CBCS SCHEME

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18EE51

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
Management and Entrepreneurship

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Define Management. What is meant by "Management Process"? **(05 Marks)**

b. Distinguish between management and administration. Comment on the nature of management. Is it science or an act? **(05 Marks)**

c. What are the roles of a Manager? Explain. **(10 Marks)**

OR

2 a. What is planning? What are the steps involved in it? Explain the importance of planning. **(06 Marks)**

b. Define vision, mission and values. What is the purpose of each? **(04 Marks)**

c. What are limitations of planning? Give any five differences between strategies planning and tactical planning **(10 Marks)**

Module-2

3 a. Differentiate between recruitment and selection. Describe the steps involved in the selection process. **(10 Marks)**

b. What is meant by departmentalization? List and explain different bases for departmentalization. **(06 Marks)**

c. What are the importance steps in the process of organizing? **(04 Marks)**

OR

4 a. Give any four differences between a leader and a manager. **(04 Marks)**

b. What are the important characteristics of leadership? **(06 Marks)**

c. Explain Maslow's need hierarchy theory. How does it compare with two factor theory? **(10 Marks)**

Module-3

5 a. Define Entrepreneurship. Explain the entrepreneurial development process. **(10 Marks)**

b. List and explain three entrepreneurial development models. **(10 Marks)**

OR

6 a. What is social audit? What are its benefits and limitations? **(05 Marks)**

b. Write short notes on: (i) Business ethics (ii) Corporate governance. **(05 Marks)**

c. Discuss the social responsibilities of business towards different groups. **(10 Marks)**

Module-4

7 a. Define SSI. What are the characteristics of SSI? **(06 Marks)**

b. Define the following:
(i) Tiny unit (ii) Ancillary unit (iii) Export oriented Unit
(iv) Small Scale Service and Business Enterprises (SSSBEs) **(04 Marks)**

c. Explain the Exogeneous and Endogeneous factors causing sickness in SSI. **(10 Marks)**

OR

8 a. List and explain all the services provided by SIDO. **(10 Marks)**
b. Write short notes on: (i) SFCs (ii) SSIDCs **(10 Marks)**

Module-5

9 a. What is project feasibility analysis? List and explain types of project feasibility analysis. **(10 Marks)**
b. What is the significance of a project report? List and explain the contents of a project report. **(10 Marks)**

OR

10 a. Discuss the concept and importance of network analysis. **(06 Marks)**
b. What are the steps involved in PERT? List its advantages and limitations. **(08 Marks)**
c. What is CPM? Explain. **(06 Marks)**

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18EE52

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
Microcontroller

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Draw and explain the architecture of 8051 microcontroller. **(08 Marks)**

b. Compare the microprocessor and microcontroller. **(06 Marks)**

c. Explain with the help of diagram, how to interface external code memory to 8051 microcontroller. **(06 Marks)**

OR

2 a. Describe the functions of various pins of 8051 microcontroller with pin diagram. **(08 Marks)**

b. Explain the various addressing modes of 8051 microcontroller examples. **(08 Marks)**

c. List and explain the criteria for choosing a microcontroller. **(04 Marks)**

Module-2

3 a. Define assembler directives. Explain the assembler directives of 8051 micronctroller with examples. **(08 Marks)**

b. Write a program to load the accumulator with the value 55H and complement the ACC 700 times. **(06 Marks)**

c. Write a program to count positive and negative numbers in a given array. **(06 Marks)**

OR

4 a. Explain the operation performed by the following instructions with examples.
i) DJNZ R1, rel ii) DA A iii) MOVX A, @ DPTR iv) SWAP A. **(08 Marks)**

b. Write a program to find factorial of a number. **(06 Marks)**

c. Write an assembly language program to toggle the bits of port P1. **(06 Marks)**

Module-3

5 a. Write 8051 program to generate square wave with t_{ON} = 3ms and t_{OFF} = 10ms an all pins of port 0. **(08 Marks)**

b. Explain the bit structure of TMOD register. **(06 Marks)**

c. Write an 8051 C program to convert FD hex to decimal and display the digits on P0, P1 and P2. **(06 Marks)**

OR

6 a. Explain Mode – 2 programming of 8051 timer. Describe the different steps to program in Mod 2. **(08 Marks)**

b. Write a 8051 C program to bring in a byte of data serially one bit at a time Via P2.0. The LSB should come in first. **(06 Marks)**

c. Write a 8051 C program to toggle all the bites of port P2 continuously with some delay in between. Use Timer 0, 16 bit mode to generate the delay. **(06 Marks)**

Module-4

7 a. Compare Interrupt and Polling. Explain the steps in executing an interrupt. **(08 Marks)**
  b. Write an 8051 C program to transfer the message "YES" serially at 9600 baud, 8 bit data, 1 stop bit. Do this continuously. **(06 Marks)**
  c. Explain the importance of TI and RI flags. **(06 Marks)**

OR

8 a. Explain the bit constants of SCON and PCON registers. **(08 Marks)**
  b. Explain the various handshaking signals of RS232 communication standard. **(06 Marks)**
  c. Write a 8051 C program using interrupts to generate 10000 Hz frequency on P2.1 using To 8 bit auto reload and also use Timer 1 as event counter to count up 1Hz pulse and display on P0. Pulse is connected to Ex1. Assume XTAL = 11.0592MHz. Baud rate = 9600. **(06 Marks)**

Module-5

9 a. Interface LCD to 8051 microcontroller and write an 8051 assembly/8051 C program to send VTU to LCD display using busy flag. **(08 Marks)**
  b. Write an ALP to rotate stepper motor continuously. **(06 Marks)**
  c. Explain the block diagram of 8255 chip. **(06 Marks)**

OR

10 a. Explain the H-Bridge configuration of DC motor and also show interfacing of 8051 microcontroller with DC motor through opto isolator. **(08 Marks)**
  b. Show interfacing between 8051 microcontroller and keyboard and explain scanning and indentifying the key pressed. **(06 Marks)**
  c. Explain the 8051 microcontroller interfacing to ADC. **(06 Marks)**

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18EE53

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
Power Electronics

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. With neat circuit diagram, input and output waveforms, explain the different types of power electronic converters. **(10 Marks)**

b. With block diagram, explain the peripheral effects of power electronics equipments. **(06 Marks)**

c. List the major applications of power electronics. **(04 Marks)**

OR

2 a. Explain the reverse recovery characteristics of power diode, with neat waveform. And also obtain an expression for peak reverse current. **(08 Marks)**

b. A single-phase full bridge diode rectifier is supplied from 230V, 50Hz source. The load consists of R = 10Ω and a large inductance so as to render the load current constant. Determine:

i) Average values of output voltage and output current.
ii) Average and rms values of diode currents
iii) rms values of output and input currents and pf. **(06 Marks)**

c. Explain the operation of single phase full wave rectifier with RL load. Derive the expression for RMS o/p current for continuous load current. **(06 Marks)**

Module-2

3 a. Explain the switching characteristics of BJT. **(10 Marks)**

b. A power transistor has its switching waveforms as shown in Fig.Q.3(b). If the average power loss in the transistor is limited to 300W, find the switching frequency at which this transistor can be operated. **(06 Marks)**

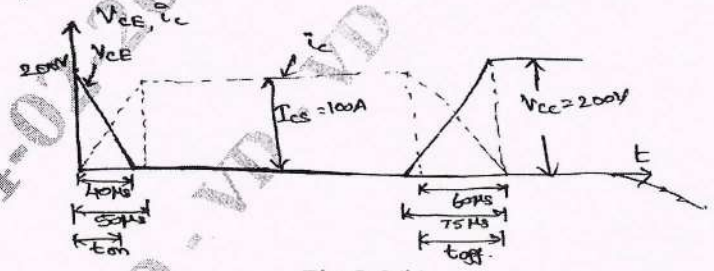

Fig.Q.3(b)

c. List the applications of BJT, MOSFET and IGBT. **(04 Marks)**

OR

4 a. With necessary waveforms explain switching characteristics of IGBT. **(05 Marks)**

b. Sketch the structure of n-channel enhancement type MOSFET and explain its working principle. **(10 Marks)**

c. With neat circuit diagram, explain pulse transformer and optscoupler. **(05 Marks)**

Module-3

5 a. Derive an expression for the anode current of thyristor with the help of two transistor analogy. **(05 Marks)**

b. With the help of neat sketch, explain the static V-I characteristics of an SCR. Define latching and holding current. **(10 Marks)**

c. For an SCR, gate-cathode characteristic is given by $V_g = 1 + 10Ig$. Gate source voltage is a rectangular pulse of 15V with 20μ sec duration. For an average gate power dissipation of 0.3W and a peak gate drive power of 5W, compute:

i) The resistance to be connected in series with the SCR gate.

ii) The triggering frequency

iii) The duty cycle of the triggering pulse. **(05 Marks)**

OR

6 a. Explain different methods of turning on of SCR. **(08 Marks)**

b. Explain the working of UJT triggering technique of SCR with neat waveform. **(06 Marks)**

c. For the circuit shown in Fig.Q.6(c) calculate:

i) The maximum values of di/dt and dv/dt for the SCR

ii) Find the rms and average current ratings of the SCR for firing angle delay of 90° and 150°.

iii) Suggest a suitable voltage rating of the SCR. **(06 Marks)**

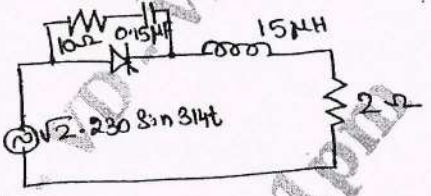

Fig.Q.6(c)

Module-4

7 a. A single phase half wave SCR circuit of RL load, draw waveforms for source voltage, load voltage, load current and voltage across the SCR for a given firing angle α. Hence obtain expressions for average and rms load voltages in terms of source voltage and firing angle. **(08 Marks)**

b. A single phase full converter is supplied from 230V, 50Hz source. The load consists of R = 10Ω, a large inductance so as to render the load current constant. For a firing angle delay of 30°, determine.

i) Average output voltage

ii) Average output current

iii) Average and rms values of SCR currents

iv) The power factor. **(06 Marks)**

c. With neat circuit diagram and waveforms explain dual converters. **(06 Marks)**

OR

8 a. With necessary waveforms, explain the operation of single phase AC voltage controller with RL load. Derive an expression for rms output voltage. **(08 Marks)**

b. A single phase voltage controller is employed for controlling the power flow from 230V, 50Hz source into a load circuit consisting of R = 3Ω, WL = 4Ω. Calculate:

i) The control range of firing angle

ii) Max value of rms load current

iii) Max values of average and rms SCR currents

iv) Max power and power factor

v) Max possible value of di/dt that may occur in SCR

vi) The conduction angle for α = 0° and α = 120° assuming a gate pulse of duration π radian. **(06 Marks)**

c. Briefly explain the application of AC voltage controller. **(06 Marks)**

Module-5

9 a. Classify the different types of choppers with the help of circuit and quadrant diagram. Explain the operation of two quadrant chopper. **(08 Marks)**

b. Derive an expression for average output voltage with a neat circuit and waveform of step up chopper. **(08 Marks)**

c. A step-up chopper has input voltage of 220V and output voltage of 660V. If the non-conducting time of thyristor-chopper is 100μs, compute the pulse width of output voltage. Incase pulse width is halved for constant frequency operation, find the new output voltage. **(04 Marks)**

OR

10 a. With circuit diagram, explain the operation of single phase full bridge inverter. **(10 Marks)**

b. With neat circuit diagram and waveforms explain the operations of transistorized current source inverter. **(10 Marks)**

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CBCS SCHEME

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Fifth Semester B.E. Degree Examination, Jan./Feb. 2021

Signals and Systems

Time: 3 hrs. Max. Marks: 100

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

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

Module-1

1 a. Determine whether the following signals are energy or power signals or neither. Justify your answer.

i) $x(t) = e^{j(t+\pi/2)}$ ii) $x(t) = 8\cos(4t)\cdot\cos(6t)$. **(10 Marks)**

b. Sketch the following signals :

i) $x_1(t) = -u(t+3) + 2u(t+1) - 2u(t-1) + u(t-3)$.

ii) $x_2(t) = r(t) - r(t-1) - r(t-3) + r(t-4)$. **(10 Marks)**

OR

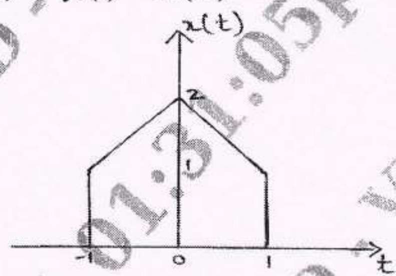
2 a. Determine whether the system $y(t) = e^{x(t)}$ is i) Causal ii) Time Invariant iii) Linear iv) Stability v) Memoryless. Justify your answer. **(10 Marks)**

b. For the signal shown in Fig. Q2(b), sketch and label each of the following signals :

i) $y_1(t) = x(t-2)$ ii) $y_2(t) = x(2t-2)$ iii) $y_3(t) = x(\frac{1}{2}t + 2)$

iv) $y_4(t) = x(-2t-1)$ v) $y_5(t) = 3x(2t)$. **(10 Marks)**

Fig. Q2(b)



Module-2

3 a. Evaluate the convolution integral for a system with input x(t) and impulse response h(t). Given $x(t) = u(t-1) - u(t-3)$; $h(t) = u(t) - u(t-2)$. Also sketch y(t). **(10 Marks)**

b. Represent the direct form I and form II realization for the system described by

i) $y[n] + \frac{1}{4}y[n-1] + \frac{1}{8}y[n-2] = x[n] + x[n-1]$.

ii) $\frac{d^2}{dt^2}y(t) + 5\frac{d}{dt}y(t) + 4y(t) = x(t) + 3\frac{d}{dt}x(t)$. **(10 Marks)**

OR

4 a. Determine the complete response of the system describe by the differential equation.

$\frac{d^2}{dt^2}y(t) + 5\frac{d}{dt}y(t) + 4y(t) = \frac{d}{dt}x(t)$ with $y(0) = 0$; $\frac{d}{dt}y(t)\Big|_{t=0} = 1$;

For input $x(t) = e^{-2t}u(t)$. **(10 Marks)**

b. Investigate the causality , stability and memory of the LTI system described by the impulse response i) $h(t) = e^{-2|t|}$ ii) $h[n] = 2^n u[n-1]$. **(10 Marks)**

Module-3

5 a. Prove the following properties related to continuous – time Fourier transform :
i) Convolution ii) Parseval's theorem. **(10 Marks)**

b. Determine the Fourier Transform of the following signals :
i) $x(t) = e^{at}\, u(-t)$ ii) $x(t) = e^{-a|t|}$ iii) $x(t) = e^{-a|t|}\, \text{sgn}(t)$. **(10 Marks)**

OR

6 a. Determine the Inverse Fourier Transform of the following :
i) $X(jw) = \dfrac{2jw+1}{(jw+2)^2}$ ii) $X(jw) = \dfrac{1}{(a+jw)^2}$. **(10 Marks)**

b. Determine the Fourier transform of the signal $x(t) = e^{-3|t|}\sin(2t)$ using appropriate properties. **(10 Marks)**

Module-4

7 a. Determine the Inverse DTFT of the following :
i) $X(e^{j\Omega}) = 1 + 2\cos\Omega + 3\cos 2\Omega$ ii) $Y(e^{j\Omega}) = j\,(3 + 4\cos\Omega + 2\cos 2\Omega)\sin\Omega$. **(10 Marks)**

b. Using appropriate properties, determine the DTFT of
i) $x[n] = \left(\frac{1}{2}\right)^n u[n-2]$ ii) $x[n] = \sin\left(\frac{\pi}{4}n\right)\left(\frac{1}{4}\right)^n u[n-1]$. **(10 Marks)**

OR

8 a. Prove the following properties related to DTFT :
i) Frequency differentiation ii) Modulation. **(10 Marks)**

b. Compute the DTFT of the following signals :
i) $x[n] = 2^n\, u[-n]$ ii) $x[n] = a^{|n|}$; $|a| < 1$. **(10 Marks)**

Module-5

9 a. Determine the Inverse Z – transform if

$$X(z) = \frac{(z^3 - 4z^2 + 5z)}{(z-1)(z-2)(z-3)},$$

with ROCs i) $2 < |z| < 3$ ii) $|z| > 3$ iii) $|z| < 1$. **(10 Marks)**

b. Use Unilateral Z – transform to determine the forced response, natural response and complete response of system described by $y[n] - \frac{1}{2}y[n-1] = 2x[n]$

with input $x[n] = 2\left(\frac{-1}{2}\right)^n u[n]$. The initial conditions are $y[-1] = 3$. **(10 Marks)**

OR

10 a. Explain the properties of ROC. **(08 Marks)**

b. A LTI discrete – time system is given by system function

$H(z) = \dfrac{3-4z^{-1}}{1-3.5z^{-1}+1.5z^{-2}}$. Specify ROC of H(z).

Determine h[n] for the following conditions : i) Stable ii) Causal. **(12 Marks)**

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18EE55

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
Electrical Machine Design

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Assume any missing data.

Module-1

1 a. Describe the modern trends in electrical machine manufacturing industries. **(10 Marks)**
b. What are the fundamental requirements of high conducting materials? **(07 Marks)**
c. What are the classification high resistivity materials according to their purpose? **(03 Marks)**

OR

2 a. Explain the classification of magnetic material related to the value of permeability and distinguish between soft and hard magnetic materials. **(06 Marks)**
b. Describe the classification of insulating materials based on their thermal consideration. **(08 Marks)**
c. List out the desirable properties of magnetic materials. **(06 Marks)**

Module-2

3 a. Explain the specific loadings of D.C. machine and what are advantages and disadvantages of higher values of specific loadings (Base & q). **(08 Marks)**
b. Determine the external diameter and gross core length of armature for a 7.5kW, 220V, 1000rpm shunt motor. Select he number of poles considering the frequency of flux reversal ≯ 50Hz. Assume average gap density as 0.63wb/m^2, ampere conductors per metre as 30000, ratio of pole arc to pole pitch is 0.7 and the friction windage and iron loss to be 600watts. Check the design for following constraints peripheral speed < 15m/s, armature mmf per pole < 2500. Considering the maximum gap density, $B_q = B_{avg}/0.75$ and mmf required for air gap is 60% of armature mmf and gap contraction factor is 1.15 calculate air gap length. **(12 Marks)**

OR

4 a. Explain the factors to be consider for selecting the number of poles of D.C. machines and write any three advantages of higher values of number of poles of D.C. machine. **(08 Marks)**
b. Design a 4 pole, 10kW, 220V, 1000rpm, d.c. shunt motor, giving following details:
i) The diameter and length of armature
ii) Number of armature conductors
iii) Number of slots
iv) Size of conductor
Assume following design data:
Specific magnetic loading = 0.45T, specific electric loading = 17500 amp cond/m, ratio of pole arc to pole pitch = 0.68, slot pitch = 2.2cm, constant losses = 8% of output, armature voltage drop = 10% of terminal voltage armature is wave wound. **(12 Marks)**

Module-3

5 a. Derive the following design equations for a 3-phase transformer, relating the output to the specific loading and main dimensions, i) EMF per turn ii) Output equation. **(08 Marks)**

b. Design the magnetic frame of 3-phase 250kVA, 6600/400 volts, 50Hz, core type distribution transformer with respect to the following: i) Core section ii) Diameter of circumscribing circle iii) Window area iv) Dimensions of window v) Yoke section and flux density in yoke vi) Yoke dimensions.
Assume; cruciform core section with $A = 0.56d^2$ and $a = 0.85d$, the constant K, in emf per turn is 0.45, maximum flux density in core is 1.2 wb/m^2 and current density is 2.2A/mm^2, the window space factor = 0.3, the ratio of window height to width = 3, yoke section is 10% higher than core section. **(12 Marks)**

OR

6 a. Explain the design of tank with cooling tubes for the transformer, giving the equation to calculate number of tubes to limit temperature rise. **(10 Marks)**

b. Calculate the active and reactive component of no-load current of a 15000kVA, 33.3/6.6kV, 3-phase, star-delta, core type transformer having following data:
net iron area of each limb = 0.15m^2 net iron area of yoke = 0.18m^2, Mean length of each limb = 2.3m, mean length of each yoke = 1.6m, number of turns in h.v. winding = 450. Take maximum flux density same for both limb and yoke, as = 1.2wb/m^2. At this flux density, ampere-turns per meter of the material is 420 AT and specific iron loss is = 1.9w/kg, density = 7.8×10^3kg/m^3 Neglect mmf for joints. **(10 Marks)**

Module-4

7 a. Discuss the factors that affect the
i) Choice of average flux density in air gap
ii) Choice of ampere conductors per meter in the design of 3-phase Induction Motor. **(08 Marks)**

b. Determine the main dimensions, turns per phase number of slots, conductor cross section and slot area of a 250h.p, 3-phase, 50Hz, 400V 1410rpm, slip-ring induction motor. Assume B_{av} = 0.5 wb/m^2, ac = 30000A/m, efficiency = 0.9 and p.f = 0.9, winding factor = 0.955, current density = 3.5A/mm^2, slot space factor is 0.4 and ratio core length to pole pitch = 1.2 take 5 slots per pole per phase motor is delta connected. **(12 Marks)**

OR

8 a. Explain the step-by-step procedure of wound rotor design. **(08 Marks)**

b. During the stator design of a 3-phase, 50Hz, 30kW, 400V, 6 pole, squirrel cage induction motor, the following informations were obtained gross length = 0.17m, internal diameter = 0.33m, number of slots = 45, number of conductors per slot = 12, stator winding is star connected based on above, design a cage rotor giving i) diameter of rotor ii) number of rotor slots iii) rotor bar current iv) size of rotor bar v) end-ring current and section of end ring. Assume: p.f. = 0.86, efficiency = 0.88, k_w = 0.955 current density in bar = 6A/mm^2; current density in end ring = 6.5A/mm^2, take length of air gap = 0.67mm. **(12 Marks)**

Module-5

9 a. Derive the output equation of synchronous machine, that relates output to main dimensions. **(08 Marks)**

b. Determine the main dimensions, number of stator slots, conductors per slot, and conductor area of a 75000kVA, 13.8kV, 50Hz, 187.5rpm, 3-phase, star connected synchronous alternator peripheral speed should be about 60m/sec. Assume average flux density = 0.65wb/m^2, ampere conductors per meter = 40,000 and current density = 6A/mm^2, $k_w = 0.955$, number of slots per pole per phase = 2.5. **(12 Marks)**

OR

10 a. Define Short Circuit Ratio (SCR) and its effect on machine performance. **(10 Marks)**

b. A 3000rpm, 50Hz, 3-phase, turbo alternator has a core length of 0.94m, the average gap density = 0.45wb/m^2, and ampere conductors per meter = 25000. The peripheral speed of rotor is 100m/s, and length of air gap is 20mm. Find kVA output of the machine when

i) Winding factor $k_w = 0.955$

ii) Winding factor $k_w = 0.827$

What is the relation between winding factor and kVA output. **(10 Marks)**

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18EE56

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
High Voltage Engineering

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Assume missing data suitably.

Module-1

1 a. Mention the desired properties of gaseous dielectric for HV applications. Give any three examples of gaseous dielectric. **(06 Marks)**

b. Derive an expression for the current in the air gap, that is $I = I_0 e^{\alpha d}$, considering Townsend's first ionization coefficient. **(08 Marks)**

c. In an experiment in a certain gas, it was found that the steady state current is 5.5×10^{-8} A at 8 kV at a distance of 0.4 cm between the plane electrodes. Keeping the field constant and reducing the distance to 0.1 cm results in a current of 5.5×10^{-9} A. Calculate Townsend's primary ionization coefficient α. **(06 Marks)**

OR

2 a. State and explain Paschen's law. **(06 Marks)**

b. Explain the following breakdown mechanism in solid:
(i) Streamer breakdown (ii) Electro mechanical breakdown. **(14 Marks)**

Module-2

3 a. Explain the need for generation of very high voltages in the laboratory. **(06 Marks)**

b. Explain with a neat sketch, how cascade transformers generates high ac voltages (show 3 stages). **(08 Marks)**

c. Explain the principle of operation of a resonant transformer. **(06 Marks)**

OR

4 a. With a neat sketch, explain the Marx circuit arrangement for multistage impulse generator. **(08 Marks)**

b. What is a Tesla coil? How are damped high frequency oscillations can be obtained using the Tesla coil? **(06 Marks)**

c. A cock craft Walton type voltage multiplier has eight stages with capacitances, all equal to 0.05 μF. The supply transformer secondary voltage is 125 kV at a frequency of 150 Hz. If the load current to be supplied is 5 mA, find (i) Percentage ripple (ii) The regulation. **(06 Marks)**

Module-3

5 a. Explain the principle of operation of an electrostatic voltmeter for measurement of very high dc and ac voltages. **(10 Marks)**

b. With a schematic diagram, explain the principle of operation of a generating voltmeter. What are its advantages and limitations? **(10 Marks)**

OR

6 a. Explain how Chubb and Fortescne circuit can be used to measure the peak value of ac voltages. **(08 Marks)**

b. Explain the factors influencing the sparkover voltages of sphere gaps. **(06 Marks)**

c. With a neat sketch, explain the working of Rogowski coil for high impulse current measurement. **(06 Marks)**

Module-4

7 a. Explain different theories of charge formation in clouds. **(10 Marks)**

b. What is a surge arrestor? Explain its function as a shunt protective device, with a neat sketch. **(10 Marks)**

OR

8 a. Explain the following :

(i) Rod gaps used as protective devices.

(ii) Ground wires for protection of overhead lines. **(10 Marks)**

b. Explain with suitable figures the principle and functioning of,

(i) Expulsion gaps

(ii) Protector tubes. **(10 Marks)**

Module-5

9 a. Explain the method of measuring capacitance and tan delta using Schering bridge. **(10 Marks)**

b. Discuss the method of discharge detection using straight detector method. **(10 Marks)**

OR

10 a. What are the various tests done on transformers? Explain in detail impulse testing of transformer. **(10 Marks)**

b. Explain in detail the testing of, (i) Circuit breaker and (ii) Insulators. **(10 Marks)**

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CBCS SCHEME

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15EE51

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
Management and Entrepreneurship

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Distinguish between Management and Administration. **(08 Marks)**
b. Explain steps involved in planning. **(08 Marks)**

OR

2 a. Explain functions of management. **(08 Marks)**
b. Explain management as profession. **(04 Marks)**
c. Explain briefly about types of decisions. **(04 Marks)**

Module-2

3 a. Distinguish between centralization and decentralization. **(08 Marks)**
b. Explain steps in controlling. **(08 Marks)**

OR

4 a. Explain process of selection and recruitment. **(08 Marks)**
b. Explain briefly following:
(i) Committee (ii) Span of control (iii) Communication **(08 Marks)**

Module-3

5 a. Define the following:
(i) Social responsibility (ii) Business ethics
(iii) Entrepreneur (iv) Intrapreneur **(08 Marks)**
b. Explain problems faced by entrepreneur. **(08 Marks)**

OR

6 a. Explain social responsibility of business towards different group. **(08 Marks)**
b. Explain entrepreneurship in India along with examples of development. **(08 Marks)**

Module-4

7 a. Define following: (i) Ancillary industry (ii) Tiny industry **(04 Marks)**
b. Explain policies and schemes of state level institutes. **(06 Marks)**
c. Explain impact of Globalization on SSI. **(06 Marks)**

OR

8 a. Explain the role of Small Scale Industries. **(06 Marks)**
b. Explain policies and schemes of (states or central) level institutes. **(08 Marks)**
c. Explain sickness to SSI industry. **(02 Marks)**

Module-5

9 a. Explain for project: (i) Market analysis (ii) Technical analysis **(08 Marks)**
b. Explain about PERT method. **(08 Marks)**

OR

10 a. Explain in detail the contents of project report. **(08 Marks)**
b. Explain CPM method for project management. **(08 Marks)**

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CBCS SCHEME

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15EE51

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
Management and Entrepreneurship

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Distinguish between Management and Administration. **(08 Marks)**
b. Explain steps involved in planning. **(08 Marks)**

OR

2 a. Explain functions of management. **(08 Marks)**
b. Explain management as profession. **(04 Marks)**
c. Explain briefly about types of decisions. **(04 Marks)**

Module-2

3 a. Distinguish between centralization and decentralization. **(08 Marks)**
b. Explain steps in controlling. **(08 Marks)**

OR

4 a. Explain process of selection and recruitment. **(08 Marks)**
b. Explain briefly following:
(i) Committee (ii) Span of control (iii) Communication **(08 Marks)**

Module-3

5 a. Define the following:
(i) Social responsibility (ii) Business ethics
(iii) Entrepreneur (iv) Intrapreneur **(08 Marks)**
b. Explain problems faced by entrepreneur. **(08 Marks)**

OR

6 a. Explain social responsibility of business towards different group. **(08 Marks)**
b. Explain entrepreneurship in India along with examples of development. **(08 Marks)**

Module-4

7 a. Define following: (i) Ancillary industry (ii) Tiny industry **(04 Marks)**
b. Explain policies and schemes of state level institutes. **(06 Marks)**
c. Explain impact of Globalization on SSI. **(06 Marks)**

OR

8 a. Explain the role of Small Scale Industries. **(06 Marks)**
b. Explain policies and schemes of (states or central) level institutes. **(08 Marks)**
c. Explain sickness to SSI industry. **(02 Marks)**

Module-5

9 a. Explain for project: (i) Market analysis (ii) Technical analysis **(08 Marks)**
b. Explain about PERT method. **(08 Marks)**

OR

10 a. Explain in detail the contents of project report. **(08 Marks)**
b. Explain CPM method for project management. **(08 Marks)**

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15EE54

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
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. Define even and odd signals. Find the even and odd components of the signal : $x(n) = u(n) - 2u(n-5) + u(n-10)$. **(06 Marks)**

b. Determine where the signal in Fig.Q1(b) is an Energy or a power single and hence determine the corresponding value of power or energy of the signal.

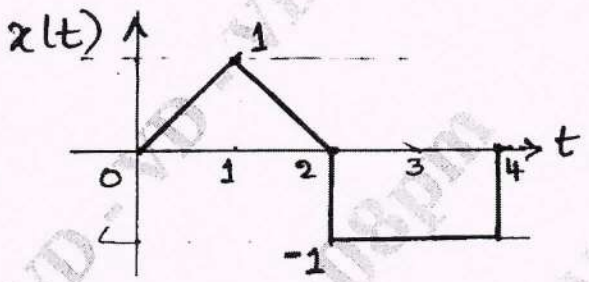

Fig.Q1(b) **(06 Marks)**

c. A discrete time system is represented as : $y(n) = \log[x(n)]$. Identify whether the system is linear, time – invariant, Causal and Memoryless. **(04 Marks)**

OR

2 a. If x(t) is a periodic signal, then show that : $\int_{\alpha}^{\beta} x(t)dt = \int_{\alpha+T}^{\beta+T} x(t)dt$. **(02 Marks)**

b. Define the elementary signals δ(n) [impulse], u(n) [unity] and r[n] [ramp] and hence obtain the relation between them. **(06 Marks)**

c. Consider a RC circuit as sown in Fig.Q2(c). Find the relation between the input x(t) and output y(t) for the system with $x(t) = V_S(t)$ and $y(t) = V_C(t)$. Determine whether the system is linear, time invariant, causal and stable.

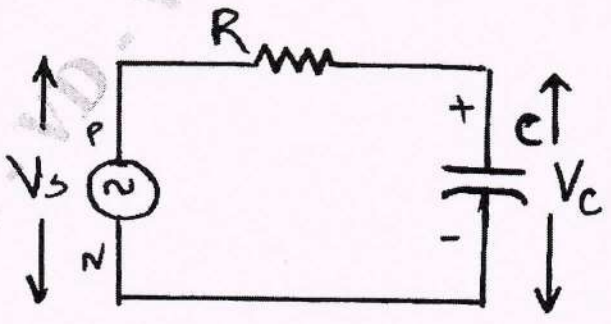

Fig.Q2(c) **(08 Marks)**

Module-2

3 a. Prove the following properties of convolution sum :
i) Associative
ii) Distributive property. **(04 Marks)**

b. Obtain the convolution sun of $x(n) = \alpha^n u(n)$ and $h(n) = \beta^n u(n)$. **(06 Marks)**

c. Draw the direct form I and direct form II for the following systems.

i) $y(t) - \frac{1}{2}y(n-1) + \frac{1}{4}y(n-2) = x(n) + 2x(n-1)$

ii) $2\frac{d^2y(t)}{dt^2} + \frac{dy(t)}{dt} + 3y(t) = x(t) + \frac{d^2x(t)}{dt^2}$. **(06 Marks)**

OR

4 a. Consider a continuous time LTI system has an input signal

$$x(t) = \begin{cases} A & 0 \le t \le T \\ 0 & \text{other values of } t \end{cases}$$

and has an impulse signal

$$h(t) = \begin{cases} A & 0 \le t \le 2T \\ 0 & \text{other value of } t \end{cases}$$

Find the output signal $y(t) = x(t) * h(t)$, using convolution integral. **(06 Marks)**

b. Show that : $x(t) * u(t - t_0) = \int_{-\infty}^{(t-t_0)} x(t - t_0)dt$. **(03 Marks)**

c. Find the complete response of a system described by the equation :
$y(n) - \frac{1}{4}y(n-1) - \frac{1}{8}y(n-2) = x(n) + x(n-1)$ with $y(-1) = 2$ and $y(-2) = -1$, as initial conditions, and input $x(n) = 2^n u(n)$. **(07 Marks)**

Module-3

5 a. Plot the magnitude and phase spectrum for the Fourier transform of the signal : $x(t) = e^{-a|t|}$. **(08 Marks)**

b. Show that :
If $x(t) \xleftrightarrow{FT} X(\omega)$, then $\frac{d}{dt}[x(t)] \xleftrightarrow{FT} j\omega \cdot X(\omega)$. **(04 Marks)**

c. Find the inverse Fourier transform of the signal : $X(\omega) = \frac{j\omega + 12}{(j\omega)^2 + 5(j\omega) + 6}$. **(04 Marks)**

OR

6 a. Find the Fourier transform of :
i) $x(t) = 1$ ii) $x(t) = u(t)$. **(06 Marks)**

b. Calculate the energy of the signal : $x(t) = 4\sin c\left(\frac{t}{5}\right)$ using Parsevats theorem. **(06 Marks)**

c. Evaluate : $\int_{-\infty}^{\infty} \frac{4}{(w^2+1)^2} = dw$ using Fourier transform. **(04 Marks)**

Module-4

7 a. Prove the modulation (time domain) property of Discrete Time Fourier Transform (DTFT). **(04 Marks)**

b. Evaluate the DTFT of the signal : $\left(\frac{1}{2}\right)^n u(n-4)$. **(04 Marks)**

c. Given input signal : $x(n) = n \cdot \left(-\frac{1}{2}\right)^n \cdot u(n)$, without evaluating $x(\Omega)$, find y(n), if $y(\Omega)$ is given by ;

i) $Y(\Omega) = e^{j3\Omega} \cdot X(\Omega)$

ii) $Y(\Omega) = \frac{d}{d\Omega}[X(\Omega)]$

iii) $Y(\Omega) = \frac{d}{d\Omega}\left[e^{-j2\Omega} \cdot [X\left(e^{j(n+\frac{\pi}{4})}\right) - X\left(e^{j(n-\frac{\pi}{4})}\right)]\right]$. **(08 Marks)**

OR

8 a. Obtain the DTFT of a rectangular pulse signal : $x(n) = \begin{cases} 1 & \text{for } |n| \le m \\ 0 & \text{for } |n| > m \end{cases}$ and plot its spectrum. **(06 Marks)**

b. Find the inverse Fourier transform of : $X(\Omega) = \cos^2(\Omega)$. **(04 Marks)**

c. Compute the frequency response and the impulse response of the system described by the difference equation : $y(n) + \frac{1}{2}y(n-1) = x(n) - 2x(n-1)$. **(06 Marks)**

Module-5

9 a. Define Z-transform of a discrete time signal x(n). Determine the z-transform of the signal : $x(n) = \alpha^n u(n) + \beta^n u(-n-1)$. **(06 Marks)**

b. Prove the following properties of Z-transform :

i) Convolution (time domain) property

ii) Differentiation (z – domain) property. **(04 Marks)**

c. Find the inverse Z-transform for the following signals :

i) $x(z) = \frac{\left(1 - \frac{1}{2}z^{-1}\right)}{\left(1 + \frac{3}{4}z^{-1} + \frac{1}{8z^{-2}}\right)}$

ii) $x(z) = \ell n[1 + z^{-1}]$. **(06 Marks)**

OR

10 a. What is ROC? Specify the properties of ROC and mention its significance. **(04 Marks)**

b. Find the convolution of $x_1(n) = \{2, 3, 4\}$ and $x_2(n) = \{1, 5, 5\}$ using Z-transform. **(04 Marks)**

c. A linear time invariant system is described by the difference equation : $y(n) = ay(n-1) + x(n)$.

i) Determine the transfer function of the system

ii) Determine the impulse response of the system

iii) Determine the step response of the system. **(08 Marks)**

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15EE54

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
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. Define even and odd signals. Find the even and odd components of the signal : $x(n) = u(n) - 2u(n-5) + u(n-10)$. **(06 Marks)**

b. Determine where the signal in Fig.Q1(b) is an Energy or a power single and hence determine the corresponding value of power or energy of the signal.

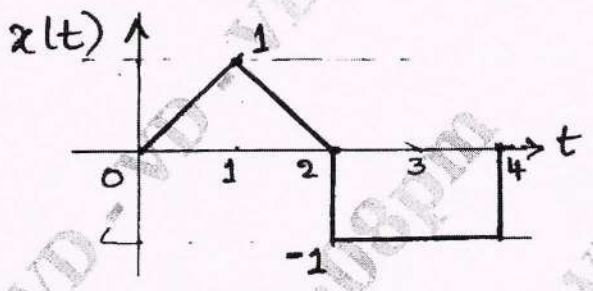

Fig.Q1(b) **(06 Marks)**

c. A discrete time system is represented as : $y(n) = \log[x(n)]$. Identify whether the system is linear, time – invariant, Causal and Memoryless. **(04 Marks)**

OR

2 a. If x(t) is a periodic signal, then show that : $\int_{\alpha}^{\beta} x(t)dt = \int_{\alpha+T}^{\beta+T} x(t)dt$. **(02 Marks)**

b. Define the elementary signals δ(n) [impulse], u(n) [unity] and r[n] [ramp] and hence obtain the relation between them. **(06 Marks)**

c. Consider a RC circuit as sown in Fig.Q2(c). Find the relation between the input x(t) and output y(t) for the system with $x(t) = V_S(t)$ and $y(t) = V_C(t)$. Determine whether the system is linear, time invariant, causal and stable.

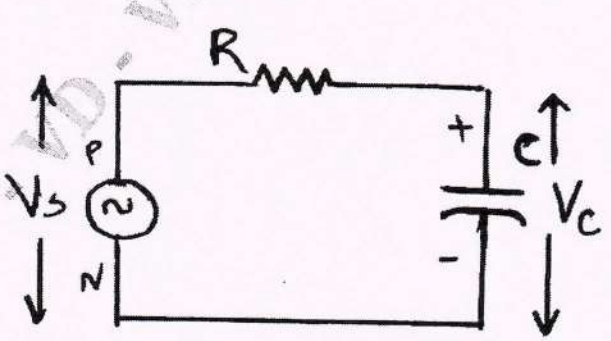

Fig.Q2(c) **(08 Marks)**

Module-2

3 a. Prove the following properties of convolution sum :
i) Associative
ii) Distributive property. **(04 Marks)**

b. Obtain the convolution sun of $x(n) = \alpha^n u(n)$ and $h(n) = \beta^n u(n)$. **(06 Marks)**

c. Draw the direct form I and direct form II for the following systems.

i) $y(t) - \frac{1}{2}y(n-1) + \frac{1}{4}y(n-2) = x(n) + 2x(n-1)$

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OR

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$y(n) - \frac{1}{4}y(n-1) - \frac{1}{8}y(n-2) = x(n) + x(n-1)$ with $y(-1) = 2$ and $y(-2) = -1$, as initial conditions, and input $x(n) = 2^n u(n)$. **(07 Marks)**

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5 a. Plot the magnitude and phase spectrum for the Fourier transform of the signal : $x(t) = e^{-a|t|}$. **(08 Marks)**

b. Show that :

If $x(t) \xleftrightarrow{FT} X(\omega)$, then $\frac{d}{dt}[x(t)] \xleftrightarrow{FT} j\omega \cdot X(\omega)$. **(04 Marks)**

c. Find the inverse Fourier transform of the signal : $X(\omega) = \frac{j\omega + 12}{(j\omega)^2 + 5(j\omega) + 6}$. **(04 Marks)**

OR

6 a. Find the Fourier transform of :
i) $x(t) = 1$ ii) $x(t) = u(t)$. **(06 Marks)**

b. Calculate the energy of the signal : $x(t) = 4\sin c\left(\frac{t}{5}\right)$ using Parsevats theorem. **(06 Marks)**

c. Evaluate : $\int_{-\infty}^{\infty} \frac{4}{(w^2+1)^2} = dw$ using Fourier transform. **(04 Marks)**

Module-4

7 a. Prove the modulation (time domain) property of Discrete Time Fourier Transform (DTFT). **(04 Marks)**

b. Evaluate the DTFT of the signal : $\left(\frac{1}{2}\right)^n u(n-4)$. **(04 Marks)**

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ii) $Y(\Omega) = \frac{d}{d\Omega}[X(\Omega)]$

iii) $Y(\Omega) = \frac{d}{d\Omega}\left[e^{-j2\Omega} \cdot [X(e^{j(n+\pi/4)}) - X(e^{j(n-\pi/4)})]\right]$. **(08 Marks)**

OR

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c. Compute the frequency response and the impulse response of the system described by the difference equation : $y(n) + \frac{1}{2}y(n-1) = x(n) - 2x(n-1)$. **(06 Marks)**

Module-5

9 a. Define Z-transform of a discrete time signal x(n). Determine the z-transform of the signal : $x(n) = \alpha^n u(n) + \beta^n u(-n-1)$. **(06 Marks)**

b. Prove the following properties of Z-transform :

i) Convolution (time domain) property

ii) Differentiation (z – domain) property. **(04 Marks)**

c. Find the inverse Z-transform for the following signals :

i) $x(z) = \frac{\left(1 - \frac{1}{2}z^{-1}\right)}{\left(1 + \frac{3}{4}z^{-1} + \frac{1}{8z^{-2}}\right)}$

ii) $x(z) = \ell n[1 + z^{-1}]$. **(06 Marks)**

OR

10 a. What is ROC? Specify the properties of ROC and mention its significance. **(04 Marks)**

b. Find the convolution of $x_1(n) = \{2, 3, 4\}$ and $x_2(n) = \{1, 5, 5\}$ using Z-transform. **(04 Marks)**

c. A linear time invariant system is described by the difference equation : $y(n) = ay(n-1) + x(n)$.

i) Determine the transfer function of the system

ii) Determine the impulse response of the system

iii) Determine the step response of the system. **(08 Marks)**

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CBCS SCHEME

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15EE563

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
Renewable Energy Sources

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Enumerate the principle causes of Energy Scarcity in India. **(04 Marks)**

b. What are Renewable Energy Sources? Briefly discuss about the status of installed capacity of Renewable Energy Sources in India. **(06 Marks)**

c. Define the following terminologies based on Earth – Sun angles and their relationship with suitable diagram. i) Hour angle ii) Declination angle iii) Equation of Time. **(06 Marks)**

OR

2 a. Mention the five factors that affect the Energy Resource development in India. **(05 Marks)**

b. Calculate the hour angle at sunrise and sunset on June 21 for a surface inclined at an angle of 10^0 and facing due south ($\gamma = 0^0$). The surface is located in Mumbai (19^0 07' N ,72^0 51' E). **(05 Marks)**

c. Explain briefly about the Solar Thermo – Electric Conversion system. **(06 Marks)**

Module-2

3 a. What are Concentrating Collectors? Enumerate the various types of Concentrating Collectors. **(04 Marks)**

b. With the help of a neat sketch, explain the Solar Water Heating System using Solar Collectors. **(08 Marks)**

c. A specific solar cell has an output capability of 0.5A at 0.4V. Assume that an array of such cells with 100 parallel strings and each string with 300 cells in series is to be building up. What will be the array output voltage (V_a), array current (I_a) and array output power (P_a) **(04 Marks)**

OR

4 a. What are the main components of Flat Plate Collector? Mention the functions of each component. **(06 Marks)**

b. Explain briefly the use of solar pond in rural areas for generation of electricity. **(06 Marks)**

c. Mention the factors limiting the efficiency of a Solar Cell. **(04 Marks)**

Module-3

5 a. Discuss briefly about the different methods of Hydrogen Production technologies. **(06 Marks)**

b. Describe the main guidelines for selecting a site for Wind generators. **(06 Marks)**

c. Mention the Environmental effects of Geothermal Energy. **(04 Marks)**

OR

6 a. What are the advantages and disadvantages of Hydrogen Energy? **(04 Marks)**

b. With a suitable schematic diagram, explain the waste recovery management scheme. **(06 Marks)**

c. Explain the Single Flash Geothermal based Electric Power Generation. **(06 Marks)**

Module-4

7 a. Define Biomass Gasification and explain briefly. **(06 Marks)**

b. Describe the construction and working of a Fixed Dome Type Biogas plant. **(06 Marks)**

c. Mention the advantages and disadvantages of Tidal Power generation. **(04 Marks)**

OR

8 a. List the different types of Gasifiers. Explain briefly about the Fluidized Bed Gasifiers. **(08 Marks)**

b. Enumerate the factors considered for the selection of Biogas plant. **(04 Marks)**

c. Show that the potential power P, generated by a Tidal power plant is estimated as : $P = 0.226\ A\ H^2$ watts, where A is the surface area of the reservoir (m^2) and H is the tidal range (m). **(04 Marks)**

Module-5

9 a. A 2m sea wave has a 6 sec period and occurs at the surface of 100-m deep water. Assume sea water density as 1,025kg/m^3. Calculate the energy and power densities of the wave. **(06 Marks)**

b. What is the principle of OTEC (Ocean Thermal Energy Conversion]? Briefly explain the closed cycle OTEC plant. **(06 Marks)**

c. Write a short note on Carnot Cycle. **(04 Marks)**

OR

10 a. Mention the devices used for harnessing wave energy. **(04 Marks)**

b. Explain the basic Rankine cycle for OTEC. **(06 Marks)**

c. What are the advantages and disadvantages of OTEC? **(06 Marks)**

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15EE563

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
Renewable Energy Sources

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Enumerate the principle causes of Energy Scarcity in India. **(04 Marks)**

b. What are Renewable Energy Sources? Briefly discuss about the status of installed capacity of Renewable Energy Sources in India. **(06 Marks)**

c. Define the following terminologies based on Earth – Sun angles and their relationship with suitable diagram. i) Hour angle ii) Declination angle iii) Equation of Time. **(06 Marks)**

OR

2 a. Mention the five factors that affect the Energy Resource development in India. **(05 Marks)**

b. Calculate the hour angle at sunrise and sunset on June 21 for a surface inclined at an angle of 10^0 and facing due south ($\gamma = 0^0$). The surface is located in Mumbai (19^0 07' N ,72^0 51' E). **(05 Marks)**

c. Explain briefly about the Solar Thermo – Electric Conversion system. **(06 Marks)**

Module-2

3 a. What are Concentrating Collectors? Enumerate the various types of Concentrating Collectors. **(04 Marks)**

b. With the help of a neat sketch, explain the Solar Water Heating System using Solar Collectors. **(08 Marks)**

c. A specific solar cell has an output capability of 0.5A at 0.4V. Assume that an array of such cells with 100 parallel strings and each string with 300 cells in series is to be building up. What will be the array output voltage (V_a), array current (I_a) and array output power (P_a) **(04 Marks)**

OR

4 a. What are the main components of Flat Plate Collector? Mention the functions of each component. **(06 Marks)**

b. Explain briefly the use of solar pond in rural areas for generation of electricity. **(06 Marks)**

c. Mention the factors limiting the efficiency of a Solar Cell. **(04 Marks)**

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b. Describe the main guidelines for selecting a site for Wind generators. **(06 Marks)**

c. Mention the Environmental effects of Geothermal Energy. **(04 Marks)**

OR

6 a. What are the advantages and disadvantages of Hydrogen Energy? **(04 Marks)**

b. With a suitable schematic diagram, explain the waste recovery management scheme. **(06 Marks)**

c. Explain the Single Flash Geothermal based Electric Power Generation. **(06 Marks)**

Module-4

7 a. Define Biomass Gasification and explain briefly. (06 Marks)

b. Describe the construction and working of a Fixed Dome Type Biogas plant. (06 Marks)

c. Mention the advantages and disadvantages of Tidal Power generation. (04 Marks)

OR

8 a. List the different types of Gasifiers. Explain briefly about the Fluidized Bed Gasifiers. (08 Marks)

b. Enumerate the factors considered for the selection of Biogas plant. (04 Marks)

c. Show that the potential power P, generated by a Tidal power plant is estimated as : $P = 0.226 \text{ A } H^2$ watts, where A is the surface area of the reservoir (m^2) and H is the tidal range (m). (04 Marks)

Module-5

9 a. A 2m sea wave has a 6 sec period and occurs at the surface of 100-m deep water. Assume sea water density as 1,025kg/m^3. Calculate the energy and power densities of the wave. (06 Marks)

b. What is the principle of OTEC (Ocean Thermal Energy Conversion]? Briefly explain the closed cycle OTEC plant. (06 Marks)

c. Write a short note on Carnot Cycle. (04 Marks)

OR

10 a. Mention the devices used for harnessing wave energy. (04 Marks)

b. Explain the basic Rankine cycle for OTEC. (06 Marks)

c. What are the advantages and disadvantages of OTEC? (06 Marks)

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15EE552

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
Electrical Engineering Materials

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Mention the properties possessed by the materials of electrical engineering. **(08 Marks)**

b. What are left handed materials? Mention their applications. **(08 Marks)**

OR

2 a. Mention the factors affecting resistivity of electrical conductors. Establish a relation between temperature coefficient of resistance α_2 at t_2 temperature and α_1 at t_1 temperature. **(10 Marks)**

b. What is Seebeck effect? What is pettier effect? **(06 Marks)**

Module-2

3 a. Discuss the characteristics of low resistivity materials. **(08 Marks)**

b. Why copper is preferred than aluminium for windings of machines. **(04 Marks)**

c. Mention the requirements of a good contact material. **(04 Marks)**

OR

4 a. Mention the factors affecting dielectric loss. Derive the loss factor for a dielectric material. **(08 Marks)**

b. A simple parallel plate condenser is to be made to store 10μc at a potential of 10kV. The separation between the plates is to be 5×10^{-4}m. Calculate the area that the plates must have if the dielectric material between the plates is alumina of dielectric constant 10. **(08 Marks)**

Module-3

5 a. Write the applications of solid insulating materials. **(06 Marks)**

b. Write the applications of liquid insulating materials. **(06 Marks)**

c. Write about the classification of dielectric gases. **(04 Marks)**

OR

6 a. Derive the relation between relative permeability and magnetic susceptibility. **(06 Marks)**

b. Relative permeability of supermalloy is 200000. It has a magnetization of 6000 A/m. Determine the strength of the magnet thus produced. Take $\mu_0 = 4\pi \times 10^{-7}$ henry/metre. **(06 Marks)**

c. What are the effects of curie temperature on various magnetic properties? **(04 Marks)**

Module-4

7 a. Write a short note on soft magnetic materials. Why soft magnetic materials preferred in the transforme core? **(08 Marks)**

b. Write the applications of super conductors? And what are their limitations? **(08 Marks)**

OR

8 a. Prove that the susceptibility of a super conductor is '−1' and relative permeability is zero. **(06 Marks)**

b. Write the properties of super conductor. **(05 Marks)**

c. Critical temperature of Pb is superconducting state is 7.17K under zero magnetic fields. The value of critical field for it is 0.0803A/m at OK. Determine its critical field at 3K and 10K. **(05 Marks)**

Module-5

9 a. What are rubbers? What are the properties of rubber? What are the applications of it? **(08 Marks)**

b. What is Photoconductive cell? Explain the construction of it. **(08 Marks)**

OR

10 a. What are the types of optical materials? Mention examples of each type. **(06 Marks)**

b. Explain the term reflection. **(04 Marks)**

c. Calculate the energy of a photon of sodium light having wavelength of 5.893×10^{-7} m i) in joules ii) in electron-volt. Take $h = 6.62 \times 10^{-34}$ Js and velocity of light $C = 3 \times 10^{8}$ m/s. **(06 Marks)**

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15EE552

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
Electrical Engineering Materials

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Mention the properties possessed by the materials of electrical engineering. **(08 Marks)**

b. What are left handed materials? Mention their applications. **(08 Marks)**

OR

2 a. Mention the factors affecting resistivity of electrical conductors. Establish a relation between temperature coefficient of resistance α_2 at t_2 temperature and α_1 at t_1 temperature. **(10 Marks)**

b. What is Seebeck effect? What is pettier effect? **(06 Marks)**

Module-2

3 a. Discuss the characteristics of low resistivity materials. **(08 Marks)**

b. Why copper is preferred than aluminium for windings of machines. **(04 Marks)**

c. Mention the requirements of a good contact material. **(04 Marks)**

OR

4 a. Mention the factors affecting dielectric loss. Derive the loss factor for a dielectric material. **(08 Marks)**

b. A simple parallel plate condenser is to be made to store 10μc at a potential of 10kV. The separation between the plates is to be 5×10^{-4}m. Calculate the area that the plates must have if the dielectric material between the plates is alumina of dielectric constant 10. **(08 Marks)**

Module-3

5 a. Write the applications of solid insulating materials. **(06 Marks)**

b. Write the applications of liquid insulating materials. **(06 Marks)**

c. Write about the classification of dielectric gases. **(04 Marks)**

OR

6 a. Derive the relation between relative permeability and magnetic susceptibility. **(06 Marks)**

b. Relative permeability of supermalloy is 200000. It has a magnetization of 6000 A/m. Determine the strength of the magnet thus produced. Take $\mu_0 = 4\pi \times 10^{-7}$ henry/metre. **(06 Marks)**

c. What are the effects of curie temperature on various magnetic properties? **(04 Marks)**

Module-4

7 a. Write a short note on soft magnetic materials. Why soft magnetic materials preferred in the transforme core? **(08 Marks)**

b. Write the applications of super conductors? And what are their limitations? **(08 Marks)**

OR

8 a. Prove that the susceptibility of a super conductor is '−1' and relative permeability is zero. **(06 Marks)**

b. Write the properties of super conductor. **(05 Marks)**

c. Critical temperature of Pb is superconducting state is 7.17K under zero magnetic fields. The value of critical field for it is 0.0803A/m at OK. Determine its critical field at 3K and 10K. **(05 Marks)**

Module-5

9 a. What are rubbers? What are the properties of rubber? What are the applications of it? **(08 Marks)**

b. What is Photoconductive cell? Explain the construction of it. **(08 Marks)**

OR

10 a. What are the types of optical materials? Mention examples of each type. **(06 Marks)**

b. Explain the term reflection. **(04 Marks)**

c. Calculate the energy of a photon of sodium light having wavelength of 5.893×10^{-7}m i) in joules ii) in electron-volt. Take $h = 6.62 \times 10^{-34}$ Js and velocity of light $C = 3 \times 10^{8}$ m/s. **(06 Marks)**

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CBCS SCHEME

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15EE52

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
Mircocontroller

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. With a neat block diagram, explain the function of each block of 8051 micro controller. **(10 Marks)**

b. Explain the memory organization in 8051. **(06 Marks)**

OR

2 a. What is stack? Explain the instructions used to access them. **(10 Marks)**

b. Explain the different addressing modes of 8051. Any three give an example for each of them. **(06 Marks)**

Module-2

3 a. Explain the following instructions of 8051 with examples:
i) XCHD A, @R_i ii) MOVC A, @A+PC iii) RL A iv) MUL AB v) DA A. **(10 Marks)**

b. What are assembler directives? Explain the functions of the assembler directives with an example for each. **(06 Marks)**

OR

4 a. Write 8051 ALP which checks whether the ten numbers stored from external RAM memory address, 2000H are odd/even. The program should store accordingly OOH/FFH from internal location 30H onwards. **(10 Marks)**

b. Write an ALP to toggle all bits of port 1 every 200ms. Assume that the crystal frequency is 11.0592MHz of 8051. **(06 Marks)**

Module-3

5 a. Write an 8051C program to read the content of port P_1. If it is greater than 200, wait for 250msec and send the data to port P_2. Otherwise wait for 150Msec and send the data to Port P0. **(10 Marks)**

b. Discuss the data types in 8051C. **(06 Marks)**

OR

6 a. Write an assembly language program to generate 2kHz square wave on port 1.0 using timer 1, mode 1. Assume oscillator frequency of the μc is 12MHz. **(10 Marks)**

b. Mention the difference between counter mode and timer mode of operation. With necessary format, explain the various bits of TMODSFR. **(06 Marks)**

Module-4

7 a. Explain how 8051 transmits the character serially using its UART. **(06 Marks)**

b. Write 8051 C program to transmit serially the message "SWITCH ON' or 'SWITCH OFF' depending on the status of the simple switch connected to pin 1.2. Use 2400 baud rate, 1 stop bit, 8 data bit format and assume XTAL frequency as 11.0592 MHz. **(10 Marks)**

OR

8 a. Explain the interrupts of 8051 clearly mentioning the vector address and priorities. **(06 Marks)**

b. Write AL program that continuously gets 8 bit data from P_0 and sends it to P_1 while simultaneously creating a square wave of 200μs period on pin P2.1. Use timer 0, mode 2 to create the square wave. Assume that XTAL = 11.0592MHz. **(10 Marks)**

Module-5

9 a. Explain the features of ADC 0804. Also draw the pin diagram of the same mentioning the various pins. **(06 Marks)**

b. Write a C program to rotate the stepper motor in the clock wise for 4 steps and in the antilock wise for 6 steps. Show the relevant calculations. **(10 Marks)**

OR

10 a. Draw the block diagram to show how 8051 is connected to DAC 0808 at port P_1, using O/P buffer for DAC. Write an 8051 C program to generate a ramp signal **(10 Marks)**

b. Explain the any two modes of operation of 8255 along with control word format. **(06 Marks)**

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15EE52

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
Mircocontroller

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. With a neat block diagram, explain the function of each block of 8051 micro controller. **(10 Marks)**

b. Explain the memory organization in 8051. **(06 Marks)**

OR

2 a. What is stack? Explain the instructions used to access them. **(10 Marks)**

b. Explain the different addressing modes of 8051. Any three give an example for each of them. **(06 Marks)**

Module-2

3 a. Explain the following instructions of 8051 with examples:
i) XCHD A, @R_i ii) MOVC A, @A+PC iii) RL A iv) MUL AB v) DA A. **(10 Marks)**

b. What are assembler directives? Explain the functions of the assembler directives with an example for each. **(06 Marks)**

OR

4 a. Write 8051 ALP which checks whether the ten numbers stored from external RAM memory address, 2000H are odd/even. The program should store accordingly OOH/FFH from internal location 30H onwards. **(10 Marks)**

b. Write an ALP to toggle all bits of port 1 every 200ms. Assume that the crystal frequency is 11.0592MHz of 8051. **(06 Marks)**

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5 a. Write an 8051C program to read the content of port P_1. If it is greater than 200, wait for 250msec and send the data to port P_2. Otherwise wait for 150Msec and send the data to Port P0. **(10 Marks)**

b. Discuss the data types in 8051C. **(06 Marks)**

OR

6 a. Write an assembly language program to generate 2kHz square wave on port 1.0 using timer 1, mode 1. Assume oscillator frequency of the μc is 12MHz. **(10 Marks)**

b. Mention the difference between counter mode and timer mode of operation. With necessary format, explain the various bits of TMODSFR. **(06 Marks)**

Module-4

7 a. Explain how 8051 transmits the character serially using its UART. **(06 Marks)**

b. Write 8051 C program to transmit serially the message "SWITCH ON' or 'SWITCH OFF' depending on the status of the simple switch connected to pin 1.2. Use 2400 baud rate, 1 stop bit, 8 data bit format and assume XTAL frequency as 11.0592 MHz. **(10 Marks)**

OR

8 a. Explain the interrupts of 8051 clearly mentioning the vector address and priorities. **(06 Marks)**

b. Write AL program that continuously gets 8 bit data from P_0 and sends it to P_1 while simultaneously creating a square wave of 200μs period on pin P2.1. Use timer 0, mode 2 to create the square wave. Assume that XTAL = 11.0592MHz. **(10 Marks)**

Module-5

9 a. Explain the features of ADC 0804. Also draw the pin diagram of the same mentioning the various pins. **(06 Marks)**

b. Write a C program to rotate the stepper motor in the clock wise for 4 steps and in the antilock wise for 6 steps. Show the relevant calculations. **(10 Marks)**

OR

10 a. Draw the block diagram to show how 8051 is connected to DAC 0808 at port P_1, using O/P buffer for DAC. Write an 8051 C program to generate a ramp signal **(10 Marks)**

b. Explain the any two modes of operation of 8255 along with control word format. **(06 Marks)**

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15EE53

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
Power Electronics

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. With the help of circuits and waveforms, explain the various types of power electronic converters. **(10 Marks)**

b. Analyse the Reverse recovery characteristics of a diode and write equations of reverse recovery time t_{rr} and reverse recovery current I_{RR} **(06 Marks)**

OR

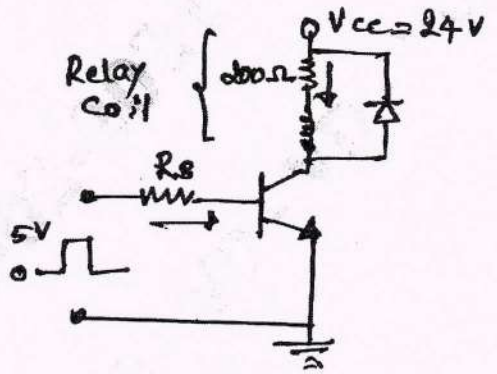
2 a. Explain the working operation of 1ϕ full wave bridge rectifier circuit with R load. With necessary waveforms. **(08 Marks)**

b. Mention the various types of power diodes and explain freewheeling diodes with switched RL load circuit along with various modes. **(08 Marks)**

Module-2

3 a. With the help of necessary waveform, explain the switching characteristics of power MOSFET. **(08 Marks)**

b. A simple transistor switch is used to connect a 24V DC supply a cross a relay coil, which has a DC resistance of 200Ω. An input pulse of 0 to 5V amplitude is applied through a series base resistor R_B at the base so as to turn on the transistor switch. Sketch the device current waveform with reference to the input pulse. Calculate: i) I_{CS} ii) Value of resistor R_B, required to obtain over drive factor of 2. iii) Total power dissipation in the transistor. [Refer Fig Q3(b)]



$\beta = 25$ to 100
$V_{CE(sat)} = 0.2V$
$V_{BE(sat)} = 0.7V$

Fig Q3(b) **(08 Marks)**

OR

4 a. What is the necessity of base drive control in a power transistor? Explain proportional base control. **(08 Marks)**

b. Write Merits, Demerits and Applications of power MOSFETs. **(04 Marks)**

c. With circuit diagram, explain electric isolation using pulse transformer. **(04 Marks)**

Module-3

5 a. Derive an expression for the anode current of a thyristor with the help of a two transistor analogy. **(08 Marks)**

b. Distinguish between holding current and latching current of thyristor. **(04 Marks)**

c. A SCR is connected in series with a 0.5H inductor and 20Ω resistance. A 100V DC voltage is applied to this circuit. If the latching of the SCR is 4mA. Find the maximum width of the gate trigger pulse required to properly turn-on the SCR. [Refer Fig Q5(c)]

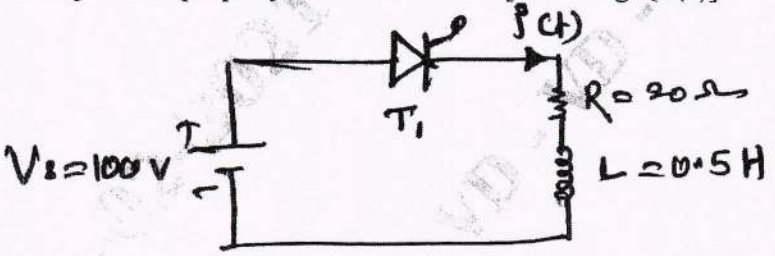


Fig Q5(c) **(04 Marks)**

OR

6 a. What is the need for protection of thyristors? Explain how thyrisors are protested against high $\frac{di}{dt}$ and $\frac{dv}{dt}$. **(10 Marks)**

b. A string of series connected thyristors is to withstand a dc voltage of 16kV. The maximum leakage current and recovery charge differences of the thyristors are 10mA and 100μC respectively. The derating factor for steady state and transient voltage sharing are 20%. For a maximum steady state voltage sharing of 1kV. Determine :

i) The steady voltage sharing resistance R for each thyristor

ii) The transient voltage capacitance C_1 for each thyristor. **(06 Marks)**

Module-4

7 a. With the help of circuit diagram and waveforms explain the working of 1ϕ fully controlled converter with inductive load. Derive the expression for rms output voltage and rms output current. **(08 Marks)**

b. A single phase full wave A.C voltage controller operates on a single phase supply voltage of 230V rms, at 50Hz. If the triac is triggered at a delay angle of 45°, during each half cycle of input supply. [Refer Fig Q7(b)] Calculate :

i) RMS value of output voltage

ii) RMS value of output current

iii) RMS value of Triac current

iv) Input power factor.

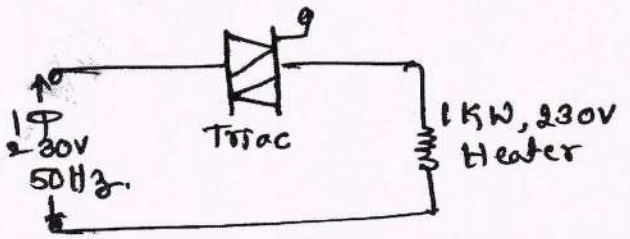


Fig Q7(b) **(08 Marks)**

OR

8 a. Explain the working of a bidirectional A.C voltage controller with R load, with the help of neat circuit's diagram, and relevant waveforms. Derive the equation for V_o(RMS). **(08 Marks)**

b. A 3ϕ full converter operated from 3ϕ, γ, connected 208V, 60Hz supply with R_L= 10Ω. It is required to obtain 50% of the maximum possible output voltage. Calculate :

i) Delay angle α
ii) rms and average current
iii) rms and average thyristor current
iv) efficiency of rectification
v) Power factor. **(08 Marks)**

Module-5

9 a. Explain the operation of step up chopper. **(06 Marks)**

b. Analyse the performance parameters of DC choppers. **(04 Marks)**

c. The 1ϕ full bridge inverter has a resistive load of R = 2.4Ω, and the DC input voltage of V_s = 48 Volts. Determine :

i) rms output voltage at the fundamental frequency
ii) The output power
iii) The peak and average currents of each transistor. **(06 Marks)**

OR

10 a. Explain 1ϕ transistorized current source inverter with the help of necessary circuit and waveforms. Also write its advantages and disadvantages. **(06 Marks)**

b. Write comparison between VSI and CSI. **(04 Marks)**

c. A dc chopper has an input voltage of 200V and a load resistance of 8Ω. The voltage drop across thyristor is 2V, and the chopper frequency is 800 Hz. The duty cycle α = 0.4. Find :

i) Average output voltage
ii) RMS output voltage
iii) Chopper efficiency. **(06 Marks)**

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2-3

CBCS SCHEME

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15EE53

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
Power Electronics

Time: 3 hrs. Max. Marks: 80

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

Module-1

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OR

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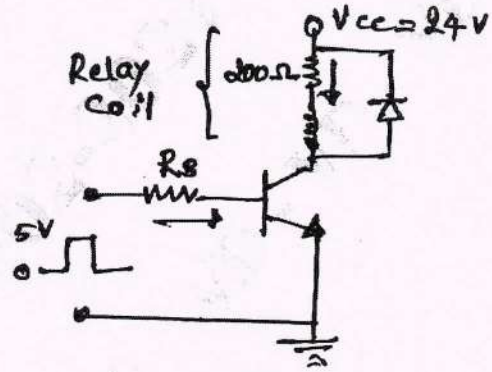

Fig Q3(b) **(08 Marks)**

OR

4 a. What is the necessity of base drive control in a power transistor? Explain proportional base control. **(08 Marks)**

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c. With circuit diagram, explain electric isolation using pulse transformer. **(04 Marks)**

Module-3

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c. A SCR is connected in series with a 0.5H inductor and 20Ω resistance. A 100V DC voltage is applied to this circuit. If the latching of the SCR is 4mA. Find the maximum width of the gate trigger pulse required to properly turn-on the SCR. [Refer Fig Q5(c)]

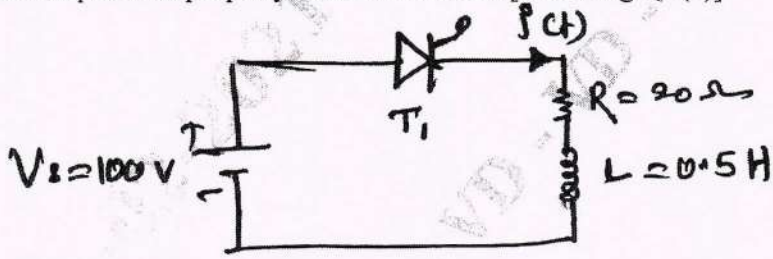

Fig Q5(c) **(04 Marks)**

OR

6 a. What is the need for protection of thyristors? Explain how thyrisors are protested against high $\frac{di}{dt}$ and $\frac{dv}{dt}$. **(10 Marks)**

b. A string of series connected thyristors is to withstand a dc voltage of 16kV. The maximum leakage current and recovery charge differences of the thyristors are 10mA and 100μC respectively. The derating factor for steady state and transient voltage sharing are 20%. For a maximum steady state voltage sharing of 1kV. Determine :

i) The steady voltage sharing resistance R for each thyristor

ii) The transient voltage capacitance C_1 for each thyristor. **(06 Marks)**

Module-4

7 a. With the help of circuit diagram and waveforms explain the working of 1ϕ fully controlled converter with inductive load. Derive the expression for rms output voltage and rms output current. **(08 Marks)**

b. A single phase full wave A.C voltage controller operates on a single phase supply voltage of 230V rms, at 50Hz. If the triac is triggered at a delay angle of 45°, during each half cycle of input supply. [Refer Fig Q7(b)] Calculate :

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iii) RMS value of Triac current

iv) Input power factor.

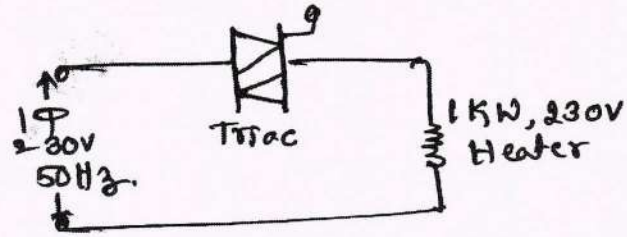

Fig Q7(b) **(08 Marks)**

OR

8 a. Explain the working of a bidirectional A.C voltage controller with R load, with the help of neat circuit's diagram, and relevant waveforms. Derive the equation for V_o(RMS). **(08 Marks)**

b. A 3ϕ full converter operated from 3ϕ, γ, connected 208V, 60Hz supply with R_L= 10Ω. It is required to obtain 50% of the maximum possible output voltage. Calculate :

i) Delay angle α
ii) rms and average current
iii) rms and average thyristor current
iv) efficiency of rectification
v) Power factor. **(08 Marks)**

Module-5

9 a. Explain the operation of step up chopper. **(06 Marks)**

b. Analyse the performance parameters of DC choppers. **(04 Marks)**

c. The 1ϕ full bridge inverter has a resistive load of R = 2.4Ω, and the DC input voltage of V_s = 48 Volts. Determine :

i) rms output voltage at the fundamental frequency
ii) The output power
iii) The peak and average currents of each transistor. **(06 Marks)**

OR

10 a. Explain 1ϕ transistorized current source inverter with the help of necessary circuit and waveforms. Also write its advantages and disadvantages. **(06 Marks)**

b. Write comparison between VSI and CSI. **(04 Marks)**

c. A dc chopper has an input voltage of 200V and a load resistance of 8Ω. The voltage drop across thyristor is 2V, and the chopper frequency is 800 Hz. The duty cycle α = 0.4. Find :

i) Average output voltage
ii) RMS output voltage
iii) Chopper efficiency. **(06 Marks)**

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CBCS SCHEME

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15EE61

Sixth Semester B.E. Degree Examination, Jan./Feb. 2021
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 open loop control system and closed loop control system with examples. **(06 Marks)**

b. Obtain transfer function of armature controlled DC servo motor. **(10 Marks)**

OR

2 a. For the mechanical system shown in Fig.Q2(a). Write the differential equation relating displacement x(t) and force f(t). Derive electrical analogous equations for the mechanical quantities using force-voltage analogy and draw electrical analogous circuit.

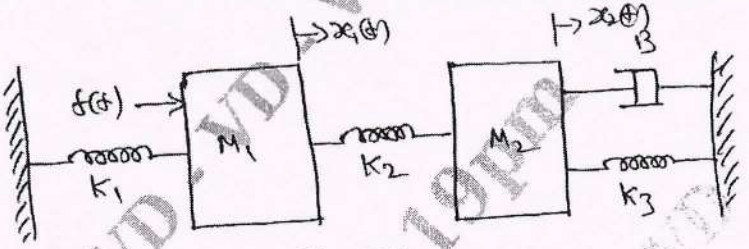

Fig.Q2(a) **(08 Marks)**

b. For the rotational system shown in Fig.Q2(b), write the differential equations relating angular displacement θ(t) and torque T(t). Derive electrical analogous equation using torque-current analogy and draw electrical analogous network.

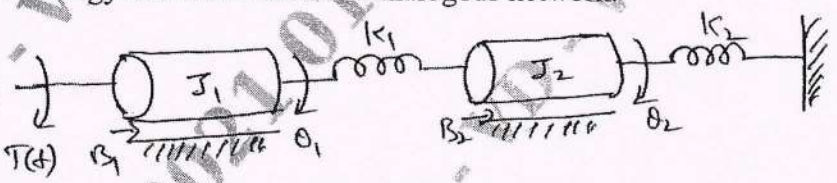

Fig.Q2(b) **(08 Marks)**

Module-2

3 a. Find the transfer function of the system shown in Fig.Q3(a) using block diagram reduction technique.

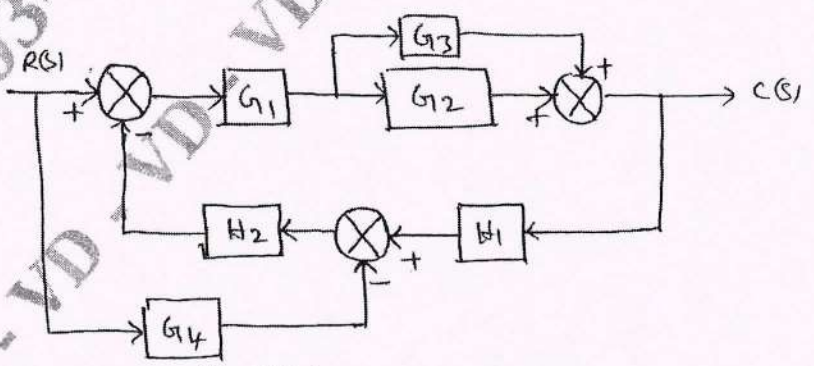

Fig.Q3(a) **(08 Marks)**

b. Find the transfer function $\frac{Y_5}{Y_1}$ for the signal flow graph shown in Fig.Q3(b).

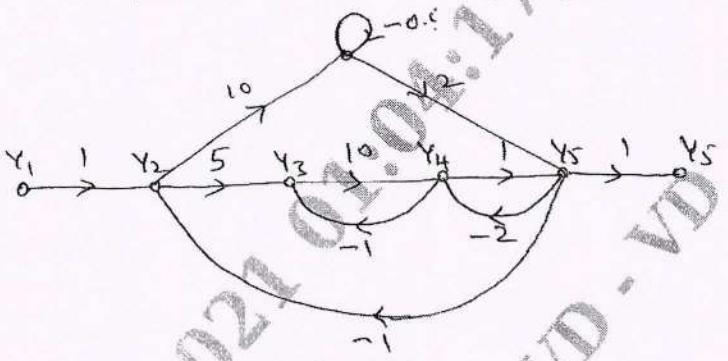

Fig.Q3(b) **(08 Marks)**

OR

4 a. For the network shown in Fig.Q4(a) construct the signal flow graph and find the transfer function $\frac{V_0(s)}{V_i(s)}$ using Mason's gain formula.

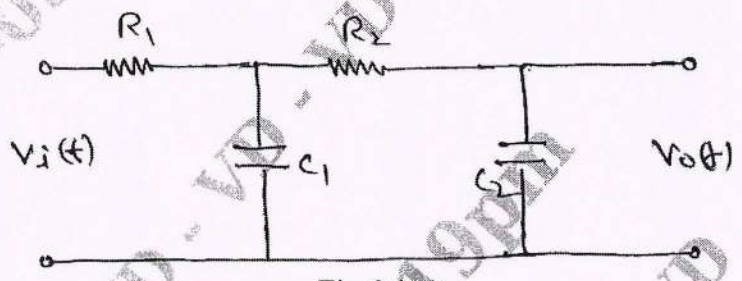

Fig.Q4(a) **(08 Marks)**

b. Obtain the transfer function $\frac{C(s)}{R(s)}$ of the block diagram shown in Fig.Q4(b) using block diagram reduction technique.

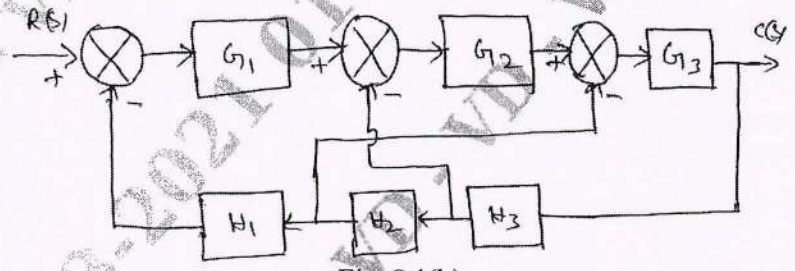

Fig.Q4(b) **(08 Marks)**

Module-3

5 a. Draw the time response curve and define time domain specifications for second order control system for unit step input. **(08 Marks)**

b. Determine the values of 'K' and 'a' so that the system shown in Fig.Q5(b) oscillates at a frequency of 2 radius/sec.

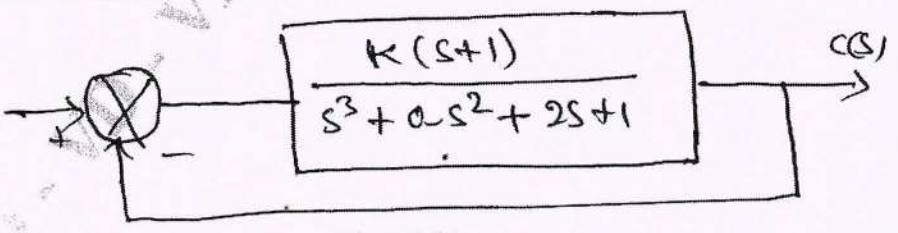

Fig.Q5(b) **(08 Marks)**

OR

6 a. Explain Routh-Hurwitz criterion on stability of a control system. **(04 Marks)**

b. Test the stability of the system characterized by its characteristic equation:

$s^4 + 2s^3 + 3s^2 + 4s + 5 = 0$ **(04 Marks)**

c. For a unity feedback control system shown in Fig.Q6(c), obtain closed loop transfer function, damping ratio, natural frequency and expression for output response subjected to unit step input.

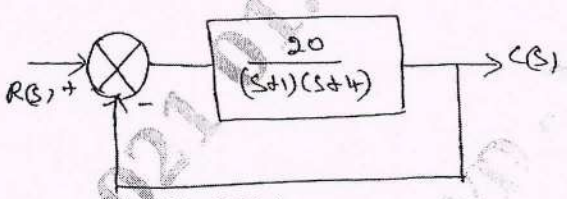

Fig.Q6(c) **(08 Marks)**

Module-4

7 a. Discuss the various rules for construction of root locus. **(06 Marks)**

b. A negative feedback control system is characterized by $G(s)H(s) = \frac{K}{s(s+1)(s+2)(s+3)}$.

Sketch the root locus plot for values of 'K' ranging from 0 to ∞ mark all the salient points on the root locus. **(10 Marks)**

OR

8 a. Construct the Bode plot for a unity feedback control system having $G(s) = \frac{2000}{s(s+1)(s+100)}$,

from the Bode plot, determine:

(i) Gain cross over frequency (ii) Phase cross over frequency

(iii) Gain margin (iv) Phase margin

Comment on stability. **(10 Marks)**

b. Determine the open loop transfer function of a system whose approximate plot is shown in Fig.Q8(b).

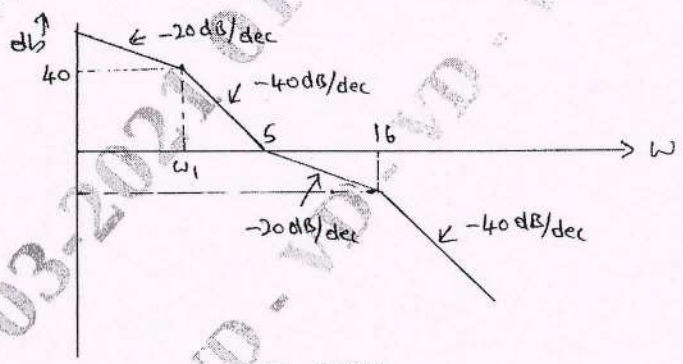

Fig.Q8(b) **(06 Marks)**

Module-5

9 a. State and explain Nyquist stability criterion. **(06 Marks)**

b. Write a note on PID controller. **(10 Marks)**

OR

10 a. Sketch the Nyquist plot for a system with $G(s)H(s) = \frac{10(s+3)}{s(s-1)}$. Comment on closed loop stability. **(10 Marks)**

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

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CBCS SCHEME

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15EE61

Sixth Semester B.E. Degree Examination, Jan./Feb. 2021
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 open loop control system and closed loop control system with examples. **(06 Marks)**

b. Obtain transfer function of armature controlled DC servo motor. **(10 Marks)**

OR

2 a. For the mechanical system shown in Fig.Q2(a). Write the differential equation relating displacement x(t) and force f(t). Derive electrical analogous equations for the mechanical quantities using force-voltage analogy and draw electrical analogous circuit.

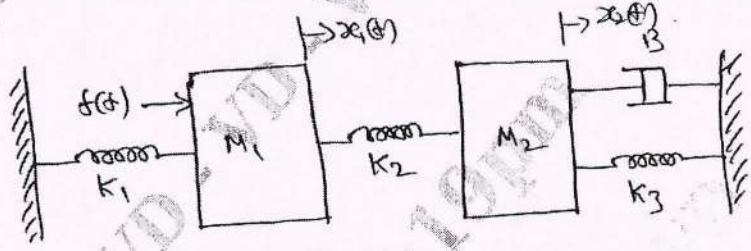

Fig.Q2(a) **(08 Marks)**

b. For the rotational system shown in Fig.Q2(b), write the differential equations relating angular displacement θ(t) and torque T(t). Derive electrical analogous equation using torque-current analogy and draw electrical analogous network.

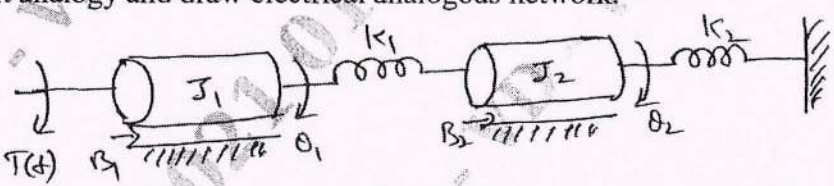

Fig.Q2(b) **(08 Marks)**

Module-2

3 a. Find the transfer function of the system shown in Fig.Q3(a) using block diagram reduction technique.

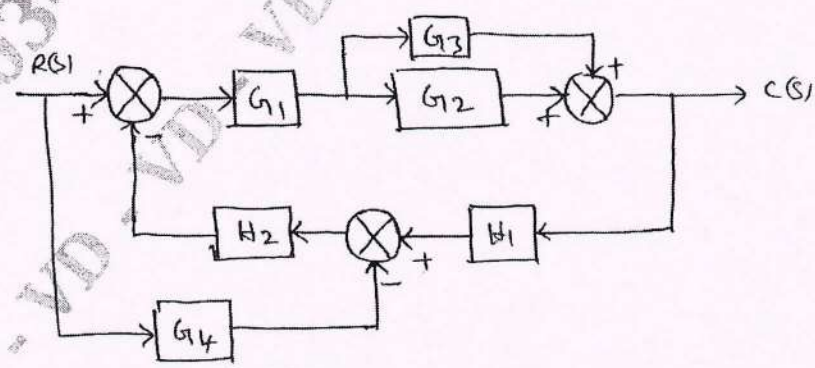

Fig.Q3(a) **(08 Marks)**

b. Find the transfer function $\frac{Y_5}{Y_1}$ for the signal flow graph shown in Fig.Q3(b).

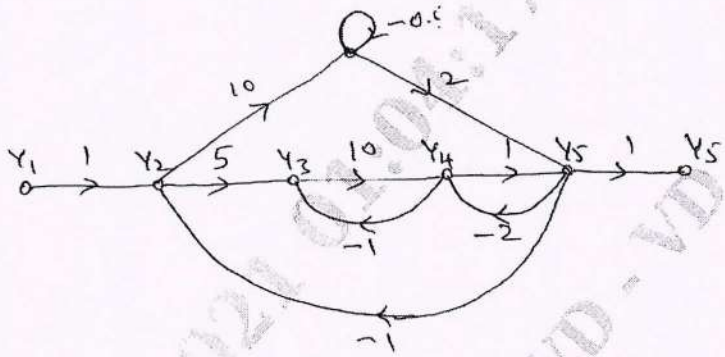

Fig.Q3(b) **(08 Marks)**

OR

4 a. For the network shown in Fig.Q4(a) construct the signal flow graph and find the transfer function $\frac{V_0(s)}{V_i(s)}$ using Mason's gain formula.

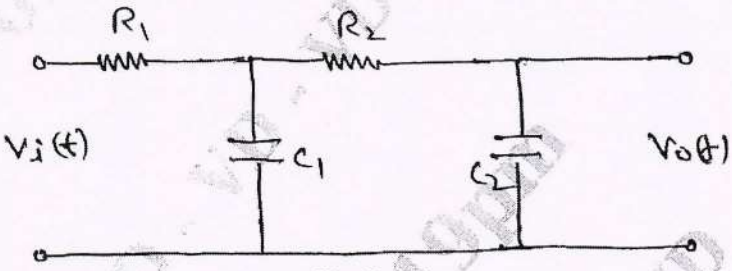

Fig.Q4(a) **(08 Marks)**

b. Obtain the transfer function $\frac{C(s)}{R(s)}$ of the block diagram shown in Fig.Q4(b) using block diagram reduction technique.

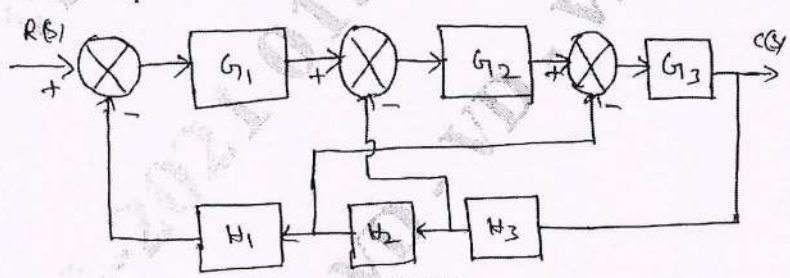

Fig.Q4(b) **(08 Marks)**

Module-3

5 a. Draw the time response curve and define time domain specifications for second order control system for unit step input. **(08 Marks)**

b. Determine the values of 'K' and 'a' so that the system shown in Fig.Q5(b) oscillates at a frequency of 2 radius/sec.

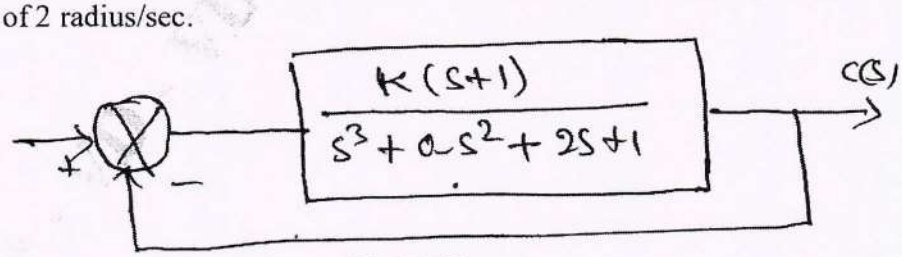

Fig.Q5(b) **(08 Marks)**

OR

6 a. Explain Routh-Hurwitz criterion on stability of a control system. **(04 Marks)**

b. Test the stability of the system characterized by its characteristic equation:

$s^4 + 2s^3 + 3s^2 + 4s + 5 = 0$ **(04 Marks)**

c. For a unity feedback control system shown in Fig.Q6(c), obtain closed loop transfer function, damping ratio, natural frequency and expression for output response subjected to unit step input.

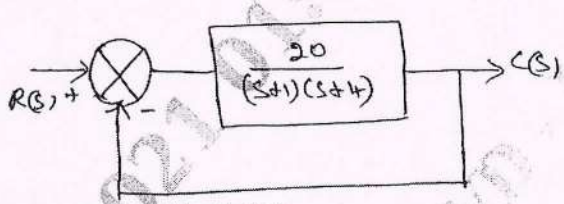

Fig.Q6(c) **(08 Marks)**

Module-4

7 a. Discuss the various rules for construction of root locus. **(06 Marks)**

b. A negative feedback control system is characterized by $G(s)H(s) = \frac{K}{s(s+1)(s+2)(s+3)}$.

Sketch the root locus plot for values of 'K' ranging from 0 to ∞ mark all the salient points on the root locus. **(10 Marks)**

OR

8 a. Construct the Bode plot for a unity feedback control system having $G(s) = \frac{2000}{s(s+1)(s+100)}$,

from the Bode plot, determine:

(i) Gain cross over frequency (ii) Phase cross over frequency

(iii) Gain margin (iv) Phase margin

Comment on stability. **(10 Marks)**

b. Determine the open loop transfer function of a system whose approximate plot is shown in Fig.Q8(b).

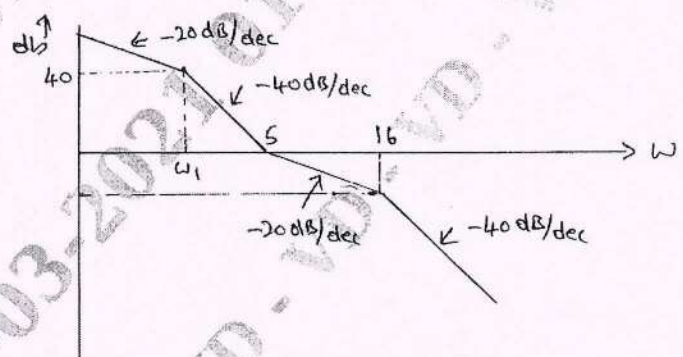

Fig.Q8(b) **(06 Marks)**

Module-5

9 a. State and explain Nyquist stability criterion. **(06 Marks)**

b. Write a note on PID controller. **(10 Marks)**

OR

10 a. Sketch the Nyquist plot for a system with $G(s)H(s) = \frac{10(s+3)}{s(s-1)}$. Comment on closed loop stability. **(10 Marks)**

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

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CBCS SCHEME

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18EE52

Fifth Semester B.E. Degree Examination, July/August 2021
Microcontroller

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions.

1 a. Draw and explain the memory structure of 8051. **(10 Marks)**

b. Draw and explain program status word register of 8051 μc. Calculate the status of carry, auxiliary carry and parity flags after the addition of (i) 55h and 52h (ii) 91h and 92h **(10 Marks)**

2 a. Draw and explain 8051 connection to interface 8K external RAM and 32 K external ROM. **(10 Marks)**

b. With an example, explain any four addressing modes used in 8051. **(06 Marks)**

c. Identify the addressing modes of the source operand (i) MOV A, #2 ch (ii) MOV A, @ RO (iii) Add A, 50h (iv) MOV C A, @ A + dptr **(04 Marks)**

3 a. Define Assembler directives. Explain DB, ORG, EQU, END, IDATA, XDATA. **(10 Marks)**

b. Write a program to complement the content of accumulator 62500 times with comments. **(05 Marks)**

c. Write a subroutine to find factorial of a given number. **(05 Marks)**

4 a. Explain the following instructions with an example (i) DA A (ii) MOV C (iii) SJMP. **(08 Marks)**

b. Write an ALP to toggle all bits of P0 continuously with explanation. **(06 Marks)**

c. Write an delay subroutine using ALP to generate 10 msec. **(06 Marks)**

5 a. Explain the different data types supported by 8051 C with its range. **(05 Marks)**

b. Write an 8051 C program to get a byte of data from P1 and then send it to P2. **(05 Marks)**

c. Write an 8051 C program to generate a rectangular wave of 2 kHz with 60% duty cycle in pin P1.2. Use timer '0' in mode 1 operation. Show delay calculations. **(10 Marks)**

6 a. Explain Mode 1 programming of 8051 timer. Describe the different steps to program in Mode 1. **(10 Marks)**

b. Write an 8051 C program to find the check sum byte of data stream 30 H, 46 H, 5AH, 18 H and display the BCD digits in port P0, P1 and P2. **(10 Marks)**

7 a. Write an 8051 ALP to transfer "HELLO" serially at 9600 band rate. **(05 Marks)**

b. Describe bit status of SCON register. **(05 Marks)**

c. Write the steps to transfer data serially and receive data serially. **(10 Marks)**

8 a. Explain the different interrupts in 8051 showing the 8051 Interrupt Structure Diagram. **(10 Marks)**

b. Write a C program that continuously receives a single bit of data from P1.0 and sends it to P2.0, while simultaneously creating a square wave of 400 μsec period on pin P2.5. Use timer '0' to create the square wave. Assume XTAL = 11.0592 MHz. **(10 Marks)**

9 a. With a neat Interfacing diagram, write an 8051 C to display letters 'B', 'Y' and 'E' to the LCD using delays. **(10 Marks)**

b. Explain the construction and working of Stepper motor along with 4 step sequence table, step angle and steps per revolution. **(10 Marks)**

10 a. With a block diagram, explain 8255 PI chip. Also explain the control word format. **(10 Marks)**

b. Write an 8051 C program to read the state of switch connected to P1.0. If low, apply 50% of power otherwise apply 75% of power to DC motor connected to pin 2.0 through optocoupler. Use PWM technique. **(10 Marks)**

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CBCS SCHEME

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18EE53

Fifth Semester B.E. Degree Examination, July/August 2021
Power Electronics

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Mention the types of power electronic circuits indicating input and output waveforms and two applications of each type. **(10 Marks)**

b. With a neat circuit diagram and waveforms explain the operation of full wave bridge diode rectifier with purely resistive load. Derive the expression for average and RMS value of output voltage, rectification efficiency. **(10 Marks)**

2 a. With a neat circuit diagram and waveforms explain diode switched RL load with necessary equations. **(08 Marks)**

b. With a block diagram explain peripheral effects of power electronic circuits. What are the remedies for them? **(06 Marks)**

c. Briefly explain different types of power diodes. **(06 Marks)**

3 a. For the transistor switching circuit shown in Fig.Q3(a) Determine :
i) The over drive factor ODF
ii) Forced β
iii) Power loss in transistor.
$V_{CE(sat)} = 1.2V$; $V_{BE(sat)} = 1.6V$, $\beta_{min} = 12$.

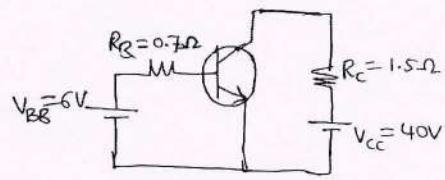

Fig.Q3(a) **(08 Marks)**

b. Draw the switching waveforms of a power MOSFET. Define different switching times associated with it. **(06 Marks)**

c. Sketch the output characteristics of power BJT indicating different operating regions **(06 Marks)**

4 a. Discuss the need for providing isolation of gate drive from power circuit and explain the methods of providing isolation. **(08 Marks)**

b. With a neat circuit diagram, explain the static characteristics of IGBT. **(06 Marks)**

c. Compare power BJT and power MOSFET. **(06 Marks)**

5 a. Derive an expression for the anode current of thyristor with the help of a two transistor analogy. **(08 Marks)**

b. Explain synchronized UJT triggering circuit with relevant waveforms. **(06 Marks)**

c. Explain the VI characteristics of SCR. Also define latching and holding current. **(06 Marks)**

6 a. A string of thyristors each of rating 1600V/16A is operated from a 35.35KV supply. The maximum leakage current difference of SCRS is 35mA and reverse recovery charge difference is 25μC. If the string efficiency is 85% determine the number of devices to be connected in series and equalizing components. **(08 Marks)**

b. An SCR circuit is operated from a 300V DC supply has series inductance of 4μH. A resistance of 4Ω and capacitance of 0.2μF is connected across the SCR. Calculate the safe di/dt and dv/dt ratings of SCR. **(06 Marks)**

c. Explain the VI characteristics of triac. **(06 Marks)**

7 a. With the help of circuit diagram and waveforms explain the working principle of on–off type AC voltage controller. Derive the expressions for RMS output voltage and average thyristor current. **(10 Marks)**

b. A single phase AC voltage controller using triac shown in Fig.Q7(b) operates on a single phase supply of 230V, 50Hz. If the triac is triggered at a firing angle of 45° during each half cycle of input supply, calculate :

i) RMS output voltage
ii) RMS load current
iii) Input power factor
iv) Average and RMS Triac current.

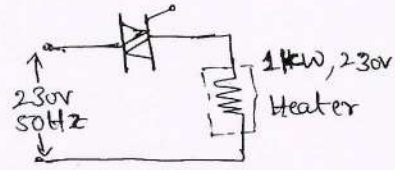

Fig.Q7(b) **(10 Marks)**

8 a. With a neat circuit diagram and waveform explain single phase dual converter operating in circulating current mode. **(10 Marks)**

b. Draw the circuit diagram of single phase half wave controlled rectifier circuit with RL load. Sketch the input voltage, output voltage and output current waveforms. **(10 Marks)**

9 a. A chopper circuit feeding an R – L load is shown in Fig.Q9(a). If V = 220V, R = 5Ω, L = 5mH, f = 1Hz, duty cycle d = 0.5 and E = 0. Calculate : i) I_{min} and I_{max} ii) Average value of load current.

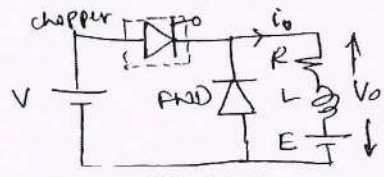

Fig.Q9(a) **(10 Marks)**

b. Explain the principle of operation of step up chopper with suitable circuit diagram. Derive the expression for average output voltage. **(10 Marks)**

10 a. With circuit diagram and waveform explain the operation of single phase full bridge inverter supplying RL load. **(10 Marks)**

b. What are the advantages of PWM techniques? Explain multiple pulse width modulation and sinusoidal pulse width modulations with relevant waveforms. **(10 Marks)**

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CBCS SCHEME

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18EE54

Fifth Semester B.E. Degree Examination, July/August 2021
Signals and Systems

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions.***

1 a. Describe the classification of signals. **(06 Marks)**

b. A continuous signal X(t) shown in Fig Q1(b). Sketch the odd and even signal of X((t).

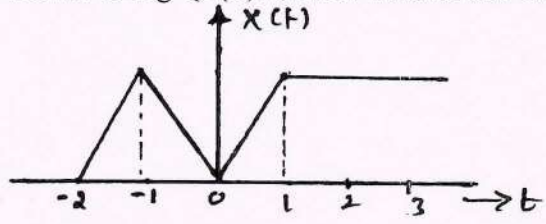

Fig Q1(b) **(06 Marks)**

c. Determine the whether the signals are periodic or non-periodic

i) $X((t) = Cos(2\pi t)\ Sin(4\pi t)$

ii) $X((n) = Cos\left(\frac{\pi n}{2}\right) + Sin\left(\frac{\pi n}{4}\right)$. **(08 Marks)**

2 a. Determine the following signals are energy or power signals.

i) $X(t) = t, \quad 0 < t < 1$

$2 - t \quad 1 \le t \le 2$

$0 \quad$ otherwise

ii) $X(n) = \left(\frac{1}{2}\right)^n u(n)$ **(06 Marks)**

b. Let y(t) and x(t) are given in Fig Q2(b) sketch the following signal.
$z(t) = X((2t) * y(0.5t + 1)$

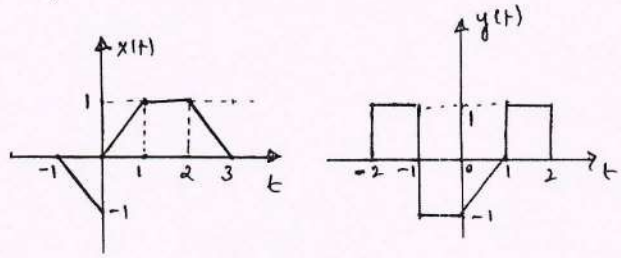

Fig Q2(b) **(06 Marks)**

c. Determine whether the following signals are linear, memoryless, causal, stable and time invariance.

i) $y(n) = X((n^3)$ ii) $y(t) = \frac{d}{dt}[e^{-t}X(t)]$. **(08 Marks)**

3 a. Compute the convolution of the sequences

$X(n) = \alpha^n u(n) \quad y(n) = \beta^n u(n)$

When $\alpha \# \beta$ and $\alpha = \beta$ **(06 Marks)**

b. Obtain the convolution of the two signals. Also sketch the result. Given

$h(t) = 1$ for $1 < t < T$ $\quad X(t) = t \ ; 0 < t < 2T$

0 otherwise $\quad 0$ otherwise **(08 Marks)**

c. Determine the natural response of the system described by the following differential equation

$\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = x(t) + 3\frac{dx(t)}{dt}$ with initial condition are $y(0) = 0$, $\left.\frac{dy(t)}{dt}\right|_{t=0} = 1$ **(06 Marks)**

4 a. A continuous time LTI system is represented by impulse response. Determine whether the system is stable, causal and memory.
i) $h(n) = a^n u(n+2)$ ii) $h(t) = e^{2t}u(t-1)$. **(06 Marks)**

b. Draw the direct form I and direct form II implementation of y

$y(n) + \frac{1}{2}y(n-1) - y(n-3) = x(n) + 3x(n-1) + 2x(n-2)$ **(06 Marks)**

c. Determine the forced response of the system described by difference equation

$y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = 2x(n)$ with input $x(n) = 2u(n)$. **(08 Marks)**

5 a. What are the properties of continuous time Fourier transform? State and prove Parsavel's theorem. **(08 Marks)**

b. Find the Fourier transform of $x(t) = t\,e^{-2t}u(t)$. Draw magnitude and phase spectra. **(06 Marks)**

c. Compute the Fourier transform for the signal x(t). Shown in Fig Q5(c).

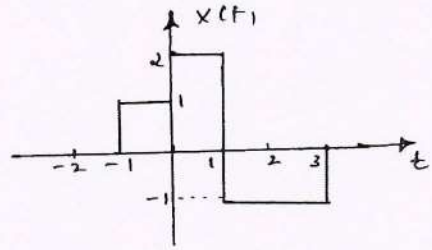

Fig Q5(c) **(06 Marks)**

6 a. Using partial fraction expansion, determine the inverse Fourier transform

$x(jw) = \frac{5jw + 12}{(jw)^2 + 5jw + 6}$. **(06 Marks)**

b. Find the Fourier transform of the following signal using appropriate properties
$x(t) = \text{Sin}(\pi t)\, e^{-2t}\, u(t)$. **(06 Marks)**

c. Find the frequency response and impulse response of the system describe by the differential equation $\frac{d^2y(t)}{dt^2} + 5\frac{dy(t)}{dt} + 6y(t) = -\frac{dx(t)}{dt}$. **(08 Marks)**

7 a. Describe the following properties of DTFT
i) Frequency differentiation ii) Linearity iii) Scaling iv) Modulation. **(08 Marks)**

b. Evaluate the DTFT of the signal $x(n) = \left(\frac{1}{2}\right)^n u(n-4)$. **(06 Marks)**

c. Using appropriate properties, find the DTFT of the following signal

$x(n) = \text{Sin}\left(\frac{\pi}{4}n\right)\left(\frac{1}{4}\right)^n u(n-1)$. **(06 Marks)**

8 a. Find the inverse DTFT of

$$x(e^{jw}) = \frac{6}{e^{-j2\Omega} - 5e^{-j\Omega} + 6}.$$ **(06 Marks)**

b. Obtain the frequency and impulse response of the system having the output y(n) for the input x(n) as given below.

$$x(n) = \left(\frac{1}{2}\right)^n u(n)$$

$$y(n) = \frac{1}{4}\left(\frac{1}{2}\right)^n u(n) + \left(\frac{1}{4}\right)^n u(n)$$ **(08 Marks)**

c. Obtain the difference equation for the system with frequency response.

$$H(e^{jw}) = 1 + \frac{e^{-jw}}{\left(1 - \frac{1}{2}e^{-j\Omega}\right)\left(1 + \frac{1}{4}e^{-j\Omega}\right)}.$$ **(06 Marks)**

9 a. Determine the Z-transform of $x(n) = -u(-n-1) + \left(\frac{1}{2}\right)^n u(n)$. Find the ROC and pole-zero location of x(z) in the Z-pole. **(06 Marks)**

b. What are the properties of Z-transform? Determine the : i) Multiplication by an exponential ii) Translation iii) Multiplication by ramps. **(08 Marks)**

c. Find the Z-transform of the following

i) $x(n) = na^n u(n-3)$

ii) $x(n) = u(-n)$ **(06 Marks)**

10 a. Find the discrete-time sequence x(n) which has Z-transform

$$x(z) = \frac{-1 + 5z^{-1}}{1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2}}.$$ With ROC i) $|z|>1$ ii) $|z| < \frac{1}{2}$. **(06 Marks)**

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

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

$$y(n) = \delta(n) - \frac{3}{4}\delta(n-1)$$ **(06 Marks)**

c. Solve the difference equation

$y(n) - \frac{1}{4}y(n-1) - \frac{1}{8}y(n-2) = x(n) + x(n-1)$. The initial conditions are $y(-1) = 1$, $y(-2) = -1$ with the input $x(n) = 3^n u(n)$. **(08 Marks)**

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CBCS SCHEME

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18EE55

Fifth Semester B.E. Degree Examination, July/August 2021
Electrical Machine Design

Time: 3 hrs. Max. Marks: 100

Note: 1. ***Answer any FIVE full questions.***
2. ***Assume any missing data suitably.***

1 a. What do you mean by Design of Machines? What are the major considerations to evolve a good design? **(06 Marks)**

b. With the help of a neat sketch, explain the basic structure of an electromagnetic rotating machine. **(07 Marks)**

c. What are the fundamental requirements of high conductivity materials? **(07 Marks)**

2 a. Discuss the factors which limit the design of a machine. **(10 Marks)**

b. Explain the classification of Insulating materials for electrical machinery is relation to their thermal stability. Give two examples for each class. **(10 Marks)**

3 a. What are the main dimensions in design of rotating machines? What do you mean by specific magnetic and specific electric loadings? **(05 Marks)**

b. Develop the output equation of a DC machine. **(05 Marks)**

c. Find the main dimensions of a 200kW, 250V, 6 pole, 1000rpm generator. The maximum value of flux density in the gap is 0.87wb/m^2 and the ampere conductors per meter of armature periphery are 31000. The ratio of pole arc to pole pitch is 0.67 and the efficiency is 91 percent. Assume the ratio of length of core to pole pitch = 0.75. **(10 Marks)**

4 a. What are the guiding factors for choice of number of poles in DC machines? **(04 Marks)**

b. What are the factors to be considered for selecting the number of armature slots? **(06 Marks)**

c. Find the main dimensions and number of poles of a 37kW, 230V, 1400rpm shunt motor so that a square pole face is obtained. The average gap density is 0.5wb/m^2 and the ampere conductors per meter are 22,000. The ratio of pole arc to pole pitch is 0.7 and the full load efficiency is 90 percent. **(10 Marks)**

5 a. Develop the output equation for a single phase as well as a three phase transformer. **(06 Marks)**

b. A 3-phase, 50Hz, oil cooled core type transformer has the following dimensions: distance between core centers = 0.2m ; height of window = 0.24m ; diameter of circumscribing circle = 0.14m. The flux density in the core is 1.25wb/m^2 and the current density in the conductors is 2.5A/mm^2. Estimate the KVA rating. Assuming a window space factor of 0.2 and a core area factor = 0.56. The core is two stepped. **(06 Marks)**

c. Explain how the temperature rise and the number of cooling tubes of the transformer are calculated. **(08 Marks)**

6 a. Prove that EMF/turn of a single phase transformer is $K\sqrt{Q}$ where Q = output KVA rating of transformer. **(04 Marks)**

b. Show that the ratio of Net core area to area of circumscribing circle is i) 0.58 for square core ii) 0.71 for stepped or cruciform core. **(06 Marks)**

c. The tank of a 1250KVA natural oil cooled transformer has the dimensions length, width and height as 1.55m × 0.65m × 1.85m respectively. The full load loss is 13.1kW. Find the number of tubes for this transformer assuming W/m^2 - °C due to radiation = 6 ; W/m^2 - °C due to convection = 6.5, Improvement is convection due to provision of tubes = 40 percent temperature rise = 40°C ; length of each tube = 1m ; diameter of tubes = 50mm. Neglect to top and bottom surfaces of the tank as regards cooling. **(10 Marks)**

7 a. What are the main dimensions of Induction motor? What are the desired values of L/τ, peripheral speed and width of ventilation ducts? **(05 Marks)**

b. Discuss the factors to be considered for selection of number of slots for the stator of induction motor. **(05 Marks)**

c. Determine the approximate diameter and length of the stator core, the number of stator slots and the number of conductors for a 11kW, 400V, 3 phase, 4 pole, 1425 rpm delta connected Induction motor. Adopt a specific magnetic loading of 0.45 wb/m^2 and a specific electric loading of 23,000 A/m. Assume full load efficiency and power factor as 0.85 and 0.88 respectively. The ratio of core length to pole pitch is 1. The stator employs a double layer winding. **(10 Marks)**

8 a. With usual notations, derive the output equation for a three phase induction motor. **(06 Marks)**

b. What are the factors to be considered when estimating the length of air gap in a induction motor. **(07 Marks)**

c. A 11kW, 3 phase, 6 pole, 50Hz, 220V, star connected induction motor has 54 stator slots, each containing 9 conductors. Calculate the values of bar and end ring currents. The number of rotor bars is 64. The machine has an efficiency of 0.86 and a power factor of 0.85. The rotor mmf may be assumed as 85 percent of stator mmf. Also find the bar and the end ring sections of the current density is $5A/mm^2$. **(07 Marks)**

9 a. Derive the output equation of the synchronous machine. **(06 Marks)**

b. Discuss the factors to be considered for the selection of armature slots is synchronous machines. **(07 Marks)**

c. Determine for a 500KVA, 50Hz, 3 phase alternator to run at 375rpm. Take mean gap density over the pole $0.55wb/m^2$, the specific electric loading as 25,000A/m. The peripheral speed should not exceed 35m/s. **(07 Marks)**

10 a. What are the factors to be considered for choice of specific magnetic loading and specific electric loading of synchronous machines? **(06 Marks)**

b. Define SCR of a synchronous machine. Discuss the effects of SCR on machine performance. **(06 Marks)**

c. The field coils of a salient pole alternator are wound with a single layer winding of base copper strip 30mm deep, with separating insulation 0.15mm thick. Determine a suitable winding length, number of turns and thickness of conductor to develop an mmf of 12000A with a potential difference of 5V per coil and with a loss of $1200w/m^2$ of total coil surface. The mean length of turn is 1.2m. The resistivity of copper is $0.021\Omega/m$ and mm^2. **(08 Marks)**

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18EE56

Fifth Semester B.E. Degree Examination, July/August 2021
High Voltage Engineering

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions.***

1 a. What is Paschen's law? How do you account for the minimum voltage for breakdown under a given "p×d" condition? **(06 Marks)**

b. Derive an expression for the current in the air gap that is $i = i_0 e^{\alpha d}$ considering Townsend's first ionization co-efficient. **(07 Marks)**

c. In an experiment in a certain gas it was found that the steady state current is 5.5×10^{-8} A at 8 KV at a distance of 0.4 cm between the plane electrodes. Keeping the field constant and reducing the distance to 0.1 cm results in a current of 5.5×10^{-9} A. Calculate Townsend's primary ionization coefficient α. **(07 Marks)**

2 a. Explain briefly Bubble theory of breakdown in liquid dielectrics. **(05 Marks)**

b. Explain suspended particle theory of breakdown in liquid dielectric. **(05 Marks)**

c. Explain the following breakdown mechanism in solid dielectrics,
   (i) Electro Mechanical breakdown.
   (ii) Thermal breakdown. **(10 Marks)**

3 a. Explain with a neat diagram and waveforms the voltage multiplier circuit using Cockcraft-Walton principle. **(07 Marks)**

b. A Cockcraft-Walton type voltage multiplier has 10 stages with capacitance all equal to 0.08 μF. The supply transforms secondary voltage is 115 KV at a frequency of 150 Hz. If the load current to be supplied is 10 mA, find:
   (i) Average ripple.
   (ii) The regulation.
   (iii) The optimum number of capacitors for minimum regulation or voltage drop. **(08 Marks)**

c. Explain the necessary of using isolating transformers for excitation with cascade transformer units, if the power requirement is large? **(05 Marks)**

4 a. With neat sketch, explain the Mark's circuit arrangement for multistage impulse generator. **(07 Marks)**

b. Define the wave front and wave tail times of an impulse voltage wave. What are the percentage tolerances for a standard lighting impulse wave? **(06 Marks)**

c. Calculate the front and tail resistance for 5 stages. 1000 KV with capacitance of each stage is 5 μF and a load capacitance of 10000 pF for 1 μs front and 50 μs tail wave. **(07 Marks)**

5 a. Explain the working principle of generating voltmeter with a diagram. **(08 Marks)**

b. A generating voltmeter is required to measure voltage between 15 KV to 250 KV. If the indicating meter reads a minimum current of 2 μA and a maximum of 35 μA, determine the capacitance of the generating voltmeter. The speed of the drive motor is 1500 rpm. **(04 Marks)**

c. What is Rogowski coil? Explain with a neat diagram its principle of operation for measurement of high impulse currents. **(08 Marks)**

6 a. Explain the factors that influence the measurement of high voltage using sphere gaps. **(08 Marks)**

b. Write a note on Cathode-Ray oscillographs for impulse measurements. **(08 Marks)**

c. How is a compensated dc potential divider used to measure the dc voltage in HVDC systems? **(04 Marks)**

7 a. Explain the different theories of charge formation in clouds. **(08 Marks)**

b. With suitable figs explain the principles and functioning of,
(i) Expulsion gaps (ii) Protector tubes **(08 Marks)**

c. Write a note on characteristics of lightning strokes. **(04 Marks)**

8 a. Write a note on surge arresters. **(08 Marks)**

b. Explain the principles of insulation coordination on HV and EHV power system. **(08 Marks)**

c. Write a note on insulation levels at substations with protective zones. **(04 Marks)**

9 a. Explain the operation of Schering bridge for three terminal measurements. **(10 Marks)**

b. Explain discharge detection using straight detector for partial discharge measurement. **(10 Marks)**

10 a. A 33 KV, 50 Hz, high voltage Schering Bridge is used to test a sample of insulation. The various arms have the following parameters on balance. The standard capacitance 500 pF, the resistive branch 500 ohms and branch with parallel combination R and C, has 180 Ω and 0.15 μF. Determine the value of capacitance of this sample, its parallel equivalent loss resistance, the PF and power loss under these conditions. **(08 Marks)**

b. Write a short note on testing of cables. **(05 Marks)**

c. Explain the methods to test the insulators and bushings. **(07 Marks)**

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17EE52

Fifth Semester B.E. Degree Examination, July/August 2021
Microcontroller

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions.***

1 a. Distinguish between microprocessor and micro controller's. **(04 Marks)**

b. Briefly discuss the features of 8051 microcontroller. **(06 Marks)**

c. With neat diagram, explain the internal architecture of 8051. **(10 Marks)**

2 a. Identify the addressing mode's of the following instruction and byte-size:

(i) XCHD A, @ R_O

(ii) MOVC A, @A+DPTR

(iii) SUBB A, #55H

(iv) DA A.

(v) MOV A, @R_O **(10 Marks)**

b. Explain the bit pattern of P.S.W **(05 Marks)**

c. Interface 8051 to external ROM and RAM and explain how 8051 access them. **(05 Marks)**

3 a. What are assembler directives? Explain them with an example. **(06 Marks)**

b. Briefly explain about what are the steps for assembly and running of 8051 program. **(06 Marks)**

c. Write an 8051 assembly program to find average of 5 numbers stored from internal data memory address 40 h. **(08 Marks)**

4 a. Explain the following instruction with an example:

(i) CJNE A, #n, radd

(ii) SWAP A

(iii) RRC A **(06 Marks)**

b. Consider 10 bytes of data from data RAM location 45h to 54h. Add 02 to each of them and save the result, in data RAM location 79h to 70h. **(06 Marks)**

c. Write an ALP to subtract two 16 bit no's. **(08 Marks)**

5 a. Explain the different data type's supported by 8051 microcontroller. **(08 Marks)**

b. Write an 8051C program to toggle. The bit of P_1 ports continuously with 250 msec delay. **(06 Marks)**

c. Write an 8051C program to convert packed BCD no's of 29 to ASCII and display the bits on P_1 and P_2. **(06 Marks)**

6 a. Explain Mode-2 programming on 8051 timer. Describe the different steps to program in Mode-2. **(10 Marks)**

b. Write an ALP in 8051 which generate and a square wave of frequency 10 kHz on P1.2 using timer 1 mode 1. Assume crystal frequency of 11.0592 MHz. **(10 Marks)**

7 a. What is the need for serial communication? Explain simplex, half duplex and full duplex transmission with the help of figures. **(08 Marks)**

b. Briefly explain about DB-9 connector pins function. **(06 Marks)**

c. Write a C program for the 8051 to transfer. The letter 'C' serially at 9600 baud rate continuously. Use 8-bit data and one stop bit. **(06 Marks)**

8 a. What is an Interrupt? List the various interrupts of the 8051 with their corresponding vector address. **(08 Marks)**

b. Explain the bit status of IP Register. **(06 Marks)**

c. Write the steps required for programming 8051 to receive data serially. **(06 Marks)**

9 a. Draw the block diagram to show how 8051 is connected to DAC 0808 at Port 1, using output buffer for DAC and explain. **(10 Marks)**

b. Write an 8051 C-program to send letter's M, D and E to the LCD using delay's. **(10 Marks)**

10 a. Explain how a Stepper. Motor can be connected to 8051 micro controller with neat diagram. **(10 Marks)**

b. Write a program of switch SW is connected to pin P0.0. Write a program to do the following:

(i) When SW = 0, the DAC output give's stair case waveform.

(ii) If SW = 1, the DAC output gives a triangular waveform. **(10 Marks)**

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17EE53

Fifth Semester B.E. Degree Examination, July/August 2021
Power Electronics

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions.***

1 a. Explain 5 types of power electronics converter system and also specify the form of input and output wave forms. **(10 Marks)**

b. With block diagram, explain the peripheral effect and remedies of power electronics. **(06 Marks)**

c. Mention the applications of power electronics. **(04 Marks)**

2 a. With the help of diagram, explain the reverse recovery characteristics of a power diode. And also obtain an expressions for reverse recovery time and peak reverse current. **(10 Marks)**

b. The reverse recovery time of a diode is 5μsec and rate of fall of diode current is 80A/μsec. Calculate :
i) Q_{RR} (storage charge)
ii) I_{RR} (peak reverse recovery current). **(04 Marks)**

c. Briefly explain different types of power diode. **(06 Marks)**

3 a. Give the list of base drive control circuit for BJT. With neat diagram, explain anti-saturation control. **(07 Marks)**

b. With neat circuit diagram and switching times explain steady state and switching characteristics of power MOSFET. **(08 Marks)**

c. With necessary wave form explain the switching characteristic of an IGBT. **(05 Marks)**

4 a. Explain briefly isolation of gate drive using :
i) pulse transformer and ii) optocoupler. **(06 Marks)**

b. List and explain the switching limits of power BJT. **(08 Marks)**

c. The β of bipolar transistor varies from 12 to 75. The load resistance $R_c = 1.5\Omega$. The supply voltage $V_{CC} = 40V$ and base input voltage is 6V. If $V_{CE(sat)} = 1.2V$, $V_{BE(sat)} = 1.6V$ and $R_B = 0.7\Omega$, calculate :
i) ODF ii) Forced β iii) Total power loss in transistor. **(06 Marks)**

5 a. Explain the operation of thysistor with the help of two-transistor model, also derive expression for anode current. **(09 Marks)**

b. With the circuit diagram and wave forms explain the working of UJT triggering technique of SCR. **(07 Marks)**

c. A SCR is connected in series with 0.5H inductor and 20Ω resistor. A 100V DC voltage is applied to the circuit. If the latching current of the SCR is 4mA. Find the minimum width of the gate triggering pulse required to properly turn on the SCR. **(04 Marks)**

6 a. With current and voltage wave forms explain briefly dynamic turn ON and turn OFF characteristics of SCR. **(09 Marks)**

b. Briefly explain the dv/dt and dI/dt protection of the thrysistor. **(07 Marks)**

c. Calculate the required parameter for snubber circuit to provide dv/dt protection to a SCR used in single phase bridge converter. The SCR has a maximum dv/dt capability of 60V/μsec. The input line voltage has a peak value of 425V and the source inductance of 0.2mH. Assume $\sigma = 0.65$. **(04 Marks)**

7 a. With necessary wave forms, explain the operation of a single phase AC voltage controller with resistive load. Derive the expression for the rms output voltage. **(08 Marks)**

b. A single phase full wave AC voltage controller has an input voltage of 230V and a load resistance of 10Ω. The firing angle is 45°. Calculate :

i) RMS output voltage

ii) The output power

iii) The input power factor. **(08 Marks)**

c. Briefly explain the applications of AC voltage controller. **(04 Marks)**

8 a. With neat circuit diagram and associated waveform explain the operation of 1–ϕ half wave controlled rectifier with freewheeling diode across RL load. **(08 Marks)**

b. With circuit diagram and waveforms explain briefly working of single phase dual converter. **(08 Marks)**

c. What are the significance of circulating current in dual converter. **(04 Marks)**

9 a. Explain the principle of step down chopper and derive an expression for average and output rms voltage. **(07 Marks)**

b. Classify the different types of chopper, the help of circuit and quadrant diagram. Explain the operation of four quadrant chopper. **(09 Marks)**

c. A chopper circuit is operating on thysistor at a frequency of 2KHz, on a 460V supply, if the load voltage of 350V calculate the conduction period of thysistor in each cycle. **(04 Marks)**

10 a. Explain the voltage control of single phase inverter using :

i) Multiple pulse width modulation

ii) Sinusoidal pulse width modulation. **(10 Marks)**

b. Briefly explain the factors that influence the performance of inverter. **(08 Marks)**

c. Write comparison between Voltage Source Inverter (VSI) and Current Source Inverter (CSI). **(02 Marks)**

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17EE54

Fifth Semester B.E. Degree Examination, July/August 2021
Signals and Systems

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions.

1 a. Explain the classification of signals. **(08 Marks)**

b. Find and sketch the even and odd components of the following:

$$x(t) = \begin{cases} t & 0 \le t \le 1 \\ 2-t & 1 \le t \le 2 \end{cases}$$ **(06 Marks)**

c. Check whether the following signals are periodic or not. If periodic, find the fundamental period. i) $x_1(n) = \cos 2\pi n$ ii) $x_2(n) = \cos 2n$. **(06 Marks)**

2 a. Explain the properties of systems. **(06 Marks)**

b. Determine whether the system $y(t) = x(t^2)$ is i) Linear ii) Time-invariant iii) Casual iv) Stable. **(08 Marks)**

c. A continuous time signal x(t) show in Fig.Q.2(c). Draw the signal $y(t) = \{x(t) + x(2-t)\}\, u(1-t)$. **(06 Marks)**

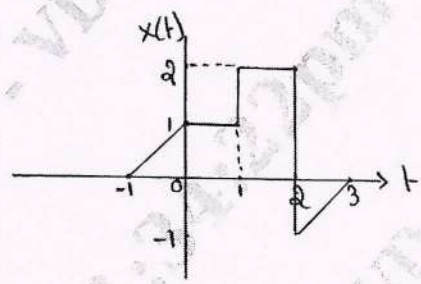

Fig.Q.2(c)

3 a. Derive the equation for convolution integral. **(06 Marks)**

b. A continuous time LTI system with unit impulse response h(t) = u(t) and input $x(t) = e^{-at}u(t)$; a > 0, find the output y(t) of the system. **(08 Marks)**

c. A difference equation of a discrete time system is given $y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n) + \frac{1}{2}x(n-1)$. Draw direct form-I and direct form-II structures. **(06 Marks)**

4 a. Find the response of the system described by the difference equation $y(n) - \frac{1}{9}y(n-2) = x(n-1)$ with $y(-1) = 1, y(-2) = 0$ and $x(n) = u(n)$. **(10 Marks)**

b. Find the total response of the system given by $\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = 2x(t)$ with $y(0) = -1$; $\left.\frac{dy(t)}{dt}\right|_{t=0} = 1$ and $x(t) = \cos t\, u(t)$. **(10 Marks)**

5 a. Find the Fourier transform of rectangular pulse shown below:

$$x(jw) = \frac{1}{(a + jw)^2}$$ **(08 Marks)**

b. Obtain the Fourier transform of $x(t) = te^{-at} u(t)$. **(06 Marks)**

c. State any six properties of the continuous time Fourier transform. **(06 Marks)**

6 a. State and prove the following properties of Fourier transform i) Time Shifting Property ii) Parseval's theorem. **(10 Marks)**

b. The impulse response of a continuous-time LTI system is given by $h(t) = \frac{1}{Rc} e^{-t/Rc} u(t)$. Find the frequency response and plot the magnitude and phase response. **(10 Marks)**

7 a. Find the OTFT of the signal, $x(n) = \alpha^n u(n)$; $|\alpha| < 1$. Draw the magnitude spectrum. **(06 Marks)**

b. Obtain the frequency response and the impulse response of the system described by the difference equation given by $y(n) + \frac{1}{2} y(n-1) = x(n) - 2x(n-1)$ **(06 Marks)**

c. Compute the DTFT of the following signals:

i) $x(n) = 2^n u(-n)$ ii) $x(n) = a^{|n|}$; $|a| < 1$ **(08 Marks)**

8 a. State and prove Parseval's theorem in discrete time domain. **(08 Marks)**

b. Obtain the frequency response and the impulse response of the system having the output y(n) for the input x(n) as given below.

$$x(n) = \left[\frac{1}{2}\right]^n u(n) \; ; \; y(n) = \frac{1}{4}\left[\frac{1}{2}\right]^n u(n) + \left[\frac{1}{4}\right]^n u(n)$$ **(06 Marks)**

c. Obtain the difference equation for the system with frequency response.

$$H(e^{j\Omega}) = 1 + \frac{e^{-j\Omega}}{\left(1 - \frac{1}{2}e^{-j\Omega}\right)\left(1 + \frac{1}{4}e^{j\Omega}\right)}$$ **(06 Marks)**

9 a. Define ROC and explain its properties. **(06 Marks)**

b. Find the z-transform of the following:

i) $x(n) = \alpha^{|n|}$, $0 < |\alpha| < 1$ ii) $n\left[\frac{1}{2}\right]^n u(n) * \left[\delta(n) + \frac{1}{2}\delta(n-1)\right]$ **(08 Marks)**

c. Find x(z) if $x(n) = -\alpha^n u(-n-1)$ and find the ROC. **(06 Marks)**

10 a. Solve the following difference equation using Z-transform $x(n-2) - 9x(n-1) + 18x(n) = 0$. Initial conditions are $x(-1) = 1$, $x(-2) = 9$. **(10 Marks)**

b. Find inverse z-transform of the following using partial fraction expansion method.

$$X(z) = \frac{\left(1 + 2z^{-1} + z^{-2}\right)}{\left(1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2}\right)}$$ **(10 Marks)**

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