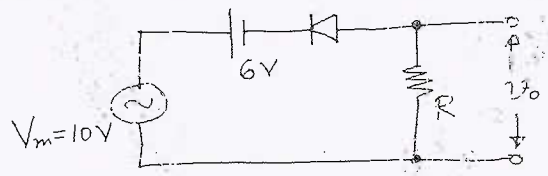

Fig. Q1 (b)

c. Check the condition for the following circuit shown in Fig. Q1 (c) to work as clamper. Sketch the output waveform. **(05 Marks)**

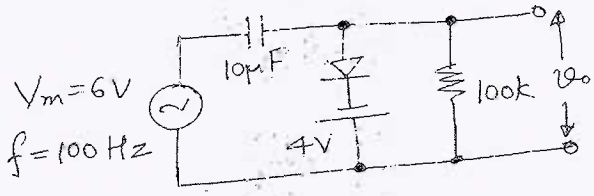

Fig. Q1 (c)

d. Find the current in the loop, the output voltage, and the power absorbed by each device. **(05 Marks)**

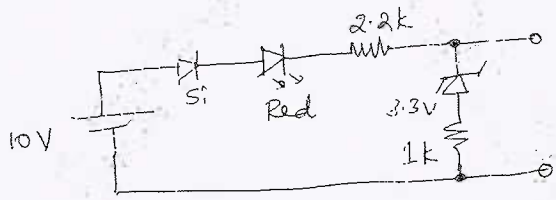

Fig. Q1 (d)

2 a. Derive the expression for I_B and V_{CE} of an emitter bias circuit. **(04 Marks)**

b. Check the condition for the approximate analysis of the voltage-divider bias circuit and obtain the Q-point using approximate analysis, given : $V_{CC} = +12$ V, $\beta = 120$, $R_C = 1.5\,K\Omega$, $R_E = 620\ \Omega$, $R_1 = 33$ kΩ and $R_2 = 4.7$ kΩ. Mark the Q-point on the DC load – line. **(06 Marks)**

c. Determine the values for the following circuit: V_E, I_E, V_{CE}, V_C, I_B and β. **(06 Marks)**

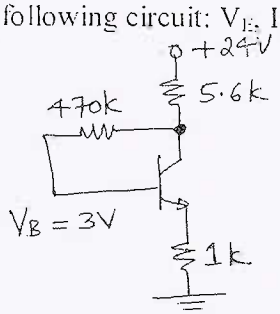

Fig. Q2 (c)

d. Design a fixed bias circuit for $V_{CC} = 10$ V, $\beta = 120$, $I_{C_Q} = 1.4$ mA and $V_{CE_Q} = 5$ V. **(04 Marks)**

3 a. Using r_e model, derive the expressions for Z_i, Z_o and A_V of a fixed bias circuit. **(06 Marks)**

b. Using exact analysis, determine Z_i, Z_o and A_V for the voltage-divider bias network if $R_1 = 220\ k\Omega$, $R_2 = 56\ k\Omega$, $R_C = 6.8\ k\Omega$, $R_E = 2.2\ k\Omega$, $\beta = 180$, $r_o = 50\ k\Omega$ and $V_{CC} = 20V$. **(10 Marks)**

c. For the network shown in Fig. Q3 (c), determine Z_i, Z_o and A_V. **(04 Marks)**

$h_{fe} = 150$
$h_{ie} = 2.75\ k\Omega$
$h_{Oe} = 25\ \mu S$

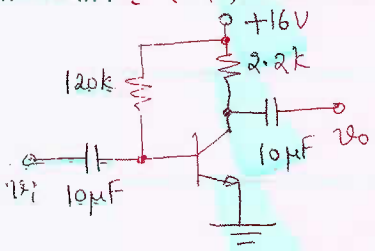

Fig. Q3 (c)

4 a. Explain the frequency response curves for RC-coupled, transformer-coupled and direct-coupled amplifiers, with reasons for the drop in gain. **(09 Marks)**

b. Determine the mid-band gain and the lower cut-off frequencies f_{L_S} and f_{L_C} for the voltage-divider bias BJT amplifier with $C_S = 10\ \mu F$, $C_C = 10\ \mu F$, $R_S = 1\ k\Omega$, $R_1 = 36\ k\Omega$, $R_{12} = 8.2\ k\Omega$, $R_E = 1.5\ k\Omega$, $R_C = 4.7\ k\Omega$, $R_L = 2.2\ k\Omega$, $\beta = 100$ and $V_{CC} = 20V$. **(11 Marks)**

PART – B

5 a. For a Darlington connection, derive the expressions for Z_i, Z_o, A_i and A_V. **(12 Marks)**

b. Mention the advantages and disadvantages of the negative feedback. **(04 Marks)**

c. Calculate the gain, input impedance and output impedance of a voltage-series-feedback amplifier having $A = -300$, $R_i = 1.5\ k\Omega$, $R_o = 50\ k\Omega$ and $\beta = -\frac{1}{15}$. **(04 Marks)**

6 a. Enumerate the types of power amplifiers along with their efficiency, conduction angle and Q-point. **(05 Marks)**

b. Prove that the maximum efficiency of a class-B power amplifier is 78.5%. **(05 Marks)**

c. Calculate the efficiency of the following circuit shown in Fig. Q6 (c), for an input current swing of 10 mA. **(05 Marks)**

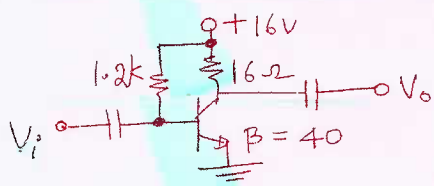

Fig. Q6 (c)

d. Along with the circuit diagram, explain the working of Class-C amplifier. **(05 Marks)**

7 a. Along with the circuit diagram, explain the working of a BJT phase-shift oscillator. **(06 Marks)**

b. Design a Wien-bridge oscillator for $f_0 = 6$ kHz, making suitable assumptions. **(06 Marks)**

c. Along with proper diagrams, explain the series resonant and parallel resonant crystal oscillators using BJT. **(08 Marks)**

8 a. Explain the operation of JFET amplifier using fixed bias. Draw the JFET small signal model, and derive the expressions for Z_i, Z_o and A_V. **(10 Marks)**

b. With necessary circuit diagram, obtain the expressions for Z_i, Z_o and A_V for an E-MOSFET voltage-divider configuration. **(10 Marks)**

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10ES33

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Logic Design

Time: 3 hrs. Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast TWO questions from each part.*

PART – A

1 a. Represent the canonical minterm forms in decimal notation :

i) $f_1 = x\bar{y} + yz$

ii) $f_2 = \bar{a}c + bc\bar{d} + ad$. **(05 Marks)**

b. Show that f(a, b, c, d) = $\sum$m(0, 1, 2, 5, 6, 8, 9, 10, 13, 14) = πM (3, 4, 7, 11, 12, 15). **(08 Marks)**

c. Simplify the following Boolean function and realize the simplified expression using basic gates.
f(a, b, c, d, e) = $\sum$m(0, 1, 4, 8, 9, 11, 15, 16, 24, 26) + dm(10, 20, 22, 23, 25, 27, 31). **(07 Marks)**

2 a. Simplify the Boolean function f(a, b, c, d) = $\sum$m(0, 1, 2, 7, 8, 9, 10, 13, 15) using Quine – Mc Cluskey tabulation method and verify the answer using k-map. **(10 Marks)**

b. Simplify the Boolean function f(a, b, c, d) = $\sum$m(0, 2, 3, 4, 5, 8, 10, 11) + dm(7, 13, 14) using Map entered variable k-map. With "d" as map entered variable, verify the answer using k-map.. **(10 Marks)**

3 a. Design a combinational circuit using basic gates to convert excess 3 binary code to BCD code. **(10 Marks)**

b. Implement full adder using decoder. **(05 Marks)**

c. Design a 4 to 16 decoder using 3 to 8 decoders. **(05 Marks)**

4 a. Design a 4 bit BCD adder circuit using 7483IC with self correcting circuit. That is a provision to be made in the circuit, in case the sum of BCD exceeds 9. **(10 Marks)**

b. Realize the Boolean function f(a, b, c) = $\sum$m(0, 1, 4, 5, 6) using 4 : 1 mux. **(05 Marks)**

c. Explain look – ahead carry adder and give its advantages and disadvantages. **(05 Marks)**

PART – B

5 a. Obtain characteristic equation of a S-R flip-flop. **(05 Marks)**

b. Explain the working of an universal shift register. **(05 Marks)**

c. Explain the working of a master –slave JK flip-flop with timing diagram for master and slave. Show how race around condition is eliminated. **(10 Marks)**

6 a. Design an asynchronous mod-8 counter using JK flip-flop and draw its timing diagram. **(10 Marks)**

b. Explain why asynchronous counter is called ripple counter. **(05 Marks)**

c. Explain mealy and Moore sequential circuit models. **(05 Marks)**

7 a. Draw and explain Moore JK flip-flop state diagram. **(05 Marks)**

b. For the state machine shown Fig.Q7(b) obtain : i) state table ii) Transition table iii) excitation table for JK flip–flop iv) logic diagram. **(15 Marks)**

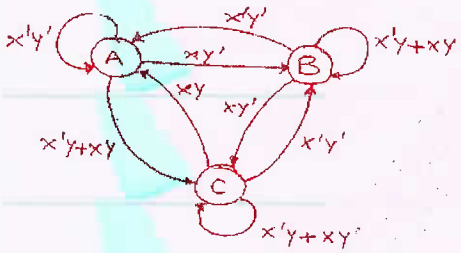

Fig.Q7(b)

8 a. Design a cyclic BCD up synchronous counter using τ flip-flops. **(10 Marks)**

b. Design a cyclic synchronous counter using D flip-flops to generate a sequence of 5421 code. (Hint : 0, 1, 2, 3, 4, 8, 9, 10, 11, 12 0, 1 - - - -) sequence. **(10 Marks)**

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10ES34

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Network Analysis

Time: 3 hrs. Max. Marks:100

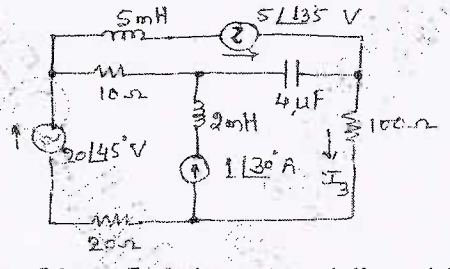
Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Define the following terms with examples :
i) Lumped Element ii) Active Element iii) Practical Source. **(03 Marks)**

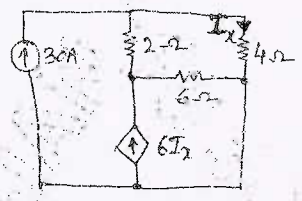
b. Find the current I_3 using mesh analysis for the circuit shown in fig.Q1(b), if the circuit is operating at frequency 5000 rad/s. **(07 Marks)**

Fig.Q1(b)



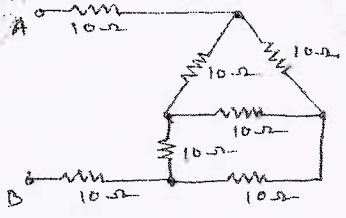
c. For the circuit shown in fig. Q1(c), find the power delivered by dependent source using node analysis. **(06 Marks)**

Fig.Q1(c)



d. Find the resistance R_{AB} for the network shown in fig.Q(d), using Δ - Y conversion. **(04 Marks)**

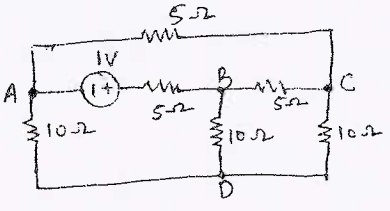
Fig.Q1(d)



2 a. Define the following terms with example :
i) Graph ii) Tree iii) Co - tree. **(03 Marks)**

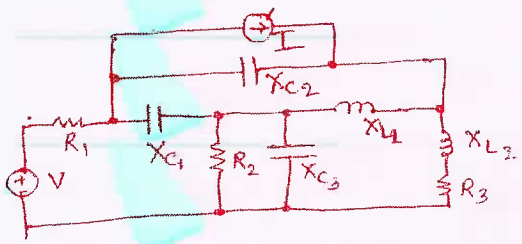
b. For the circuit in fig.Q2(b), write the tie – set matrix using AB, BC and CA or the links of the tree. Obtain the equilibrium equations in matrix from using KVL and calculate all loop currents and branch voltages. **(10 Marks)**

Fig.Q2(b)



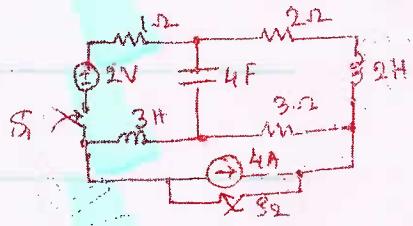
c. Draw the oriented graph for the circuit shown in fig.Q2(c). Also find fundamental cut -- set schedule using X_{C1} , R_2 and X_{L1} or the twigs of the tree. Find admittance matrix also. **(04 Marks)**

Fig.Q2(c)



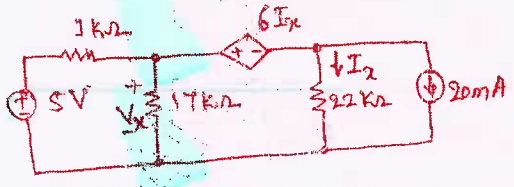
d. Find the dual of the circuit shown in fig.Q2(d). **(03 Marks)**

Fig.Q2(d)



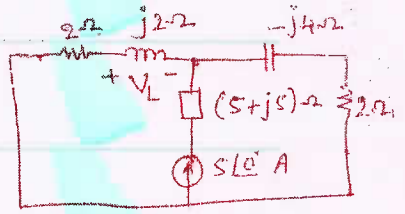
3 a. Find V_x using superposition for the circuit shown in fig.Q3(a). **(08 Marks)**

Fig.Q3(a)



b. Find the voltage V_L across the inductor and verify reciprocity theorem for the circuit shown in Fig.Q3(b). **(06 Marks)**

Fig.Q3(b)



c. State and prove Milliman's theorem. **(06 Marks)**

4 a. Find the Thevenin's equivalent circuit across terminals a & b for the circuit shown in fig.Q4(a). Also find the current I_L using this equivalent circuit. **(08 Marks)**

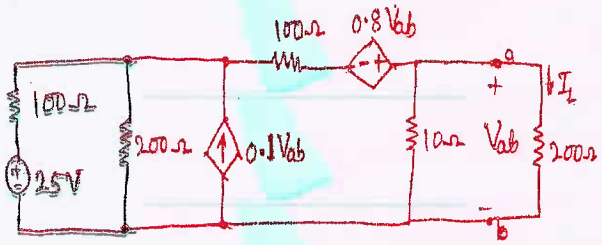
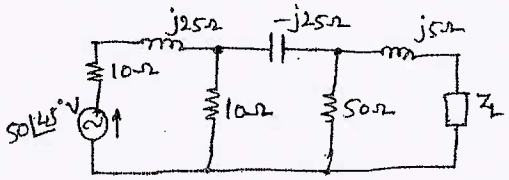


Fig.Q4(a)

b. State and prove Norton's theorem. **(05 Marks)**

c. Find Z_L for maximum power transfer for the circuit shown in fig.Q4(c). And also find the average maximum power absorbed by Z_L. **(07 Marks)**

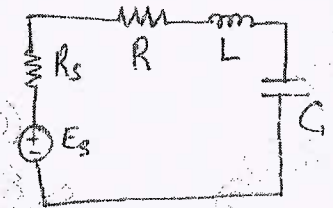
Fig.Q4(c)



PART – B

5 a. For the circuit shown in fig.Q5(a), find the transfer function, resonant frequency half power frequencies , bandwidth and Q - factor. **(10 Marks)**

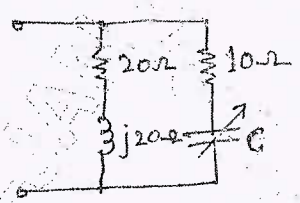
Fig.Q5(a)



b. Define the term Q – factor. Using this definition find the Q – factor of an inductor and a capacitor. **(05 Marks)**

c. For the network shown in fig.Q5(c), find the value of C for resonance to take place at w = 5000 rad/s. **(05 Marks)**

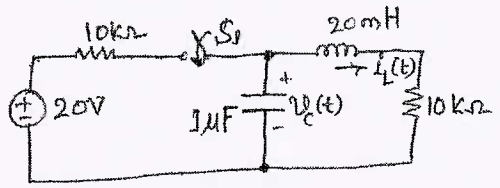
Fig.Q5(c)



6 a. Write a short note on Initial and Final conditions of circuit elements under switching conditions. **(06 Marks)**

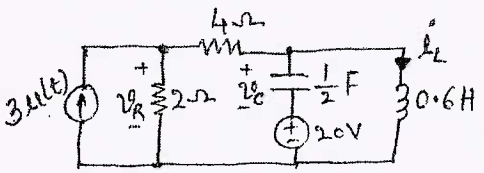
b. In the circuit shown in fig.Q6(b), the switch S_1 has been open for a long time before closing at t = 0. Find $V_c(0^-)$, $i_L(0^-)$, $Vc(\infty)$, $i_L(\infty)$, $\frac{di_L}{dt}(0^+)$ and $\frac{d^2i_L}{dt^2}(0^+)$. **(06 Marks)**

Fig.Q6(b)



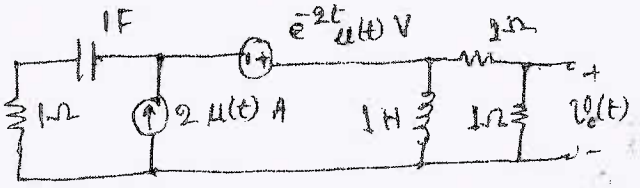
c. For the circuit shown in fig.Q6(c), calculate $i_L(0^+)$ $\frac{di_L(0^+)}{dt}$, $\frac{d}{dt}V_c(0^+)$, $V_R(\infty)$, $V_c(\infty)$ and $i_L(\infty)$ **(08 Marks)**

Fig.Q6(c)



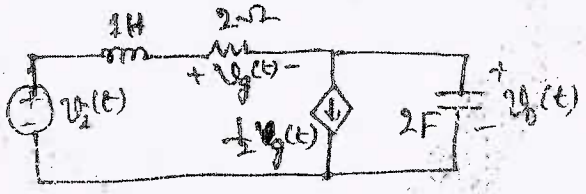
7 a. Find $V_o(t)$ of the circuit shown in fig.Q7(a). **(10 Marks)**

Fig.Q7(a)



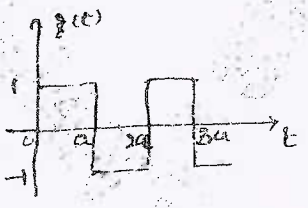
b. Find the impulse response of the circuit shown in fig.Q7(b). **(06 Marks)**

Fig.Q7(b)



c. Find the Laplace Transform of non – sinusoidal periodic waveform shown in fig.Q7(c). **(04 Marks)**

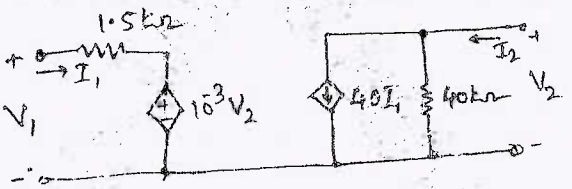
Fig.Q7(c)



8 a. Find the Z – transform in terms of Y - parameters. **(04 Marks)**

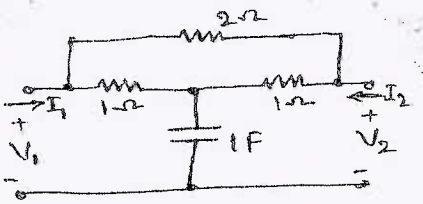
b. For the network shown in fig.Q8(b), find the transmission line parameters. **(08 Marks)**

Fig.Q8(b)



c. Find the h – parameters of the network shown in fig.Q8(c). **(08 Marks)**

Fig.Q8(c)



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10ES36

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Field Theory

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. State and prove gauss law for electrostatics. **(06 Marks)**

b. If $E = (-8xy\hat{a}_x - 4x^2\hat{a}_y + \hat{a}_z)$ V/mt. Find the work done in carrying a 6 C charge from A(1, 8, 5) to B(2, 18, 6) along the path $y = 3x + 2$, $z = x + 4$ **(06 Marks)**

c. Four point charges each 20 μc are at A(4, 0, 0), B(–4, 0, 0), C(0, 4, 0), D(0, - 4, 0) respectively. Find the force on a 200 μC point charge at (0, 0, 3). **(08 Marks)**

2 a. Derive an equation for divergence of flux density in differential form, and hence explain Gauss divergence theorem. **(08 Marks)**

b. A 15 nC point charge is at the origin in free space. Calculate v_1 if point P is located at (2, -3, -1). Also calculate v_1 at P if $v = 0$ at (6, 5, 4) **(06 Marks)**

c. Deduce an expression for energy and energy density in an electro static field. **(06 Marks)**

3 a. Using Poisson's equation, obtain the expression for junction potential in a p-n junction. **(08 Marks)**

b. Derive Laplace's equation and hence write the expression for Laplacian of V in cylindrical and spherical co-ordinates. **(06 Marks)**

c. Find E at P(3, 1, 2) for the field of two co-axial conducting cylinders. V = 50 V at r = 2 m, V = 20 V at r = 3 m. **(06 Marks)**

4 a. Derive an expression for magnetic flux density ($\vec{B}$) due to straight conductor of finite length. **(06 Marks)**

b. If $\vec{H}$ in a region is $2x\hat{a}_y + (3y - 2)\hat{a}_z$, find the current density at the origin. **(06 Marks)**

c. Given the magnetic field $\vec{H} = 2r^2(z+1)\sin\phi\hat{a}_\phi$, verify Stoke's theorem for the portion of cylindrical surface defined by r = 2, $\frac{\pi}{4} < \phi < \frac{\pi}{2}$, $1 < z < 1.5$. **(08 Marks)**

PART – B

5 a. Find the magnetic flux density due to long current carrying conductor using vector magnetic potential. **(08 Marks)**

b. Derive the expression for boundary conditions, if the field lines are tangent and normal to the boundary line between two media's in static magnetic field. **(06 Marks)**

c. A solenoid with air core has 2000 turns and a length of 500 mm, core radius 40 mm. Find its inductance. **(06 Marks)**

6 a. Derive the modification of Ampere's circuit law to suit for time varying conditions. **(06 Marks)**

b. Explain Maxwell's equations in point and integral form. Establish relationship between conduction current density and displacement current density for the given field $E = E_0 \sin \omega t$ **(08 Marks)**

c. Do the fields $E_z = E_m \sin x \sin t \hat{a}_y$ and $\vec{H} = \frac{E_m}{\mu} \cos x \cos t \hat{a}_z$. Satisfy Maxwell's equations. Verify. **(06 Marks)**

7 a. Derive an expression for electric and magnetic wave equations. **(06 Marks)**

b. For an electromagnetic wave propagating in free space, show that $\frac{E}{H} = \eta$. **(08 Marks)**

c. Find skin depth and surface resistance of copper conductor at 100 MHz having conductivity $\sigma = 5.8 \times 10^7$ ℧/m and $\mu_r = 100$. **(06 Marks)**

8 a. Explain the reflection of uniform plane wave with normal incidence at a plane dielectric boundary. **(10 Marks)**

b. Write short notes on:

(i) Reflection co-efficient.

(ii) Standing wave ratio. **(10 Marks)**

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CBCS Scheme

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15EC42

Fourth Semester B.E. Degree Examination, June/July 2018
Microprocessor

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Explain flag register of 8086 with its format. **(08 Marks)**

b. Determine the physical address for the following instructions, if DS = 2000h, SS = 3000h, ES = 4000h, BP = 0010h, BX = 0020h, SP = 0030h, SI = 0040h, DI = 0050h,
i) MOV AL, [BP]
ii) MOV CX, [BX]
iii) MOV AL, [BP + SI]
iv) MOV ES : [BX], AL. **(08 Marks)**

OR

2 a. Write an 8086 ALP to add a data byte present at address 2000 : 0600h with a data byte present at address 3000 : 0700h and store the result at address 4000 : 0900h. **(06 Marks)**

b. Explain machine language formats for any 2 instructions. **(04 Marks)**

c. Given the opcode 8907h, explain how these two bytes are interpreted in machine language what is the resulting instruction. **(06 Marks)**

Module-2

3 a. Using string instruction, write an 8086 ALP to copy 5 words from source memory area to destination memory area. Give the significance of SI, DI, CX and the DF bit. **(10 Marks)**

b. List all the flag manipulation and processor control instructions. **(06 Marks)**

OR

4 a. What are assembler directives? Explain any 5 assembler directives. **(07 Marks)**

b. List and explain the string manipulation instructions. Also give its advantages. **(09 Marks)**

Module-3

5 a. Explain the operation of i) PUSH and POP instructions ii) call and ret instruction. **(06 Marks)**

b. Draw the interrupt vector table and write the sequence of operations that are performed when an interrupt is recognized. **(10 Marks)**

OR

6 a. Explain maskable and non-maskable interrupts. **(04 Marks)**

b. Differentiate between procedures and Macros. **(05 Marks)**

c. Write a program to generate a delay of 100ms using an 8086 system that runs on 10 MHz frequency. Show the calculations. **(07 Marks)**

Module-4

7 a. With a neat circuit diagram, explain minimum mode configuration of 8086 system. **(08 Marks)**

b. Draw the timing diagram for read and write operation of maximum mode. **(08 Marks)**

OR

8 a. Write the control word format of 8255 PIA. **(06 Marks)**

b. Show an interface of keyboard to 8086 and explain with a flowchart. **(10 Marks)**

Module-5

9 a. Write an 8086 ALP to rotate the stepper motor in clockwise direction by 360° and then in anti clockwise direction by 180°. Assume 1–8 deg stepper and proc 'DELAY', **(08 Marks)**

b. Explain the following INT 21h DOS function calls.
i) Function 01h ii) function 02h iii) function 09h iv) function 0Ah. **(08 Marks)**

OR

10 a. Explain 8087 architecture with a neat diagram. **(08 Marks)**

b. Explain von-neumann and Harvard CPU architecture and CISC and RISC CPU architecture. **(08 Marks)**

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CBCS Scheme

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15EC43

Fourth Semester B.E. Degree Examination, June/July 2018
Control Systems

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Write the differential equations for the mechanical system shown in Fig.Q1(a) and obtain F-V analogy. **(06 Marks)**

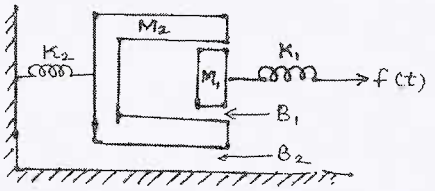

Fig.Q1(a)

b. Differentiate between open loop control system and closed-loop control system. **(06 Marks)**

c. For the rotational system shown in Fig.Q1(c). Draw torque-voltage analogous circuit. **(04 Marks)**

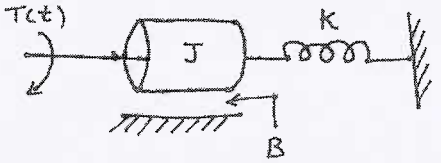

Fig.Q1(c)

OR

2 a. Reduce the following block diagram of the system shown on Fig.Q2(a) into a single equivalent block diagram by block diagram reduction rules. **(06 Marks)**

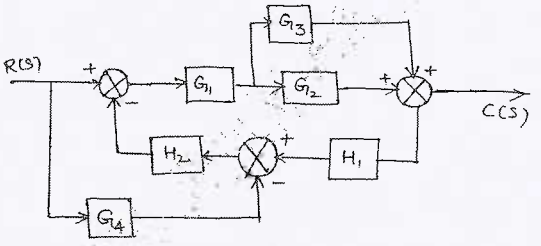

Fig.Q2(a)

b. Find $\frac{C(s)}{R(s)}$ for the following signal flow graph. [Refer Fig.Q2(b)] **(06 Marks)**

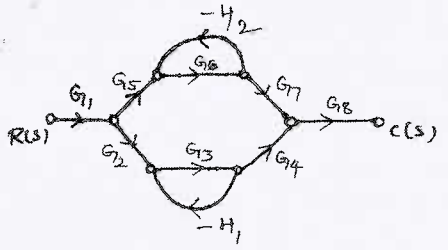

Fig.Q2(b)

c. For the following circuit write the signal flow graph. [Refer Fig.Q2(c)] **(04 Marks)**

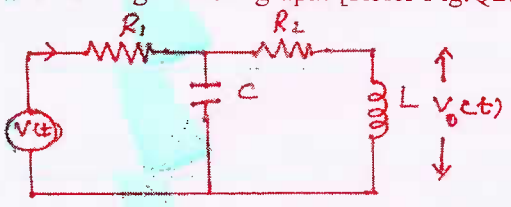

Fig.Q2(c)

Module-2

3 a. For the system shown in Fig.Q3(a). Find the : i) system type ii) static error constants k_p, k_v and k_a and iii) the steady state error for an input r(t) = 3 + 2t. **(06 Marks)**

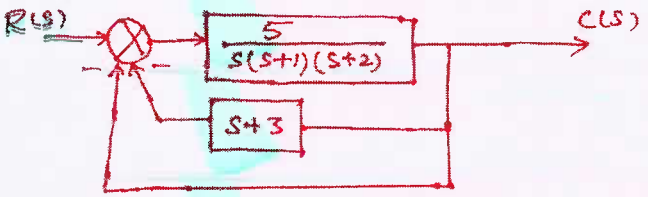

Fig.Q3(a)

b. Find the step-response, C(t) for the system described by $\frac{C(s)}{R(s)} = \frac{4}{S+4}$. Also find the time constant, rise time and settling time. **(05 Marks)**

c. Derive the equation for steady state error of simple closed loop system. **(05 Marks)**

OR

4 a. A second order system is represented by the transfer function.

$$\frac{Q(s)}{I(s)} = \frac{1}{JS^2 + fS + K}$$

A step input of 10 Nm is applied to the system and the test results are :

i) maximum overshoot = 6%
ii) time at peak overshoot = 1sec
iii) the steady state value of the output is 0.5 radian.

Determine the values of J, f and K. **(06 Marks)**

b. A system has 30% overshoot and settling time of 5 seconds for on unit step input. Determine: i) The transfer function ii) peak time 't_p' iii) output response (assume e_{ss} as 2%). **(06 Marks)**

c. Write the general block diagrams of the following :

i) PD type of controller
ii) PI type of controller. **(04 Marks)**

Module-3

5 a. Determine the ranges of 'K' such that the characteristic equation :

$S^3 + 3(K+1)S^2 + (7K+5)S + (4K+7) = 0$ has roots more negative than S = –1. **(06 Marks)**

b. Check the stability of the given characteristic equation using Routh's method.

$S^6 + 2S^5 + 8S^4 + 12S^3 + 20S^2 + 16S + 16 = 0$. **(06 Marks)**

c. Mention few limitations of Routh's criterion. **(04 Marks)**

OR

6 a. Sketch the complete root locus of system having, $G(s)H(s) = \frac{K}{S(S+1)(S+2)(S+3)}$. **(12 Marks)**

b. Consider the system with $G(S)H(s) = \frac{K}{S(S+1)(S+4)}$. Find whether S = –2 point is on root locus or not using angle condition. **(04 Marks)**

Module-4

7 a. The open loop transfer function of a system is $G(s) = \frac{K}{s(1+s)(1+0.1s)}$. Determine the values of K such that i) gain margin = 10 dB ii) phase margin = 24°. Use Bode plot. **(10 Marks)**

b. Derive the expression for resonant peak 'M_r' and corresponding resonant frequency 'W_r' for a second–order underdamped system in frequency response analysis. **(06 Marks)**

OR

8 a. Sketch the Nyquist plot for a system with the open-loop transfer function :

$$G(s)H(s) = \frac{k(1+0.5s)(1+s)}{(1+10s)(s-1)}$$

Determine the range of values of 'k' for which the system is stable. **(08 Marks)**

b. Write the polar plot for the following open-loop transfer function :

$$G(S)H(s) = \frac{1}{1+0.1s}.$$ **(04 Marks)**

c. Explain Nyquist stability criteria. **(04 Marks)**

Module-5

9 a. Explain spectrum analysis of sampling process. **(06 Marks)**

b. Explain how zero–order hold is used for signal reconstruction. **(04 Marks)**

c. Find the state–transition matrix for $A = \begin{bmatrix} 0 & -1 \\ +2 & -3 \end{bmatrix}$. **(06 Marks)**

OR

10 a. Obtain an appropriate state model for a system represented by an electric circuit as shown in Fig.Q10(a).

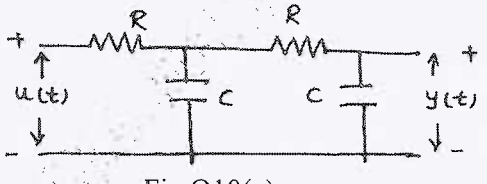

Fig.Q10(a) **(06 Marks)**

b. A linear time invariant system is characterized by the homogeneous state equation :

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

Compute the solution of homogeneous equation, assume the initial state vector.

$$X_0 = \begin{bmatrix} 1 \\ 0 \end{bmatrix}.$$ **(06 Marks)**

c. State the properties of state transition matrix. **(04 Marks)**

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CBCS SCHEME

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15EC44

Fourth Semester B.E. Degree Examination, June/July 2018
Signals and Systems

Time: 3 hrs. Max. Marks: 80

Note: ***Answer FIVE full questions, choosing one full question from each module.***

Module-1

1 a. Sketch the even and odd part of the signals shown in Fig. Q1 (a)-(i) and Fig. Q1 (a)-(ii) **(08 Marks)**

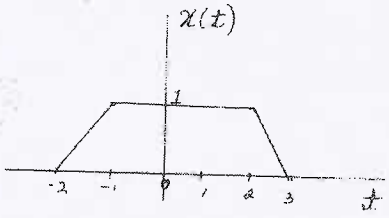


Fig. Q1 (a)-(i)

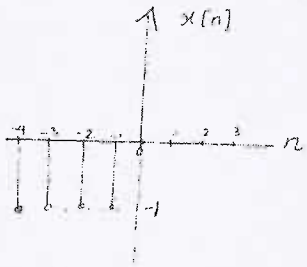


Fig. Q1 (a)-(ii)

b. The trapezoidal pulse x(t) shown in Fig. Q1 (b) is applied to a differentiator defined by,

$$y(t) = \frac{d}{dt}x(t)$$

Determine the resulting output y(t) and the total energy of y(t). **(08 Marks)**

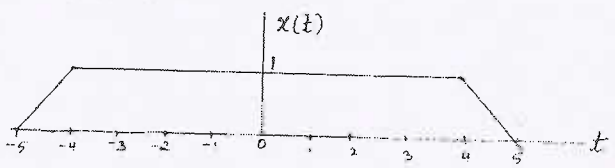
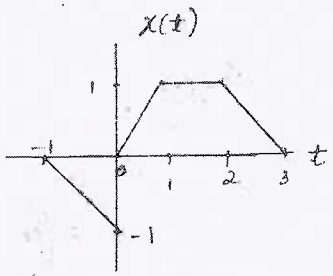


Fig. Q1 (b)

OR

2 a. Two systems are described by, (i) $y(n) = (n+1)x(n)$ (ii) $y(t) = x(t) + 10$. Test the systems for (i) Memory (ii) Causality (iii) Linearity (iv) Time-invariance and (v) Stability **(08 Marks)**

b. Let x(t) and y(t) be given in Fig. Q2 (b) respectively. Sketch the following signals, (i) $x(t)y(-t-1)$ (ii) $x(4-t)y(t)$ **(05 Marks)**



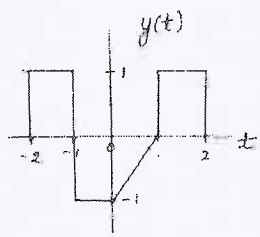


Fig. Q2 (b)

c. Determine whether the following signal is periodic or not. If periodic find the fundamental period, $x(n) = \cos\left(\frac{n\pi}{5}\right)\sin\left(\frac{n\pi}{3}\right)$. **(03 Marks)**

Module-2

3 a. Show that, (i) $x(t)*\delta(t-t_0)=x(t-t_0)$ (ii) $x(n)=\sum_{K=-\infty}^{\infty}x(k)\delta(n-K)$

(iii) $x(t)*u(t)=\int_{-\infty}^{t}x(z)dz$ **(08 Marks)**

b. Determine graphically, the output of a LTI system whose impulse response is

$h(t)=\begin{cases}4 & \text{for } 0\le t\le 2\\ 0 & \text{elsewhere}\end{cases}$

for the input $x(t)=\begin{cases}2 & \text{for } -2\le t\le 2\\ 0 & \text{elsewhere}\end{cases}$ **(08 Marks)**

OR

4 a. Use the definition of the convolution sum to prove the following properties:

(i) $x(n)*(h_1(n)+h_2(n))=(x(n)*h_1(n))+(x(n)*h_2(n))$

(ii) $x(n)*h(n)=h(n)*x(n)$ **(08 Marks)**

b. Compute the convolution sum of,

$x(n)\equiv\alpha^n[U(n)-U(n-8)]$, $|\alpha|<1$ and

$h(n)\equiv U(n)-U(n-5)$ **(08 Marks)**

Module-3

5 a. Determine the overall impulse response h(t) in terms of impulse response of each subsystem shown in Fig. Q5 (a). **(04 Marks)**

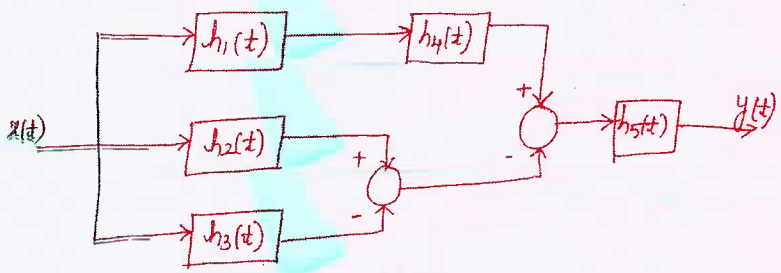


Fig. Q5 (a)

b. Determine whether the systems described by the following impulse responses are stable, causal and memoryless:

(i) $h(n)=\left(\frac{1}{2}\right)^n U(n)$ (ii) $h(t)=e^t u(-1-t)$ **(06 Marks)**

c. Find the DTFS coefficients of the signal shown in Fig. Q5 (c). **(06 Marks)**

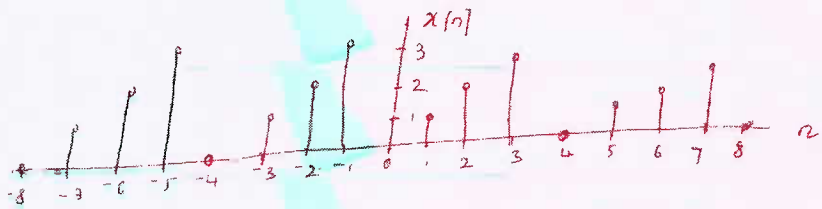


Fig. Q5 (c)

OR

6 a. Find the unit step response for the LTI systems represented by the following responses:

(i) $h(n)=\left(\frac{1}{2}\right)^n U(n-2)$ (ii) $h(t)=e^{-|t|}$ **(08 Marks)**

b. Find the Fourier series of the signal shown in Fig. Q6 (b), T = 2 **(08 Marks)**

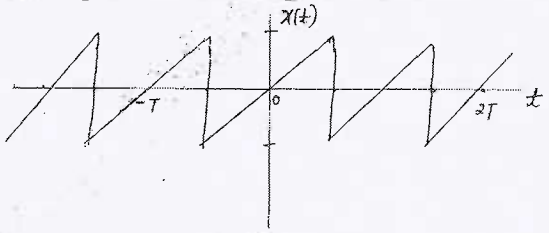


Fig. Q6 (b)

Module-4

7 a. State and prove the following properties of Discrete time Fourier transform:

(i) Frequency shift property (ii) Time differentiation property **(06 Marks)**

b. Find the Discrete time Fourier Transform of the following signals,

(i) $x(n)=a^{|n|}\ |a|<1$ (ii) $x(n)=2^n U(-n)$ **(10 Marks)**

OR

8 a. Determine the Nyquist sampling rate and Nyquist sampling interval for,

(i) $x(t)=1+\cos 2000\pi t+\sin 4000\pi t$ (ii) $x(t)=25e^{j500\pi t}$ **(05 Marks)**

b. Determine the Fourier transform of the following signals,

(i) $x(t)=e^{-3t}u(t-1)$ (ii) $x(t)=e^{-a|t|}\ a>0$ **(06 Marks)**

c. Determine the time domain expression of $X(j\omega)=\frac{j\omega+1}{(j\omega+2)^2}$. **(05 Marks)**

Module-5

9 a. Determine the z-transform x(z), the ROC for the signals. Draw the ROC

(i) $x(n)=-\left(\frac{1}{2}\right)^n U[-n-1]-\left(-\frac{1}{3}\right)^n U[-n-1]$ (ii) $x(n)=-\left(\frac{3}{4}\right)^n U[-n-1]+\left(-\frac{1}{3}\right)^n U[n]$ **(08 Marks)**

b. State and prove the following properties of Z-transform:

(i) Time shift (ii) Convolution property. **(08 Marks)**

OR

10 a. The Z-transform of a sequence x(n) is given by, $x(z)=\frac{z(z^2-4z+5)}{(z-3)(z-2)(z-1)}$.

find x(n) for the following ROCs

(i) $2<|z|<3$ (ii) $|z|>3$ **(08 Marks)**

b. A causal system has input x(n) and output y(n). Find the impulse response of the system if,

$x(n)=\delta(n)+\frac{1}{4}\delta(n-1)-\frac{1}{8}\delta(n-2)$

$y(n)=\delta(n)-\frac{3}{4}\delta(n-1)$

Find the output of the system if the input is, $\left(\frac{1}{2}\right)^n U(n)$. **(08 Marks)**

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CBCS SCHEME

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15EC45

Fourth Semester B.E. Degree Examination, June/July 2018
Principles of Communication Systems

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define Amplitude modulation. Explain the generation of AM wave using switching modulator. **(06 Marks)**

b. What is coherent detection? With a neat block diagram, explain the demodulation of DSB-SC signals using Costas receiver. **(05 Marks)**

c. Obtain the expression for a spectrum of single tone AM signal. Show that the total power in the sidebands is one third of the total power in the modulated wave with 100% modulation. **(05 Marks)**

OR

2 a. What are the modified forms of amplitude modulation? With a neat circuit diagram and waveform, explain the operation of ring modulator. **(06 Marks)**

b. With the help of an amplitude response of VSB filter. Explain the VSB modulation and demodulation process. **(06 Marks)**

c. Consider a square law detector using a nonlinear device whose output defined by $v_2(t) = a_1 v_1(t) + a_2 v_1^2(t)$, where a_1, a_2 are constants and $v_1(t) = A_c [1 + k_a u(t)] \cos 2\pi f_c t$.

i) Evaluate the output $v_2(t)$

ii) How the message signal can be recovered from $v_2(t)$? **(04 Marks)**

Module-2

3 a. Derive the expression for narrow band FM and compare it with the AM signal using phasor diagrams. **(06 Marks)**

b. Describe the frequency response of an ideal slope circuit used for the demodulation of FM signals and explain the balanced frequency discriminator. **(08 Marks)**

c. A commercial FM radio broadcasting uses modulation frequency w = 15KHz with the maximum value of frequency deviation 75KHz. Find the deviation ratio and transmission bandwidth. **(02 Marks)**

OR

4 a. With a neat block diagram, explain the generation of wideband FM signals. How the frequency stability is achieved. **(06 Marks)**

b. With the help of linear model of phase locked loop, obtain the output expression for demodulation of FM signals. **(07 Marks)**

c. An FM signal with a frequency deviation of 10KHz at a modulation frequency of 5KHz is applied to two frequency multipliers connected in cascade. The first multiplier doubles the frequency and the second multiplier triples it. Determine the frequency deviation and modulation index at the output. What is the frequency separation of adjacent side frequencies of this FM signal? **(03 Marks)**

Module-3

5 a. Define a random variable. Illustrate the relationship between sample space, random variable and probability. **(04 Marks)**

b. Define the autocorrelation and cross correlation functions. State the properties of auto correlation function. **(05 Marks)**

c. Explain the shot noise and thermal noise with the relevant expressions. **(07 Marks)**

OR

6 a. What is binary symmetric channel? Obtain a posteriori probabilities for the binary symmetric channel using transition probability diagram. **(06 Marks)**

b. Define mean, correlation and covariance function of a random process. compute the cross correlation for a pair of quadrature modulated stationary processes $x_1(t) = \cos 2\pi f_c t$ and $x_2(t) = \sin 2\pi f_c t$ **(05 Marks)**

c. What is white noise? Explain the power spectral density and autocorrelation function. **(05 Marks)**

Module-4

7 a. Explain the noise analysis of coherent detection of DSB – SC receiver. **(06 Marks)**

b. Explain the need of pre emphasis and de-emphasis in FM. Describe the transfer functions and circuit diagram of these filters. **(06 Marks)**

c. Compare the noise performance of AM and FM signals with reference to sinusoidal modulating signal and figure of merit. **(04 Marks)**

OR

8 a. Obtain the figure of merit of an AM receiver using envelope detector. **(08 Marks)**

b. With a neat block diagram, explain FMFB demodulator. **(04 Marks)**

c. Explain the following term with respect to FM i) Threshold effect ii) Capture effect. **(04 Marks)**

Module-5

9 a. State the sampling theorem. Obtain the expression for the spectrum of an ideally sampled signal and plot the spectrum for an arbitrary signal. **(06 Marks)**

b. What is multiplexing? What are the different types of multiplexing? Explain TDM with a neat block diagram. **(06 Marks)**

c. For a sinusoidal modulating signal, show that the signal to quantization noise ratio is 1.8 + 6R dB, where R is the number of bits per sample. **(04 Marks)**

OR

10 a. Define pulse amplitude modulation. Obtain the expression for the Fourier transform of PAM signal. **(07 Marks)**

b. What is quantization process? Explain the different types of Quantization with their input output characteristics. **(05 Marks)**

c. Represent the binary data: 10011101 in polar NRZ and bipolar RZ formatting. **(04 Marks)**

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CBCS Scheme

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15EC45

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Principles of Communication System

Time: 3 hrs. Max. Marks: 80

Note: *Answer FIVE full questions, choosing one full question from each module.*

Module-1

1 a. Explain in detail the working of switching modulator with suitable block diagram and necessary derivations. **(07 Marks)**

b. An audio frequency signal 5cos (2π 1000t) is used to amplitude modulate a carrier of 100 cos ($2\pi\ 10^6$t). If modulation index is 0.4, find i) Sideband frequencies ii) Amplitude of each sideband iii) Bandwidth required iv) Total power delivered to a load of 100Ω. **(04 Marks)**

c. Explain the generation of DSB – SC – modulated waves using ring modulator. **(05 Marks)**

OR

2 a. Give the comparison of various amplitude modulation techniques. **(05 Marks)**

b. With relevant block diagram, explain the working of FDM system. **(06 Marks)**

c. Consider a two stage product modulator with a band pass filter after each product modulator as shown in fig. Q2(c). The filter characteristics is such that its pass band is exactly the same as the upper sideband of the preceding product modulators output. The input signal consists of a voice signal occupying the frequency band of 0.3 to 3.4 KHz. The two oscillator frequencies have values f_1 = 100KHz and f_2 = 10MHz. Specify the following : **(05 Marks)**

i) Output of two product modulator, mentioning the frequency values.

ii) Output of two bandpass filters, mentioning the frequency values.

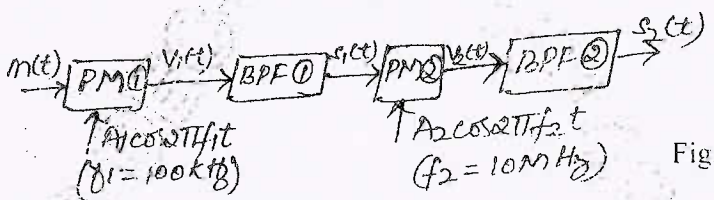

Fig.Q2(c)

Module-2

3 a. Explain the important properties of angle modulated waves. **(05 Marks)**

b. Explain the generation of wideband frequency modulated wave by direct method. **(07 Marks)**

c. A FM wave is represented by the following equation :
s(t) = 10 sin [5×10^8t + 4sin 1250t]. find i) Carrier frequency ii) Modulation index and frequency deviation iii) Power dissipated by this FM wave across a 5Ω resistor. **(04 Marks)**

OR

4 a. With the help of block diagram, explain the working of FM stereo multiplexing. **(06 Marks)**

b. Explain the non linear model of PLL, with relevant block diagram and derivations. **(05 Marks)**

c. Explain the working of super heterodyne receiver. **(05 Marks)**

Module-3

5 a. Explain the following terms and find the relation between them : (06 Marks)
i) Joint probability of events A & B ii) Conditional probability of events A & B.

b. Define Autocorrelation function. Explain its important properties. (06 Marks)

c. Describe Mean and Covariance function with respect to stationary random process. (04 Marks)

OR

6 a. Define Shot noise , White noise and Thermal noise. (06 Marks)

b. Define Noise equivalent bandwidth and derive the expression for the same. (06 Marks)

c. Suppose amplifier 1 has a noise figure of 9dB and power gain of 15dB. It is connected in cascade to the other amplifier 2 with noise figure of 20dB. Calculate the overall noise figure for this cascade connection in decibel units. (04 Marks)

Module-4

7 a. Discuss the noise in DSBSC receiver with a model receiver using coherent detection. Prove that the figure of merit for such a receiver is unity. (08 Marks)

b. An AM receiver operating with a sinusoidal wave and 80% modulation has an output signal to noise ratio of 30dB. Calculate the corresponding carrier to noise ratio. Prove the formula used. (08 Marks)

OR

8 a. Explain about the FM threshold effect and its reduction method. (06 Marks)

b. Why pre = emphasis and de – emphasis are required? Explain how they are implemented. (06 Marks)

c. An FM signal with $\Delta f = 75KHz$ is applied to and FM demodulator. When channel SNR is 15dB, fm is 10KHz. Find output SNR at demodulator. (04 Marks)

Module-5

9 a. What are the advantages of digital signals over analog signals? (04 Marks)

b. State and prove sampling theorem for band limited signals. (06 Marks)

c. Explain the working of TDM system with necessary block diagram. (06 Marks)

OR

10 a. Explain the generation and reconstruction of a PCM signal. (08 Marks)

b. What is Quantization noise? Derive the output signal to ratio of a uniform quantizer. (08 Marks)

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10ES42

Fourth Semester B.E. Degree Examination, June/July 2018
Microcontrollers

Time: 3 hrs. Max. Marks:100

Note: 1. *Answer FIVE full questions, selecting at least TWO questions from each part.*
2. *Standard notations are used.*
3. *Missing data may be suitably assumed.*

PART – A

1 a. What are the differences between microprocessor and microcontroller? **(04 Marks)**

b. Explain in brief Harvard and Von-Neumann CPU architecture. **(06 Marks)**

c. With neat block diagram, explain the architecture of 8051. **(10 Marks)**

2 a. Identify the addressing modes used in the following instruction:
(i) MOV A, @ R1 (ii) MOV A, #52h (iii) MOV A, 50h (iv) SJMP NEXT
(v) LJMP 1C00h. **(05 Marks)**

b. With an example write the classification of instructions in 8051. **(10 Marks)**

c. Explain the different types of Jump instruction in 8051. **(05 Marks)**

3 a. What are assembler directives? Explain any four assembler directives. **(08 Marks)**

b. Write a program to subtract two 16-bit numbers in assembly language. **(06 Marks)**

c. Find the delay produced by the following program, and assume that clock frequency is 11.0592 MHz.

```
Delay : MOV R2, #30
HERE : DJNZ R2, HERE
       NOP
       NOP
       RET
```

(06 Marks)

4 a. Describe with functional block diagram 'Port 0' and 'Port 1' of 8051. **(10 Marks)**

b. Write an 8051 C program to turn port line $P_{0.5}$ on and off 500 times, with a suitable delay. **(05 Marks)**

c. Explain the technique of debouncing a key using a circuit diagram. **(05 Marks)**

PART – B

5 a. With a neat diagram, describe the interrupt structure of 8051 and also explain the interrupt control register. **(12 Marks)**

b. Describe the mode 1 operation of Timer 0 with timer control logic diagram. **(08 Marks)**

6 a. Explain the function of each bit of SCON register in 8051. **(06 Marks)**

b. Write the sequence of actions to be performed for serial data transmission. **(06 Marks)**

c. Write the assembly language program to transfer letter C serially at 9600 baud rate continuously. Assume clock frequency of 11.0592 MHz. **(08 Marks)**

7 Write short notes on:
(i) Clock system of MSP 430 (ii) Real time clock.
(iii) 8255 PPI. (iv) Features of MSP430. **(20 Marks)**

8 a. Explain the bits of TCON register. Write an 8051 C program to toggle only bit P1.5 continuously every 50 msec. Use timer1 to generate the delay. Assume XTAL = 11.0592 MHz. **(10 Marks)**

b. Give the control word format of 8255. Write an ALP (Assembly program) to send data 55H and AAH to port B continuously. Assume base address for 8255 as 4500H. **(10 Marks)**

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10EC44

Fourth Semester B.E. Degree Examination, June/July 2018
Signals and Systems

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Explain the following continuous time signals with examples: (i) Even and Odd (ii) Periodic and Non periodic (iii) Energy and power. **(06 Marks)**

b. Test $y(t) = x(t)g(t)$ whether the system is,
(i) Linear (ii) Time variant (iii) Stable. **(06 Marks)**

c. Perform the following operation on the signal shown in Fig. Q1 (c).

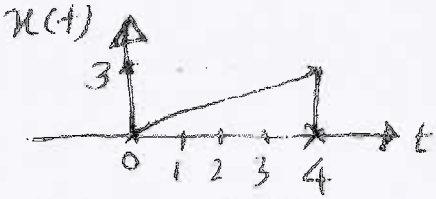

Fig. Q1 (c)

(i) $x(3t+2)$; (ii) $x(2(t+2))$; (iii) $x(-2t-1)$ (iv) $x(-2t+3)$ **(08 Marks)**

2 a. Prove the following properties of convolution sum:
(i) $x(n) * h(n) = h(n) * x(n)$.
(ii) $\{x(n) * h_1(n)\} * h_2(n) = x(n) * \{h_1(n) * h_2(n)\}$ **(06 Marks)**

b. Evaluate the following convolution integral: $y(t) = u(t+1) * u(t-2)$. **(06 Marks)**

c. Find the convolution of,
$x(n) = \{1 \underset{\uparrow}{2} 3 \ 4\}$ and $h(n) = \{5 \underset{\uparrow}{4} 3 \ 2 \ 1\}$ **(08 Marks)**

3 a. Determine LTI systems characterized by impulse response.
(i) $h(n) = \left(\frac{1}{2}\right)^n u(n)$
(ii) $h(t) = e^{-4t}$ are stable and causal. **(06 Marks)**

b. Find the natural response of the system,
$y(n) - \frac{1}{4}y(n-1) - \frac{1}{8}y(n-2) = x(n) + x(n-1)$
with $y(-1) = 0$ and $y(-2) = 1$. **(06 Marks)**

c. Sketch direct form I and direct form II implementations for,
(i) $y(n) + \frac{1}{2}y(n-1) - 2y(n-3) = 3x(n-1) + 2x(n-2)$
(ii) $\frac{d^2y(t)}{dt^2} + 5\frac{dy(t)}{dt} + 4y(t) = 2\frac{dx(t)}{dt}$. **(08 Marks)**

4 a. State and prove (i) Time-shift and (ii) Frequency shift properties of Fourier series. **(06 Marks)**

b. Determine the DTFS of the signal, $x(n) = \cos\left(\frac{\pi}{3}n\right)$ and draw the spectrum. **(06 Marks)**

c. Evaluate the FS representation for the signal, $x(t) = \sin(2\pi t) + \cos(3\pi t)$.
Sketch the magnitude and phase spectra. **(08 Marks)**

PART – B

5 a. State and prove the following properties of DTFT:(i)Frequency differentiation (ii)Linearity. **(06 Marks)**

b. Find the inverse Fourier transform of,

$$X(j\omega) = \frac{-j\omega}{(j\omega)^2 + 3j\omega + 2}.$$ **(06 Marks)**

c. Find the DTFT of the signals:

(i) $x(n) = 2^n u(-n)$ (ii) $x(n) = \left(\frac{1}{4}\right)^n u(n+4)$. **(08 Marks)**

6 a. The system produces the output of $y(t) = e^{-t}u(t)$ for an input of $x(t) = e^{-2t}u(t)$. Determine the frequency response and impulse response of the system. **(06 Marks)**

b. State and prove sampling theorem for low pass signal. **(08 Marks)**

c. Find the Nyquist rate and Nyquist interval for the following signals:

(i) $m(t) = \frac{1}{2\pi}\cos(4000\pi t)\cos(1000\pi t)$

(ii) $m(t) = \frac{\sin 500\pi t}{\pi t}$. **(06 Marks)**

7 a. Write any six properties of ROC's. **(06 Marks)**

b. Determine the z-transform of.

(i) $x(n) = -a^n u(-n-1)$.

(ii) $x(n) = a^n \cos(\Omega_0 n)u(n)$ **(06 Marks)**

c. Determine the inverse z-transform of the following:

(i) $x(z) = \frac{1}{1-az^{-1}}$, ROC : $|z| > |a|$

(ii) $x(z) = \frac{1}{1-az^{-1}}$, ROC : $|z| < |a|$ **(08 Marks)**

8 a. Find the unilateral z-transform of the following x(n):

(i) $x(n) = a^n u(n)$.

(ii) $x(n) = a^{n+1}u(n+1)$ **(06 Marks)**

b. Determine the system function and unit sample response of the system described by the difference equation, $y(n) - \frac{1}{2}y(n-1) = 2x(n)$, $y(-1) = 0$. **(06 Marks)**

c. Solve the difference equation.
$y(n) - 3y(n-1) - 4y(n-2) = 0$, $n \geq 0$
If $y(-1) = 5$ and $y(-2) = 0$. **(08 Marks)**

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10ES43

Fourth Semester B.E. Degree Examination, June/July 2018
Control Systems

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO full questions from each part.***

PART – A

1 a. Define control system. Explain linear and nonlinear control system. **(06 Marks)**

b. Derive transfer function for a lag-lead network, shown in Fig.Q.1(b). **(06 Marks)**

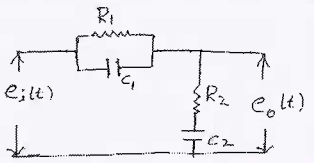


Fig.Q.1(b)

c. For the mechanical system shown in Fig.Q.1(c) i) Draw the mechanical network; ii) Write differential equations; iii) Draw force-to-voltage [F-V] analogous electric network.

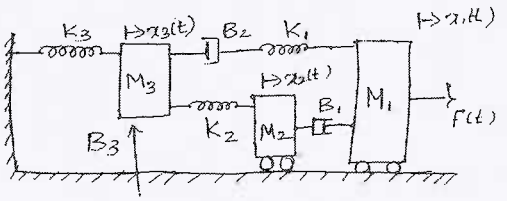


Fig.Q.1(c) **(08 Marks)**

2 a. Illustrate how to perform the following in connection with block diagram reduction techniques:

i) Moving a summing point before the block.

ii) Removing minor feedback loop.

iii) Shifting take off point after summing point. **(06 Marks)**

b. Obtain $\frac{C_1(S)}{R_2(S)}$ and $\frac{C_2(S)}{R_1(S)}$ for the given multiple input and multiple output system shown in Fig.Q.2(b). **(06 Marks)**

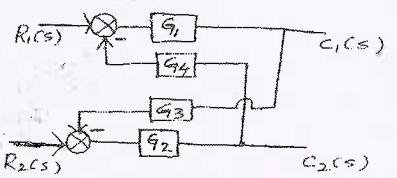


Fig.Q.2(b)

c. Draw the signal flow graph and determine the overall transfer function of the block diagram shown in Fig.Q.2(c) using Mason's gain formula. **(08 Marks)**

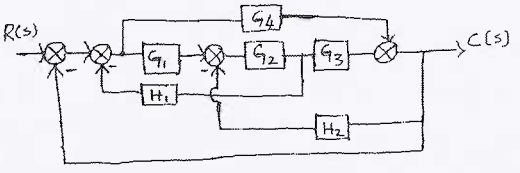


Fig.Q.2(c)

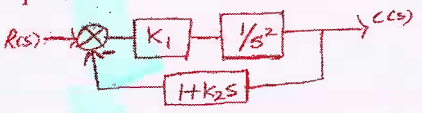
3 a. State various standard test signals commonly used in control system. Sketch their typical plots and obtain their Laplace transform. **(06 Marks)**

b. A unity feedback system has $G(S) = \frac{10(S+2)(S+3)}{S(S+1)(S+5)(S+4)}$. Determine:

i) Type of the system
ii) All error coefficients and
iii) Steady state error where input is $r(t) = 3 + t + t^2$. **(06 Marks)**

c. For control system shown in Fig.Q.3(c) find the values of K_1 and K_2 so that $M_P = 25\%$ and $T_P = 4$ sec. Assume unit step input. **(08 Marks)**

Fig.Q.3(c)



4 a. Define the following terms related to a control system:
i) Stable system ii) Marginally stable system iii) Relatively more stable system. **(06 Marks)**

b. For unity feedback system, $G(S) = \frac{K}{S(1+0.4S)(1+0.25S)}$, find range of values of K, marginal value of K and frequency of sustained oscillations. **(06 Marks)**

c. Using RH criterion determine the stability of the system having the characteristic equation $S^6 + 2S^5 + 5S^4 + 8S^3 + 8S^2 + 8S + 4 = 0$. Examine the stability. **(08 Marks)**

PART – B

5 a. Find valid break away points and inter section of root locus with imaginary axis for $G(S)H(S) = \frac{K(S+1)}{S(S+1)(S^2+5S+20)}$. **(08 Marks)**

b. Sketch the rough nature of the root locus of a certain control system whose characteristic equation is given as $S^3 + 9S^2 + KS + K = 0$. Comment on stability. **(12 Marks)**

6 a. Explain the correlation between time domain and frequency domain systems. **(06 Marks)**

b. For a unity feedback system $G(S) = \frac{242(S+5)}{S(S+1)(S^2+5S+121)}$. Sketch the bode plot, find W_{gc}, W_{pc}, GM and PM. Comment on stability. **(14 Marks)**

7 a. Draw a polar plot for a –VC feedback control system having an open loop transfer function. $G(S)H(S) = \frac{100}{(S+2)(S+4)(S+8)}$. **(06 Marks)**

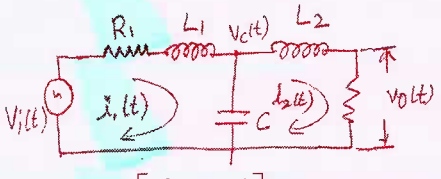
b. List the advantages of Nyquist plot. **(04 Marks)**

c. Investigate the stability of a negative feedback control system whose open loop transfer function is given by $G(S)H(S) = \frac{100}{(S+1)(S+2)(S+3)}$, using Nyquist stability criterion. **(10 Marks)**

8 a. Define state variables. List the properties of state transition matrix. **(06 Marks)**

b. Obtain the state and output equation for the electrical network shown in Fig.Q.8(b). **(06 Marks)**

Fig.Q.8(b)



c. Find the state transition matrix for $A = \begin{bmatrix} 0 & -1 \\ +2 & -3 \end{bmatrix}$. **(08 Marks)**

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10EC45

Fourth Semester B.E. Degree Examination, June/July 2018
Fundamentals of HDL

Time: 3 hrs. Max. Marks:100

Note: *Answer FIVE full questions, selecting at least TWO full questions from each part.*

PART – A

1 a. Explain VHDL and verilog ports. **(07 Marks)**

b. Discuss scalar data types in aVHDL. **(08 Marks)**

c. Compare VHDL and verilog. **(05 Marks)**

2 a. List five major differences between signal assignment and variable assignment statements. **(05 Marks)**

b. Draw the logic symbol and excitation table of a D-latch. Derive the next state equation and draw the logic diagram. Write verilog code in dataflow description. **(10 Marks)**

c. Explain, with example, how to assign delay time to signal assignment statements in VHDL and verilog. **(05 Marks)**

3 a. Explain process statement in VHDL and always statement in verilog. **(08 Marks)**

b. Write behavioral verilog code for a 8:3 priority encoder. **(06 Marks)**

c. Multiply +7 and -5 using Booth's algorithm. **(06 Marks)**

4 a. Explain with example, i) Binding between library and component in VHDL and ii) Binding between two modules in verilog. **(10 Marks)**

b. Write VHDL structural description of a N-bit magnitude comparator using generate statement (Assume all component descriptions available in work library). **(10 Marks)**

PART – B

5 a. Explain procedures in VHDL and tasks in verilog. **(06 Marks)**

b. Write verilog code to convert an unsigned integer to binary using task. **(06 Marks)**

c. Write VHDL description using function to compute the factorial of a positive integer. **(08 Marks)**

6 a. Describe packages in VHDL with example. **(06 Marks)**

b. Draw the block diagram and write verilog description for a 16 × 8 SRAM. **(10 Marks)**

c. List various built-in procedures and built-in tasks for file-handling. **(04 Marks)**

7 a. Develop a block diagram of a 9-bit adder using three 3-bit carry look-ahead adder slices. Describe 3-bit look-ahead adder slice using VHDL and invoke this in verilog module. **(10 Marks)**

b. Show through an example of 8:3 priority encoder how to instantiate CASEX in VHDL. **(10 Marks)**

8 a. What is synthesis? Discuss important facts associated with synthesis. **(08 Marks)**

b. Generate the gate-level synthesis for a signal assignment statement y = 2 * x + 3 and write its structural code in verilog. **(12 Marks)**

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