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15EE51

Fifth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Management and Entrepreneurship

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Briefly explain the functional area's of management. **(06 Marks)**
b. Bring out the difference between management and administration. **(05 Marks)**
c. Discuss the importance of planning. **(05 Marks)**

OR

2 a. Explain the various roles a manager plays. **(05 Marks)**
b. Explain the different types of plans. **(06 Marks)**
c. Briefly explain the steps in decision making. **(05 Marks)**

Module-2

3 a. What are the various principles of organization? **(05 Marks)**
b. What is committees and explain the different types of committees? **(05 Marks)**
c. Explain with a diagram Maslow's theory of motivation. **(06 Marks)**

OR

4 a. Distinguish between centralization and decentralization. **(05 Marks)**
b. Define staffing. Explain importance and functions of staffing. **(06 Marks)**
c. Explain the meaning and importance of coordination. **(05 Marks)**

Module-3

5 a. Explain social responsibities of business towards different groups. **(05 Marks)**
b. Explain the different stages of an Entrepreneural process. **(06 Marks)**
c. Explain the role of an entrepreneurs in economic development in INDIA. **(05 Marks)**

OR

6 a. What are the qualities of an Entrepreneur? **(05 Marks)**
b. What are the functions of an entrepreneurs? **(05 Marks)**
c. Write a note on social audit and business ethics. **(06 Marks)**

Module-4

7 a. Explain the different policies for development of SSI in INDIA. **(06 Marks)**
b. Explain the impact of Liberalization, Privatization and Globalization on SSI's. **(05 Marks)**
c. Write a note on TECSOK (Technical Consultancy Services Organization of Karnataka). **(05 Marks)**

OR

8 a. What are the different roles of SSI's? **(05 Marks)**
b. Explain the Impact of GATT and WTO. **(05 Marks)**
c. Write a note on (i) KIADB (ii) KSFC **(06 Marks)**

Module-5

9 a. Explain the factors to be considered for selection of projects. **(05 Marks)**
b. List the various contents of the project report. **(06 Marks)**
c. Explain PERT and CPM. **(05 Marks)**

OR

10 a. Explain the process of project appraisal. **(06 Marks)**
b. Explain the need and significance of project report. **(05 Marks)**
c. What are the guidelines by planning commission for a project report? Explain. **(05 Marks)**

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15EE52

Fifth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Microcontroller

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Draw the programming model of 8051 µc. Explain the function of following :
(i) Accumulator, Register B and CPU Registers.
(ii) Program controller, Stack and Stack pointer **(10 Marks)**

b. After adding the following data, show the states of CY, AC and P flags:
(i) 55h and AAh
(ii) 12h and 62h **(06 Marks)**

OR

2 a. Explain the internal RAM organization of 8051 with suitable diagrams. **(08 Marks)**

b. How many address lines are required for accessing the data in the following memory ICs, while data is organized as bytes:
(i) 512 bytes RAM (ii) 8K RAM. **(04 Marks)**

c. Explain the program ROM space allocation for the following :
(i) EA = 0 for 8751 chip (ii) EA = V_{CC} with both on-chip and off-chip ROM for 8751. **(04 Marks)**

Module-2

3 a. Explain the following assembler directives:
(i) DB (ii) ORG (iii) EQU **(06 Marks)**

b. Explain the working of the instruction SUBB when borrow = 0 and borrow = 1. **(06 Marks)**

c. A student has to take 6 courses in a semester. The marks of the student out of 25 are stored in RAM locations 50h onwards. Write a program to find the average marks and save it in Register R6. **(04 Marks)**

OR

4 a. Write a program to complement the value AAh, 800 times. **(04 Marks)**

b. With respect to Port 0, explain the following :
(i) Working of Port 0
(ii) Dual role of Port 0
(iii) Example program to use Port 0 as input and output. **(08 Marks)**

c. Write a program to generate a square wave of 50% duty cycle on bit 5 of Port-2. **(04 Marks)**

Module-3

5 a. Write an 8051 'C' program to send values – 4 to +4 to Port P1. **(05 Marks)**

b. Write 8051 'C' program to toggle all the bits of P0 and P2 continuously with 250 ms delay. **(05 Marks)**

c. Write an 8051 'C' program to convert packed BCD 0×28 to ASCII and display bytes on P1 and P2. **(06 Marks)**

OR

6 a. Explain Mode-1 programming of 8051 timer. Describe the different steps to program in Mode-1. **(08 Marks)**

b. Write 8051 assembly program to generate square wave with t_{ON} = 3ms and t_{OFF} = 10ms on all pins of Port 0. System clock is 22 MHz. Use timer 0 in Mode-1. **(08 Marks)**

Module-4

7 a. Describe bit status of SCON register. **(08 Marks)**

b. Write 8051 assembly program to receive the data in serial form and send it out to Port-0 in parallel form. Save the data in RAM location 62h. Assume baud rate = 9600. Use timer 1 in Mode 2. **(05 Marks)**

c. Calculate the baud rate if TH1 = – 2, SMOD = 1, XTAL = 11.0592 MHz. Is this baud rate supported by IBM PCS? **(03 Marks)**

OR

8 a. Explain the steps in executing an interrupt. **(04 Marks)**

b. Write 8051 assembly program in which 8051 reads data from P1 and writes it to P2 continuously while giving a copy of it to serial COM port to be transferred serially. Assume baud rate = 9600 and XTAL = 11.0592 MHz. Use timer –1 in mode 2. **(08 Marks)**

c. Explain the bit status of IP Register. **(04 Marks)**

Module-5

9 a. Calculate the address range of 16×2 LCD and 20×1 LCD. **(03 Marks)**

b. Explain the internal architecture of ADC 0804 and its timing diagram to convert analog data to digital form. **(10 Marks)**

c. Consider 8 bit ADC. Assume V_R = 5V. Calculate the 8 bit digital output when V_{in} = 3V. **(03 Marks)**

OR

10 a. Write 8051 assembly program to rotate a stepper motor 64° in clockwise direction. The motor has step angle of 2°. Use 4 step sequence and draw the schematic diagram. Steps per revolution = 180, number of rotor teeth = 45. Movement per 4 step sequence = 8°. **(08 Marks)**

b. What is PWM technique? Explain bidirectional motor control using L293 chip. If SW = 0, the dc motor moves clockwise and if SW = 1, the dc motor moves counter-clockwise. Draw the schematic diagram. Write 8051 assembly program to do this. **(08 Marks)**

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15EE53

Fifth Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. Explain any five types of power electronics converter system and also specify the form of input and output waveforms. **(10 Marks)**

b. With block diagram, explain the peripheral effects and remedies of power electronic converter system. **(06 Marks)**

OR

2 a. With circuit diagram and waveforms explain uncontrolled single phase full wave rectifier with RL load. **(08 Marks)**

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

Module-2

3 a. Explain the different types of base drive control circuits for BJT. **(08 Marks)**

b. In the bipolar transistor circuit shown in Fig.Q.3(b) B various between 5 and 50. The load resistance $R_C = 10\Omega$, $V_{CC} = 180V$ and $V_{BB} = 10V$. If $V_{CE(sat)} = 1.0V$ and $V_{BE(sat)} = 1.4V$. Calculate:

i) The value of R_B that results in saturation with an overdrive factor of 6.

ii) The forced B_f

iii) The total power loss in the transistor. **(08 Marks)**

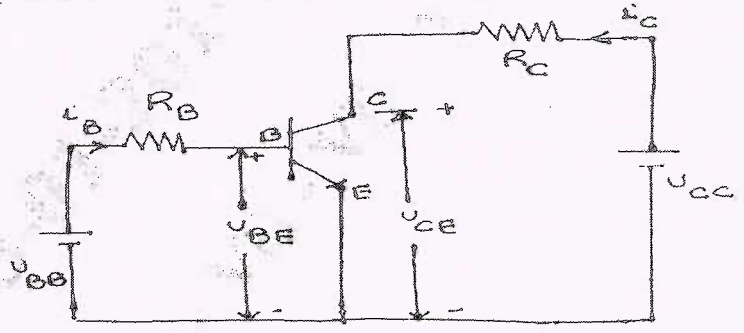

Fig.Q.3(b)

OR

4 a. Sketch the structure of n-channel enhancement type MOSFET and explain its working principle. **(08 Marks)**

b. The IGBT shown in the circuit of Fig.Q.4(b) has the following data: t_{on} = 3μsec, t_{off} = 1.2μsec, duty cycle D = 0.7, $V_{ce(sat)}$ = 2V, f_s = 1kHz. Calculate:
   i) Average load current.
   ii) Conduction power loss.
   iii) Switching power loss during turn-on and turn off. **(08 Marks)**

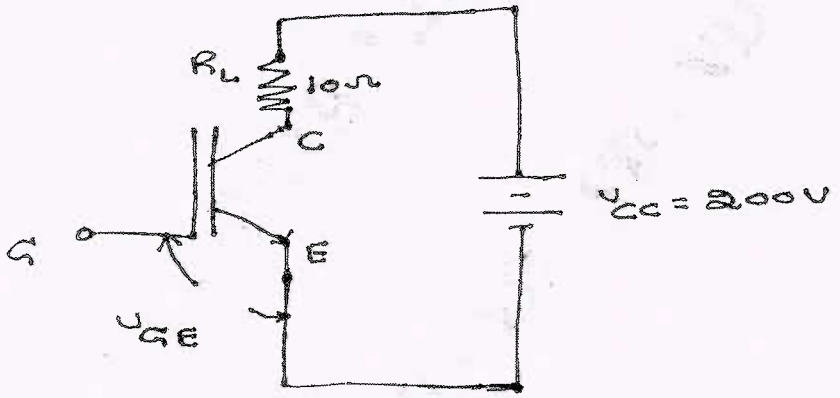

Fig.Q.4(b)

Module-3

5 a. Derive an expression for the anode current of thyristor with the help of transistor analogy. **(10 Marks)**

b. For the circuit shown in Fig.Q.5(b) if the latching current is 4mA, calculate the minimum width of gate pulse required to properly turn on the SCR. **(06 Marks)**

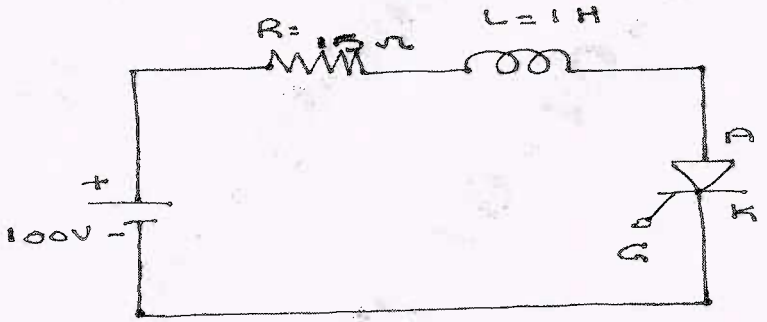

Fig.Q.5(b)

OR

6 a. With circuit diagrams and wave forms explain the method of protection of SCR. **(10 Marks)**

b. How many SCRS are required in a series string to withstand a d.c. voltage of 5000V in steady state, if the SCRS have steady state voltage rating of 1200V and the steady state derating factor is 10%. Assuming maximum difference in leakage current of SCRS to be 12mA, calculate the value of voltage sharing resistance to be used. **(06 Marks)**

Module-4

7 a. With circuit diagram and waveforms explain dual converters. **(08 Marks)**

b. With circuit diagram and waveforms explain the operation of three phase full converters. **(08 Marks)**

OR

8 a. With circuit diagram and wave forms explain the operation of full wave ac voltage controller connected to resistive load. And also obtain the equation for RMS output voltage. **(08 Marks)**

b. A single phase half wave ac voltage controller has an input voltage of 200V and a load resistance of 10Ω. The firing angle of each thyristor is 30 degree in each positive half cycle. Calculate:

i) Average output voltage
ii) RMS output voltage
iii) Power output
iv) Power input. **(08 Marks)**

Module-5

9 a. With circuit diagram and waveforms explain the working of class D chopper. **(08 Marks)**

b. A step up chopper has input voltage of 200V and output voltage of 660V. If the nonconducting time of thyristor is 100μsec. Calculate the pulse width of the output voltage. If the pulse width is halved for constant frequency operation, calculate the new output voltage. **(08 Marks)**

OR

10 a. With circuit diagram explain the operation of a single phase full bridge inverter supplying a resistive load. **(08 Marks)**

b. Explain any two modulation techniques available for voltage control of a single phase inverter. **(08 Marks)**

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15EE54

Fifth Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. Distinguish between
i) Continuous and Discrete time signals
ii) Even and Odd signals
iii) Periodic and Non-periodic signals
iv) Deterministic and Random signals
v) Energy and Power signals. **(10 Marks)**

b. Determine and sketch the even and odd parts of the signal shown in Fig Q1(b)

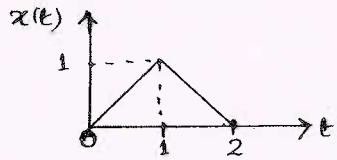

Fig Q1(b) **(06 Marks)**

OR

2 a. Determine whether the following signals are periodic, if periodic determine the fundamental period i) $x(t) = \cos 2t + \sin 3t$ ii) $x[n] = \cos\left(\frac{n\pi}{5}\right) \sin\left(\frac{n\pi}{3}\right)$ **(08 Marks)**

b. Using convolution integral, determine and sketch output of LTI system whose input and impulse response is $x(t) = e^{-3t}\left[u(t) - u(t-2)\right]$ and $h(t) = e^{-t}u(t)$ **(08 Marks)**

Module-2

3 a. Determine the convolution sum of two sequences
$x[n] = \left\{3, \underset{\uparrow}{2}, 1, 2\right\}$ and $h[n] = \left\{1, \underset{\uparrow}{2}, 1, 2\right\}$. **(08 Marks)**

b. Find the step response of an LTI system, if impulse responses are
i) $h(t) = t^2 u(t)$ ii) $h[n] = \left(\frac{1}{2}\right)^n u[n]$ **(08 Marks)**

OR

4 a. Find the output response of the system described by a differential equation $\frac{d^2y(t)}{dt^2} + 6\frac{dy(t)}{dt} + 8y(t) = \frac{dx(t)}{dt} + 2x(t)$. The input signal $x(t) = e^{-t}u(t)$ and initial conditions are $y(0) = 2$, $\frac{dy(0)}{dt} = 3$. **(06 Marks)**

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

c. Check whether the response of LTI system $y[n] = 2x[n+1] + 3x[n] + x[n-1]$ is causal and stable? **(04 Marks)**

Module-3

5 a. State and prove the following properties in continuous time Fourier transform i) Linearity ii) Time shift iii) Time differentiation. **(10 Marks)**

b. Find the Fourier Transformation of $x(t) = e^{-at} u(t)$, $a > 0$. **(06 Marks)**

OR

6 a. Using partial fraction expansion and linearity to determine the inverse Fourier transform of

$$x(j\omega) = \frac{-j\omega}{(j\omega)^2 + 3j\omega + 2}$$ **(08 Marks)**

b. Find the frequency response and impulse response of the system described by the differential equation.

$$\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = 2\frac{dx(t)}{dt} + x(t)$$ **(08 Marks)**

Module-4

7 a. State and prove the following properties in Discrete time Fourier transform i) Frequency shift ii) Parseval's theorem. **(10 Marks)**

b. Find DTFT of the following signal

i) $x[n] = \left(\frac{1}{2}\right)^{n+2} u[n]$ ii) $x[n] = 2(3)^n u[-n]$ **(06 Marks)**

OR

8 a. Using DTFT, find the total solution to the difference equation for discrete time $n \geq 0$.

$5y(n+2) - 6y(n+1) + y(n) = (0.8)^n u(n)$ **(08 Marks)**

b. Determine the difference equation description for the system with the following impulse response $h[n] = \delta[n] + 2\left(\frac{1}{2}\right)^n u(n) + \left(\frac{-1}{2}\right)^n u(n)$ **(08 Marks)**

Module-5

9 a. What is region of convergence? List any 5 properties of ROC. **(07 Marks)**

b. Find the z-transform and ROC of the signal $x[n] = -b^n u[-n-1]$ **(05 Marks)**

c. State and prove time shift property. **(04 Marks)**

OR

10 a. Determine the inverse z-transform of x(z)

$$x(z) = \frac{1}{1 - 1.5z^{-1} + 0.5z^{-2}} \text{ for ROC } |z| > 1;\ \frac{1}{2} < |z| < 1.$$ **(06 Marks)**

b. Consider a causal discrete time sequence whose output y(n) and x(n) are related by

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

i) Find its system function ii) Find its impulse response h[n]. **(10 Marks)**

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15EE552

Fifth Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. Discuss the characteristics of a conductor and its factor affecting the conductivity of metals. **(06 Marks)**

b. Classify the solids on the basis of energy gap and briefly explain each of them. **(10 Marks)**

OR

2 a. Resistance of a conducting wire is 57.2Ω at 70°C and 50Ω at 25°C. Estimate its temperature coefficient of resistance. **(06 Marks)**

b. Discuss the scope of electrical materials. Where do these find use in consumer items, electrical engineering and in computer engineering? **(06 Marks)**

c. What is Thomson effect? Mention their types. **(04 Marks)**

Module-2

3 a. Define spontaneous polarization, with neat diagram explain polarization curve and hystersis loop. **(10 Marks)**

b. What is the need of fuse material? What are their requirements? **(06 Marks)**

OR

4 a. Discuss the characteristics of low resistivity materials. **(06 Marks)**

b. Derive an expression $P = \epsilon_0(\epsilon_r - 1)E$ to relate polarization, dielectric constant and electrical field strength. And determine the polarization produced in steatite ($MgO.SiO_2$) by an electric field of 600V/m, if its dielectric constant is 6.1. Take $\varepsilon_0 = 8.85 \times 10^{-12}$. **(10 Marks)**

Module-3

5 a. Differentiate between thermosetting and thermoplast plastics. **(04 Marks)**

b. A magnetic field of 2400 A/m is applied to a material having a susceptibility of 1500. Determine :
i) Its relative permeability
ii) Intensity of magnetization
iii) The resonance, take $\mu_0 = 4\pi \times 10^{-7}$ henry/meter. **(06 Marks)**

c. Discuss the different laws being followed by various magnetic materials. What is the effect of temperature on magnetic susceptibility? **(06 Marks)**

OR

6 a. What are the requirements of good liquid insulating materials? **(06 Marks)**

b. In magnetic material, prove that $\mu_r = 1 + X_m$ where X_m is magnetic susceptibility and μ_r is relative permeability. **(06 Marks)**

c. Define the terms :
i) Magnetic dipole moment
ii) Magnetic flux density
iii) Susceptibility. **(04 Marks)**

Module-4

7 a. Explain the properties of soft and hard magnetic materials along with initial and maximum permeability. **(06 Marks)**

b. Write the application of super conductors stating their limitations. **(06 Marks)**

c. What are the properties of super conductor below their critical temperature? **(04 Marks)**

OR

8 a. Write short note on :

i) Meissner effect

ii) Silskee rule. **(06 Marks)**

b. Compare hard and soft magnetic materials. **(04 Marks)**

c. Critical magnetic field at zero Kelvin and critical temperature for Pb are 65 KA/m and 7.18K respectively. Determine the critical density at 4.2K in a lead wire of 1mm diameter. Consider a parabolic dependence of Hc on temperature. **(06 Marks)**

Module-5

9 a. What is reflection? Explain how reflectivity and refractive Index 'n' are interrelated. **(06 Marks)**

b. What are plastics? Explain the AC electrical properties. **(06 Marks)**

c. Define :

i) Photo emissivity

ii) Photons

iii) Brightness

iv) Translucent material. **(04 Marks)**

OR

10 a. Sketch and explain the construction and working of a photo conductive cell. **(08 Marks)**

b. What is Luminescence? What are its different types? Differentiate between fluorescence and phosphorescence. **(08 Marks)**

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15EE562

Fifth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Programmable Logic Controllers

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Write a short note on Human Machine Interfaces (HMI). **(06 Marks)**

b. Discuss processor memory organization of programmable logic controllers. **(10 Marks)**

OR

2 a. With a neat diagram explain typical parts of a PLC. **(08 Marks)**

b. With appropriate diagram show how addressing is achieved for an Allen-Bradley SLC – 500 controller. **(08 Marks)**

Module-2

3 a. With an example of controlling a electric motor explain the concept of SEAL-IN circuit. **(06 Marks)**

b. What do you mean by 'Electrical Interlocking Circuits'. Draw sequential hardwired three motor relay control circuit and its equivalent ladders diagram. **(10 Marks)**

OR

4 a. Draw a PLC program for fluid pumping process. Comment on each rung. **(08 Marks)**

b. Explain cascading and reciprocating timers with an example for each. **(08 Marks)**

Module-3

5 a. Draw a PLC program for 24 hour clock, explain in brief. **(08 Marks)**

b. Draw and explain a PLC program for "Motor Lockout Program". **(08 Marks)**

OR

6 a. Explain the process of forcing external I/O addresses. **(08 Marks)**

b. Underline the problems occurs due to subroutine program execution. Also discuss the remedy. **(08 Marks)**

Module-4

7 a. Draw and explain how file to file copy function is used in FAL instruction. **(08 Marks)**

b. Draw the block format of SUB-instruction also draw ladder diagram for 'vessel overfill alarm program'. **(08 Marks)**

OR

8 a. Draw the ladder diagram for the MUL instruction used as a part of a 'temperature control program". **(08 Marks)**

b. Draw and explain 'set –point control program'. **(08 Marks)**

Module-5

9 a. Explain sequencer program for time driven sequencer output. **(08 Marks)**

b. Using BSL instruction draw the ladder diagram for "spray painting application". **(08 Marks)**

OR

10 a. Explain SCADA in conjunction with PLC. **(08 Marks)**

b. Write a short note on : i) Token passing ii) Polling. **(08 Marks)**

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15EE51

Fifth Semester B.E. Degree Examination, June/July 2019
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. Define Management. Explain the roles of Manager. (08 Marks)
b. Whether Management is a Science , Arts or Profession? Justify your answer. (08 Marks)

OR

2 a. What are the various steps involved in planning? (08 Marks)
b. What is Decision making? Explain different types of decisions. (08 Marks)

Module-2

3 a. Briefly explain the principles of Organization. (08 Marks)
b. Explain briefly various steps involved in selection process. (08 Marks)

OR

4 a. Explain importance of co-ordination and its techniques. (08 Marks)
b. Define Controlling and explain the steps in a control process. (08 Marks)

Module-3

5 a. Explain Business Ethics and Corporate Governance. (08 Marks)
b. Explain the characteristics of Entrepreneur. (08 Marks)

OR

6 a. Explain the stages in entrepreneurial process. (08 Marks)
b. Explain the barriers involved in entrepreneurship. (08 Marks)

Module-4

7 a. Explain the objective of Small Scale Industry. (08 Marks)
b. Explain the impact of Globalization on Small Scale Industry. (08 Marks)

OR

8 a. Briefly explain the steps involved in starting Small Scale Industry. (08 Marks)
b. Describe the objective and function of TECSOK and KSSIDC. (08 Marks)

Module-5

9 a. Define Project and explain Project Identification. (08 Marks)
b. Explain the contents of Project Report. (08 Marks)

OR

10 a. Write a note on Project Appraisal. (08 Marks)
b. Define and differentiate CPM and PERT. (08 Marks)

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15EE52

Fifth Semester B.E. Degree Examination, June/July 2019
Microcontroller

Time: 3 hrs. Max. Marks: 80

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. Missing data, if any, may be suitably assumed.

Module-1

1 a. With neat diagram, explain the internal architecture of 8051. **(10 Marks)**
b. Compare micro processor with microcontroller. **(06 Marks)**

OR

2 a. What is microcontroller? List out the differences between CISC and RISC. **(06 marks)**
b. Explain any five addressing modes of 8051 with examples for each. **(10 Marks)**

Module-2

3 a. What do you understand by assembler directives? Explain the following assembler directives : i) ORG ii) END iii) EQU. **(08 Marks)**
b. Briefly explain the steps involved to assemble and run an 8051 program. **(08 Marks)**

OR

4 a. Explain the following instructions with an example :
i) DIV AB ii) SWAPA iii) RRC A iv) XCHD A,@Rp. **(08 Marks)**
b. Write an ALP to find the value of P = N!/R! Using a subroutine which finds the value of factorial of a given number. The values of N and R are stored in locations 30H and 31H. Store P in 32H. **(08 Marks)**

Module-3

5 a. Explain the various data types in 8051C. **(08 Marks)**
b. Assume that XTAL = 11.0592MHz. What value do we need to load into the timer's registers if we want to have a time delay of 5ms? Write an ALP for timer 0 to create a pulse width of 5ms on P2.3. **(08 Marks)**

OR

6 a. Write an 8051C program to find the checksum byte of data stream 30H, 4AH, 65H and 10H. Convert the binary value of checksum into decimal and display the value of the BCD digits on ports P_0, P_1 and P_2. **(10 Marks)**
b. Assume that a 1–Hz external clock is being fed into pin T_0(P3.4). Write a C program for counter 0 in mode 1 to count the pulses and display the THO and TLO registers on P2 and p1 respectively. **(06 Marks)**

Module-4

7 a. What is serial data communication? Explain the significance of SCON register in detail. **(06 marks)**
b. Write an ALP to transfer letter "A" serially at 4800 baud continuously? **(06 marks)**
c. Write the steps to transfer data serially. **(04 Marks)**

OR

8 a. Explain the different interrupts of 8051 indicating their vector addresses. **(06 marks)**

b. Write a C program that continuously gets a single bit of data from P1.7 and sends it to P1.0, while simultaneously creating a square wave of 200μs period on pin P2.5. Use timer 0 to create the square wave. Assume that XTAL = 11.0592MHz. **(10 Marks)**

Module-5

9 a. Write an ALP to rotate the stepper motor 5 steps in clockwise direction and 10 steps in anticlockwise direction with a delay between each step. **(10 Marks)**

b. Explain with a diagram, the interfacing of DAC 0808 to 8051 chip. **(06 Marks)**

OR

10 a. Interface an LCD display to 8051 and write an 8051 C program to send letters 'M', 'D', and 'L' to the LCD using delays. **(10 Marks)**

b. With a block schematic explain the features of 8255 PI chip. **(06 Marks)**

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15EE53

Fifth Semester B.E. Degree Examination, June/July 2019
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 neat circuit diagram and input, output waveforms explain the different types of power electronic converter circuits. **(08 Marks)**

b. With the help of neat block diagram explain briefly peripheral effects associated with power converters. **(08 Marks)**

OR

2 a. What is power electronics? Mention the applications of power electronics. **(06 Marks)**

b. With neat circuit diagram and associated waveforms explain the working of FWR with R load, center tapping, also derive the expressions for i) $V_{0(rms)}$ and $V_{0(avg)}$ ii) Efficiency iii) Ripple factor and iv) TUF. **(10 Marks)**

Module-2

3 a. With the help of switching model and switching waveforms explain the switching characteristics of power MOSFET. **(08 Marks)**

b. For the transistor switch shown in Fig.Q.3(b). Calculate: i) The value of R_B that results in saturation with an ODF of 20 ii) The forced β and iii) Power loss in the transistor. **(08 Marks)**

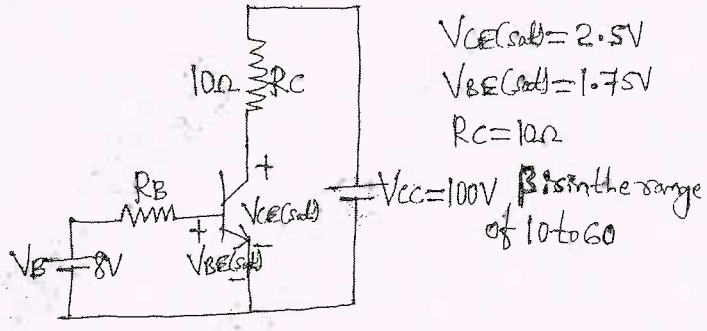

Fig.Q.3(b)

OR

4 a. Explain briefly isolation of gate drive using i) Pulse transformer and ii) Opto couplers. **(08 Marks)**

b. The collector clamping circuit has V_{CC} = 100V, R_C = 1.5Ω, Vd_1 = 2.1V, Vd_2 = 0.9V, V_{BE} = 0.7V, V_B = 15V, R_B = 2.5Ω and β = 16. Calculate : i) Collector current without clamping ii) Collector-emitter clamping voltage and iii) Collector current with clamping. **(08 Marks)**

Module-3

5 a. Explain the operation of thyristor with the help of two transistor model, also derive expression for anode current. **(10 Marks)**

b. A thyristor operating at 220V is gated with a pulse width of 40μsec, the latching current of thyristor is 36 mA, for a load of 60Ω and 2H will the thyristor gets triggered? If not find the width of the pulse for successful triggering of SCR (thyristor operating at 220V). **(06 Marks)**

OR

6 a. With current and voltage waveforms explain briefly dynamic turn on and turn off characteristics of SCR. **(10 Marks)**

b. With neat circuit diagram and waveforms explain the operation of WT triggering circuit. **(06 Marks)**

Module-4

7 a. With neat circuit diagram and associated waveforms, explain the operation of single phase half wave controlled rectifier with freewheeling diode across the RL load. **(08 Marks)**

b. With circuit diagram and waveforms explain briefly working of 1ϕ dual converter. **(08 Marks)**

OR

8 a. With neat circuit diagram and waveforms, explain the operation of half wave AC voltage controller with resistive load. **(06 Marks)**

b. A 1ϕ half wave ACVC has a resistive load of R = 5Ω and input voltage V_S = 120V, 60Hz if delay angle $\alpha = \frac{\pi}{3}$. Calculate: i) RMS output voltage, ii) Input Power Factor and iii) Average output current. **(06 Marks)**

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

Module-5

9 a. Explain the principle of step-down chopper and derive an expression for average and output rms voltage. **(08 Marks)**

b. A step up chopper has input voltage of 220V and output voltage of 660V. If the non conducting time of chopper is 100μsec. Calculate: i) Conducting time of chopper ii) If TON is halved for constant frequency operation find new output voltage. **(08 Marks)**

OR

10 a. Write a note on performance parameters of inverter. **(06 Marks)**

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

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CBCS SCHEME

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15EE552

Fifth Semester B.E. Degree Examination, June/July 2019
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. Classify the electrical engineering materials on the basis of their energy gap and briefly explain each of them. **(08 Marks)**

b. Write a short notes on the following :
(i) Emerging spintronic materials
(ii) Ferromagnetic semiconductor **(04 Marks)**

c. Discuss the role of following materials as futuristic electronic materials:
(i) Left-handed materials
(ii) Wide Bandgap semiconductors. **(04 Marks)**

OR

2 a. Discuss the scope of electrical materials. **(04 Marks)**

b. What are spintronic devices? State the principle of their operation. Discuss the various fields of spintronic research. **(08 Marks)**

c. Write notes on the following :
(i) Seebeck effect
(ii) Thomson effect. **(04 Marks)**

Module-2

3 a. What is the need of fusible material? Discuss different fusible materials. **(08 Marks)**

b. Suggest with reasons, the materials generally used for the following applications:
(i) Brushes on commutator for a d.c. generator.
(ii) Filament of an incandescent lamp.
(iii) Electric contact in an iron-clad switch.
(iv) Busbar in a sub-station. **(08 Marks)**

OR

4 a. What are the characteristics and properties of dielectric materials? What are the effects of high temperature and high frequency on dielectric constant? **(08 Marks)**

b. Derive an expression to relate polarization, dielectric constant and electrical field strength. **(08 Marks)**

Module-3

5 a. Classify various insulating materials in different categories. How do the solid, liquid and gaseous insulating materials compare with each other? **(08 Marks)**

b. What are the requirements of a good liquid insulating material? Write the characteristics of transformer oil. **(08 Marks)**

OR

6 a. Discuss different laws being followed by various magnetic materials. What is the effect of temperature on magnetic susceptibility? **(08 Marks)**

b. Write notes on the following :
(i) Soft and hard ferrites
(ii) Domain theory
(iii) Garnets
(iv) Core losses **(08 Marks)**

Module-4

7 a. What are the salient features and properties of super-conductors? **(04 Marks)**

b. Explain the following in a superconductor:
(i) Meissner effect
(ii) Type-II superconductor **(04 Marks)**

c. Explain the mechanism of superconduction. What are various theories in these regard? **(08 Marks)**

OR

8 a. Distinguish between Type-I and Type-II superconductors with the help of suitable diagrams. **(08 Marks)**

b. Explain the depth of penetration, coherence length. **(04 Marks)**

c. Bring out difference between LTS and HTS **(04 Marks)**

Module-5

9 a. Explain the mechanical properties of plastics. **(04 Marks)**

b. What do you mean by optical absorption? State the conditions of photon absorption. **(08 Marks)**

c. Define the following :
(i) Photon
(ii) Electro-optic effect
(iii) Photo emissivity
(iv) Photoconductivity. **(04 Marks)**

OR

10 a. Explain DC and AC properties of plastics. **(04 Marks)**

b. Define the following :
(i) Luminescence
(ii) Optical absorption
(iii) Photoemissivity
(iv) Diffusion **(04 Marks)**

c. Sketch and explain the construction and working of a photo conductive cell. **(08 Marks)**

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15EE562

Fifth Semester B.E. Degree Examination, June/July 2019

Programmable Logic Controllers

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 PLC components. **(08 Marks)**

b. Describe special I/O Modules of PLC. **(08 Marks)**

OR

2 a. Write a neat diagram of PLC processor module and explain three modes of operation. **(05 Marks)**

b. Explain relay type instructions with ladder diagram and truth table. **(06 Marks)**

c. Write a short note on language associated with PLC programming. **(05 Marks)**

Module-2

3 a. Write a PLC program used to implement control of water level in a storage tank and explain the sequence of operation. **(08 Marks)**

b. Describe the method of operation of manually operated, mechanically operated and proximity switches. **(08 Marks)**

OR

4 a. Draw the symbol and explain the operation of on delay and off delay timers contacts of mechanical timing relay. **(08 Marks)**

b. Write a PLC program for the control of traffic lights in one direction and explain the sequence of events involved. **(08 Marks)**

Module-3

5 a. Write a PLC program to illustrate 24 hour clock, measuring time in hours and minutes and explain the operation. **(08 Marks)**

b. Describe the instructions and commands used in counter file. **(08 Marks)**

OR

6 a. Write a program flow of nested subroutine form the main program to subroutine files and explain the operation. **(08 Marks)**

b. Write a PLC program for safety wiring requirements during PLC installation and summarize the sequence of events involved. **(08 Marks)**

Module-4

7 a. Write a PLC program using MOV instruction used to change the preset count of counter and explain the operation. **(08 Marks)**

b. With a neat diagram explain BCD output interface module connected to a seven segment LED display board. **(08 Marks)**

OR

8 a. Write a PLC program using MUL (multiplication instruction) used as a part of temperature control program. **(08 Marks)**

b. Describe other word level math instructions used in PLC programming. **(08 Marks)**

Module-5

9 a. Describe the sequencer instructions and commands used in PLC. **(08 Marks)**

b. Describe spray painting operation controlled shift left register and write a PLC program for the same. **(08 Marks)**

OR

10 a. Explain the major components of a process control system involved in the structure of control system. **(08 Marks)**

b. With a neat diagram, explain signal sources and o/p loads of SCADA. **(08 Marks)**

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CBCS SCHEME

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15EE62

Sixth Semester B.E. Degree Examination, June/July 2019
Power System Analysis – I

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Show that per unit impedance of two winding transformer will remain same referred to primary as well as secondary. **(06 Marks)**

b. A 300 MVA, 20 KV, 3-phase generator has subtransient reactance of 20%. The generator supplies two synchronous motors through a 64 KVA transmission line having transformers at both ends as shown in Fig.Q1(b). T_1 is a 3-phase transformer and T_2 is composed of 3-single phase transformers of rating 100 MVA each, 127/13.2 KV, 10% reactance, series reactance of transmission line is 0.5 ohm/km. Draw the reactance diagram with all reactances marked in per unit. Select generator rating on base values.

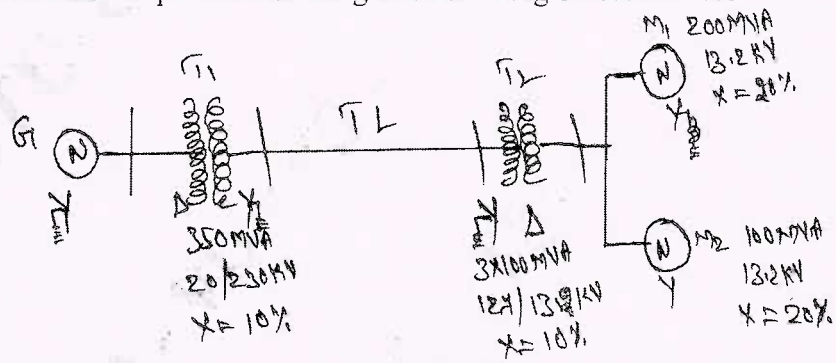

Fig.Q1(b) **(10 Marks)**

OR

2 a. Define per unit quantity. Mention the advantages of per unit system. **(04 Marks)**

b. The one line diagram of an unloaded generator is shown in Fig.Q2(b). Draw the PU reactance diagram. Choose a base of 50 MVA, 13.8 KV in the circuit of generator G_1. The ratings are as follows:

G_1 : 20 MVA, 13.8 KV, X″ = 20% T_1 : 25 MVA, 13.8/220 KV, X = 10%
G_2 : 30 MVA, 18 KV, X″ = 20% T_2 : 30 MVA, 220/18 KV, X = 10%
G_3 : 30 MVA, 20 KV, X″ = 20% T_3 : 35 MVA, 220/22 KV, X = 10%

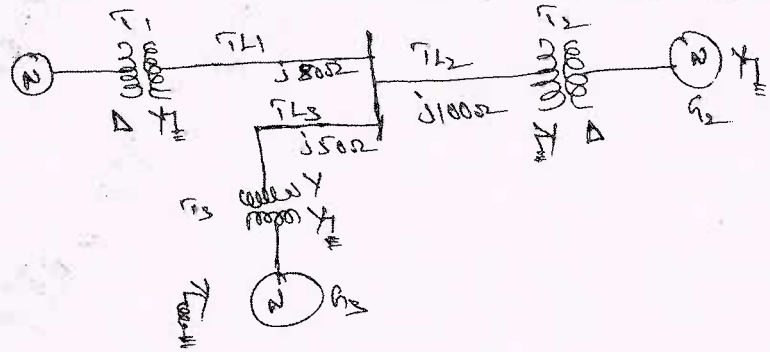

Fig.Q2(b) **(12 Marks)**

Module-2

3 a. With the help of waveform at the time of three phase symmetrical fault, on synchronous generator define steady state, transient and subtransient reactances. **(08 Marks)**

b. A generator is connected to a synchronous motor through transformer. Reduced to a common base, the per unit subtransient reactances of generator and motor are 0.15 and 0.35 PU respectively. The leakage reactance of the transformer is 0.1 PU. A 3-phase star circuit fault occurs at terminals of the motor when terminal voltage of generator is 0.9 P.U and output current of generator is 1 P.U at 0.8 pf leading. Find the subtransient current in the fault, generator and motor.

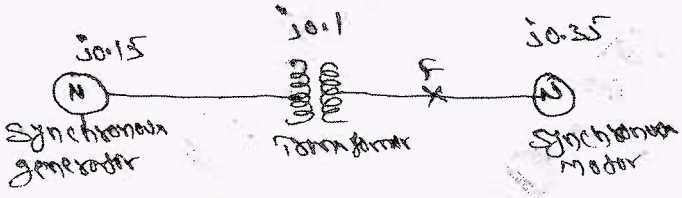

Fig.Q3(b) **(08 Marks)**

OR

4 a. Explain clearly, how circuit breaker are rated? **(06 Marks)**

b. A synchronous generator and motor are rated 30 MVA, 13.2 KV, both have subtransient reactance of 20%. The line connecting them has a reactance of 20%, on the base of machine rating. The motor is drawing 20 MW at 0.8 pf (lead). The terminal voltage of motor is 12.8 KV, when a symmetrical fault occurs at motor terminals, find subtransient current in generator, motor and at the point of fault? **(10 Marks)**

Module-3

5 a. Obtain the relationship between line and phase sequence components of voltages in star connection. Give the relevant phasor diagrams. **(08 Marks)**

b. Draw the positive, negative and zero sequence network for the power system shown in Fig.Q5(b). Choose a base of 50 MVA, 220 KV in the 50Ω transmission lines and marks all reactances in PU. The ratings of the generator and transformers are:

G_1: 25 MVA, 11 KV, X″ = 20%; G_2 : 25 MVA, 11 KV, X″ = 20%

3ϕ transformers (each) : 20 MVA, 11/220 KV, X = 15%

The negative sequence reactance of each synchronous machine is equal to the sub-transient reactance. The zero sequence reactance of a each machine is 8%. Assume that the zero sequence reactances of lines are 250% of their positive sequence reactances.

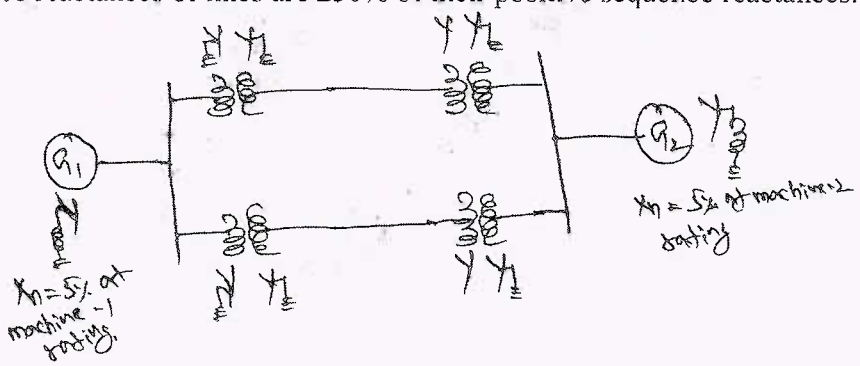

Fig.Q5(b) **(08 Marks)**

OR

6 a. Draw the zero sequence impedance networks of a transformer for the following connections:

i) Y - Y ii) Δ - Δ iii) Δ - Y

(06 Marks)

b. The positive, negative and zero sequence components of line currents are $20\angle 10^{\circ}$, $6\angle 60^{\circ}$ and $3\angle 30^{\circ}$ A respectively. Determine the line currents. **(04 Marks)**

c. In a 3ϕ, 4 wire system, the sequence voltages and currents are:

$V_{a1} = 0.9\angle 10^{\circ}$ PU ; $V_{a2} = 0.25\angle 110^{\circ}$ PU ; $V_{a0} = 0.12\angle 300^{\circ}$ PU ;

$I_{a1} = 0.75\angle 25^{\circ}$ PU ; $I_{a2} = 0.15\angle 170^{\circ}$ PU ; $I_{a0} = 0.1\angle 330^{\circ}$ PU

Find the complex power in PU. If the neutral gets disconnected, find the new power. **(06 Marks)**

Module-4

7 a. An unloaded fully excited three phone aftemafor is subjected to an L-G fault at its terminals. Find the fault current. Using symmetrical components by showing the interconnection of all sequence networks. **(08 Marks)**

b. Draw the sequence networks for the system shown in Fig.Q7(b). Determine the fault current if a line to line occurs at F. The PU reactances all referred to the same base are as follows. Both the generators are generating 1.0 PU.

Component	X_0	X_1	X_2
G_1	0.05	0.30	0.20
G_2	0.03	0.25	0.15
Line-1	0.70	0.30	0.30
Line-2	0.70	0.30	0.30
T_1	0.12	0.12	0.12
T_2	0.10	0.10	0.10

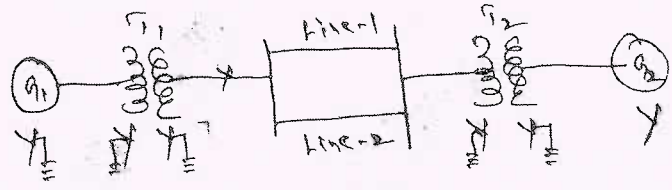

Fig.Q7(b) **(08 Marks)**

OR

8 a. Derive expression for fault current if Line-Line-Ground (LLG) fault occurs through fault impedance Z_f in power system. Show the connection of sequence networks to represent the fault. **(08 Marks)**

b. A three phase generator with an open circuit voltage of 400 V is subjected to an LG fault through a fault impedance of j2Ω. Determine the fault current is Z_1 = j4Ω, Z_2 = j2Ω and Z_0 = j1Ω. Repeat the problem for LL fault. **(08 Marks)**

Module-5

9 a. Explain 'equal area criteria' concept when a power system is subjected, to sudden loss of one of the 'parallel lines'. **(08 Marks)**

b. Define stability pertaining to a power system and classify the different types of stability. **(04 Marks)**

c. A 2 pole, 50 Hz, 11 KV turbo alternator has a rating of 100 MW, 0.85 p.f. lagging. The rotor has moment of inertia of 10000 kg-m^2. Calculate H and M. **(04 Marks)**

OR

10 a. Derive the power angle equation of a salient pole synchronous machine connected to an infinite bus. Draw the power angle curve. **(08 Marks)**

b. Derive an expression for the swing equation. **(08 Marks)**

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CBCS SCHEME

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Sixth Semester B.E. Degree Examination, June/July 2019
Digital Signal Processing

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Determine DFT of sequence $x(n) = \frac{1}{3}$ for $0 \le n \le 2$ for N = 4. Plot magnitude and phase spectrum. **(08 Marks)**

b. Two length – 4 sequence are defined below :

$$x(n) = \cos\left(\frac{\pi n}{2}\right) \quad n = 0, 1, 2, 3$$

$$h(n) = 2^n \quad n = 0, 1, 2, 3$$

i) Calculate $x(n) \circledast_4 h(n)$ using circular convolution directly.

ii) Calculate $x(n) \circledast_4 h(n)$ using Linear convolution. **(08 Marks)**

OR

2 a. Compute circular convolution using DFT + IDFT for following sequence :

$$x_1(n) = \{\underset{\uparrow}{2}, 3, 1, 1\}, \quad x_2(n) = \{\underset{\uparrow}{1}, 3, 5, 3\}.$$ **(08 Marks)**

b. Find the output of the LTI system whose impulse h(n) = {1, 1, 1} and the input signal is x(n) = {3, –1, 0, 1, 3, 2, 0, 1, 2, 1}. Using the overlap save method. Use 6-pt circular convolution. **(08 Marks)**

Module-2

3 a. What are FFT algorithms? Explain the advantages of FFT algorithms over the direct computations of DFT for a sequence x(n). **(04 Marks)**

b. What are the differences and similarities between DIT and DIF –FFT algorithms? **(04 Marks)**

c. Find the 8-pt DFT of the sequence x(n) = {1, 2, 3, 4, 4, 3, 2, 1}. Using DIT – FFT radix – 2 algorithm. **(08 Marks)**

OR

4 a. Find the 4-pt circular convolution of x(n) and h(n) given. Using radix-2 DIF – FFT algorithm. **(08 Marks)**

Fig.Q4(a)

b. Given x(n) = (n + 1) and N = 8. Determine X(K). Using DIF – FFT algorithm. **(08 Marks)**

Module-3

5 a. Convert the analog filter with system transfer function :

$$H(s) = \frac{(s+0.1)}{(s+0.1)^2 + 3^2}$$

into a digital IIR filter by mean of the impulse invariant method. **(06 Marks)**

b. Design a butter worth digital IIR lowpass filter using bilinear transformation by taking T = 0.1sec, to satisfy the following specification :

$$0.6 \le \left|H(e^{j\omega})\right| \le 1.0; \quad \text{for } 0 \le \omega \le 0.35\pi$$
$$\left|H(e^{j\omega})\right| \le 0.1; \quad \text{for } 0.7\pi \le \omega \le \pi$$

(10 Marks)

OR

6 a. Compare analog and digital filters. **(04 marks)**

b. Determine the poles of lowpass Butterworth filter for N = 2. Sketch the location of poles on s-plane and hence determine the normalized transfer function of lowpass filter. **(08 Marks)**

c. Write difference between IIR and FIR filter. **(04 Marks)**

Module-4

7 a. Design a Chebyshev digital IIR lowpass filter using impulse invariant transformation by taking T = 1 sec to satisfy the following specifications;

$$0.9 \le \left|H(e^{j\omega})\right| \le 1.0; \quad \text{for } 0 \le \omega \le 0.25\pi$$
$$\left|H(e^{j\omega})\right| \le 0.24; \quad \text{for } 0.5\pi \le \omega \le \pi$$

Draw direct form – I and II structure of the filter. **(12 Marks)**

b. Write the relation between analog and digital frequency in Billnear transformation. **(04 Marks)**

OR

8 a. Obtain the direct form – I, direct form II realization of the LTI system governed by the relation.

$$y(n) = -\frac{3}{8}y(n-1) + \frac{3}{32}y(n-2) + \frac{1}{64y}y(n-3) + x(n) + 3x(n-1) + 2x(n-2).$$ **(08 Marks)**

b. Realize the given system in cascade and parallel form :

$$H(z) = \frac{1 + 0.25z^{-1}}{(1 - 2z^{-1} + 0.25z^{-2})(1 - 3z^{-1} + 0.25z^{-2})}.$$ **(08 Marks)**

Module-5

9 a. The frequency response of a filter is described by : $H(\omega) = j\omega, -\pi \le \omega \le \pi$. Design the filter using a rectangular window. Take N = 7. **(08 Marks)**

b. Design a lowpass digital filter to be used in A/D – H(z) – D/A structure that will have – 3dB cutoff at 30π rad/sec and attenuation factor of 5dB at 45π rad/sec. The filter is required to have a linear phase and the system will use sampling frequency of 100 samples/sec. **(08 Marks)**

OR

10 a. Deduce the equation for the following frequency spectrum for rectangular window sequence defined by :

$$w_f(n) = \begin{cases} 1, & \frac{-(N-1)}{2} \le n \le \frac{N-1}{2} \\ 0, & \text{otherwise} \end{cases}. \quad \textbf{(06 Marks)}$$

b. A lowpass filter has the desired frequency response :

$$H_d(\omega) = \begin{cases} e^{-j\omega 3}, & 0 < \omega < \pi/2 \\ 0, & \text{otherwise} \end{cases}.$$

Determine h(n) based on frequency sampling method. Take K = 7. **(06 Marks)**

c. Realize the linear phase FIR filter having the following impulse response :

$$h(n) = \delta(n) + \frac{1}{4}\delta(n-1) - \frac{1}{8}\delta(n-2) + \frac{1}{4}\delta(n-3) + \delta(n-4). \quad \textbf{(04 Marks)}$$

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CBCS SCHEME

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15EE64

Sixth Semester B.E. Degree Examination, June/July 2019
Electrical Machine Design

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of design data handbook is permitted.
3. Any missing data may be suitably assumed.

Module-1

1 a. Explain the principles of design of electrical machines. What are the limitations in design? **(06 Marks)**

b. What are the desirable properties of magnetic materials? Explain in brief magnetic materials and its classification. **(05 Marks)**

c. Give a brief comparison between copper and aluminium wires. **(05 Marks)**

OR

2 a. Classify the insulating materials used in electrical machines, according to their thermal stability. Give one example for each class. **(06 Marks)**

b. Write brief note on Cold Rolled Grain Oriented (CRGO) steel used in electrical machines. **(05 Marks)**

c. What are the desirable properties of conducting materials? **(05 Marks)**

Module-2

3 a. Define specific electric and magnetic loadings of D.C. machine. What are the merits and demerits of selecting higher values of specific loadings? Mention the factors to be considered during choice of specific loadings. **(08 Marks)**

b. A design is required for a 50kW, 4pole, 600rpm dc shunt generator. The full load terminal voltage is 220V. If the maximum gap density is 0.83Wb/m^2 and ampere conductors = 30,000ac/m, calculate suitable dimensions of armature core to give a square pole face. Assume that the full load armature voltage drop is 3% of rated terminal voltage and field current is 1% of rated full load current. The ratio of pole arc to pole pitch is 0.67. **(08 Marks)**

OR

4 a. Discuss the various factors which govern the choice of number of poles in a D.C. machine. **(08 Marks)**

b. A shunt field coil has to develop an mmf of 9000A. The voltage drop in the coil is 40V and the resistivity of the round wire is 0.021Ω/m/mm^2. The depth of the winding is 35mm approximately and the length of the mean turn is 1.4m. Design a coil so that the power dissipated is 700 W/m^2 of the total coil surface. Take diameter of the insulated wire 0.2mm greater than the bare wire. **(08 Marks)**

Module-3

5 a. Derive the output equation of a 3 phase core type transformer and hence deduce an expression for output-emf/turn. **(08 Marks)**

b. Calculate the main dimensions and winding details of a 100kVA, 2000/400V, 50Hz, 1ϕ shell type, oil immersed self cooled transformer. Assume voltage per turn = 10V, flux density in core = 1.1 Wb/m^2, current density = 2A/mm^2, window space factor = 0.33, the ratio of window height to window width is 3, ratio of core depth to width of central limb = 2.5, stacking factor = 0.9. **(08 Marks)**

OR

6 a. Explain the procedure to calculate the no-load current for a single phase transformer. **(08 Marks)**

b. A 250kVA, 6600/400V, 3ϕ core type transformer has a total loss of 4800W at full load. The transformer tank is 1.25m in height and 1m × 0.5m in plan. Design a suitable scale for number of tubes, if the average temperature rise is limited to 35°C. The diameter of the tube is 50mm and are spaced 75mm from each other. The average height of the tube is 1.05m. Specific heat dissipation due to radiation and convection is respectively 6 and 6.5 W/m^2 °C. Assume convention is improved by 35% due to provision of tubes. **(08 Marks)**

Module-4

7 a. With usual notations, derive the output equations of a 3ϕ induction machine. **(08 Marks)**

b. Calculate the diameter of stator bore and core length of a 70HP, 415V, 3ϕ, 50Hz, Y connected, 6 pole Induction motor for which q = 32000 Ac/m, B_{av} = 0.51 T, efficiency = 90%, p.f. = 0.91. Assume pole pitch equal to core length. Estimate the number of stator conductors required for a winding in which the conductors are connected in two parallel paths. Choose a suitable number of conductors/slot, so that the slot loading does not exceed 750 Ampere conductors. **(08 Marks)**

OR

8 a. Discuss the factors to be considered while deciding the length of air gap, number of stator and rotor slots in an Induction motor. **(08 Marks)**

b. A 15kW, 3ϕ, 6 pole, 50Hz, squirrel cage Induction motor has the following data: stator bore dia = 0.32m, axial length of stator core = 0.125m, number of stator slots = 54, number of conductors/stator slot = 24, current in each stator conductor = 17.5A, full load power factor = 0.85 lagging. Design a suitable cage rotor giving number of rotor slots, section of each bar, section of each ring. The full load speed is to be 950rpm approximately. Use copper for rotor bars and end rings. Resistivity of copper = 0.02Ω/m and mm^2. Assume δ = 7A/mm^2 for end rings. **(08 Marks)**

Module-5

9 a. Derive an output equation of a synchronous machine and show that $HP = \frac{\text{Input KVA} \times \eta \times \cos\phi}{0.746}$. **(08 Marks)**

b. A 1000KVA, 3300V, 50Hz, 300rpm, 3ϕ alternator has 180 slots with 5 conductors/slot, single layer winding with full pitch coils is used. The winding is star connected with one circuit per phase. Determine the specific electric and specific magnetic loadings, if the stator bore is 2.0m and the core length is 0.4m. Using the same loadings, determine corresponding data for a 1250kVA, 3300V, 50Hz, 250rpm, 3ϕ star connected alternator having 2 circuits per phase. The machines have 60° phase spread. **(08 Marks)**

OR

10 a. What is SCR of a synchronous machine? What are the effects of SCR on machine performance? **(08 Marks)**

b. A 2500kVA, 225rpm, 3ϕ, 60Hz, 2400V, Y-connected salient pole alternator has the following design data: stator bore = 2.5m, core length = 0.44m, slot/pole/phase = 3, conductors/slot = 4, circuits/phase = 2, leakage factor = 1.2, winding factor = 0.95.
The flux density in the pole core is 1.5 Wb/m^2, the winding depth is 30mm, the ratio of full load field mmf to armature mmf is 2, field winding space factor is 0.84 and the field winding dissipates 1800 W/m^2 of inner and outer surface without the temperature rise exceeding permissible limit. Leave 30mm for insulation, flanges and height of pole shoe along the height of pole. Find: i) The flux per pole ii) Length and width of pole iii) Winding height iv) Pole height. **(08 Marks)**

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CBCS SCHEME

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15EE654

Sixth Semester B.E. Degree Examination, June/July 2019
Solar and Wind Energy

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Explain briefly the Indian energy scenario. **(06 Marks)**

b. Explain the importance of non-conventional energy sources. **(04 Marks)**

c. What are the reasons for variation in solar radiation reaching the earth than received at the outside of the atmosphere? **(06 Marks)**

OR

2 a. Classify energy storage systems and describe in brief the different storage systems. **(06 Marks)**

b. State and explain solar constant. **(04 Marks)**

c. What do you understand by energy conservation? Explain its various aspects. **(06 Marks)**

Module-2

3 a. Define the following terms related to solar radiation geometry :
i) Declination angle ii) Local solar time iii) Zenith angle. **(06 Marks)**

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

c. With a neat diagram, explain the working principle of solar water heater. **(05 Marks)**

OR

4 a. With a neat diagram, explain the working principle of pyranometer used for measuring global radiation. **(06 Marks)**

b. Derive the expression for estimating solar radiation empirically on horizontal surface. **(06 Marks)**

c. Calculate the sunset hour angle and daylength at a location, latitude of 35°N, on February 20. **(04 Marks)**

Module-3

5 a. Explain how the variation of insulation and temperature affects the I–V characteristics of a solar PV cell. **(06 Marks)**

b. With a neat diagram, explain the solar water pumping system. **(05 Marks)**

c. What are the major advantages and disadvantages of solar PV systems? **(05 Marks)**

OR

6 a. Describe the working principle of a solar photo voltaic cell. With the help of neat diagram explain the working of a solar photovoltaic power system. **(08 Marks)**

b. Discuss the standalone type PV system with an example. **(08 Marks)**

Module-4

7 a. What is the basic principle of wind energy conversion? **(04 Marks)**

b. Describe the main consideration in selecting site for wind generators. **(06 Marks)**

c. Derive an expression for the available power in the wind. **(06 Marks)**

OR

8 a. Wind at 1 standard atmospheric pressure and 15°C has velocity of 15m/s calculate :

i) The total power density in the wind stream

ii) The maximum obtainable power density

iii) Total power

iv) TorQue at maximum efficiency

Turbine diameter = 120m, turbine operating speed = 40rpm at maximum efficiency. Propeller type wind turbine is considered. For air, the value of gas constant R = 0.287 kJ/kg-k 1 atm = 1.01325×10^5Pa. **(08 Marks)**

b. Discuss the advantages and disadvantages of horizontal and vertical axis windmill. **(08 Marks)**

Module-5

9 a. With the help of neat diagram, explain the working of a wind energy conversion system for generation of electricity. **(07 Marks)**

b. Classify the wind energy conversion systems. **(04 Marks)**

c. Discuss the advantages and disadvantages of wind energy conversion systems. **(05 Marks)**

OR

10 a. Prove that in case of horizontal axis wind turbine maximum power can be obtained when Exit velocity = 1/wind velocity and $P_{max} = \frac{8}{27} PAV^3$. **(08 Marks)**

b. Describe the main applications of wind energy, giving neat sketches. **(08 Marks)**

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15EE654

Sixth Semester B.E. Degree Examination, June/July 2019
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Module-2

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i) Declination angle ii) Local solar time iii) Zenith angle. **(06 Marks)**

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

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OR

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15EE654

Sixth Semester B.E. Degree Examination, June/July 2019
Solar and Wind Energy

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2 a. Classify energy storage systems and describe in brief the different storage systems. **(06 Marks)**

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b. Describe the main consideration in selecting site for wind generators. **(06 Marks)**

c. Derive an expression for the available power in the wind. **(06 Marks)**

OR

8 a. Wind at 1 standard atmospheric pressure and 15°C has velocity of 15m/s calculate :

i) The total power density in the wind stream

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b. Discuss the advantages and disadvantages of horizontal and vertical axis windmill. **(08 Marks)**

Module-5

9 a. With the help of neat diagram, explain the working of a wind energy conversion system for generation of electricity. **(07 Marks)**

b. Classify the wind energy conversion systems. **(04 Marks)**

c. Discuss the advantages and disadvantages of wind energy conversion systems. **(05 Marks)**

OR

10 a. Prove that in case of horizontal axis wind turbine maximum power can be obtained when Exit velocity = 1/wind velocity and $P_{max} = \frac{8}{27} PAV^3$. **(08 Marks)**

b. Describe the main applications of wind energy, giving neat sketches. **(08 Marks)**

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15EE662

Sixth Semester B.E. Degree Examination, June/July 2019
Sensors and Transducers

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. What is transducer? How are they classified? **(06 Marks)**

b. What are the advantages of electrical transducers? **(05 Marks)**

c. Explain variable reluctance transducer. **(05 Marks)**

OR

2 a. Explain the working of Piezoelectric accelerometer. List the advantages, disadvantages and application of Piezoelectric transducers. **(06 Marks)**

b. Explain the working of LVDT with advantages, disadvantages and its applications. **(06 Marks)**

c. Explain the displacement measurement using Hall effect transducers. **(04 Marks)**

Module-2

3 a. Explain the working of semi conductor strain gauges with advantages and disadvantages. **(06 Marks)**

b. Explain: i) Pneumatic Sensors ii) Eddy current proximity sensors. **(06 Marks)**

c. What are digital transducers? What are the advantages of them? **(04 Marks)**

OR

4 a. Explain the working of synchros and Resolvers, mentioning their advantages. **(08 Marks)**

b. Explain MEMS accelerometer with its applications and advantages. **(04 Marks)**

c. What are the factors need to be considered for selecting a sensor for a particular application? **(04 Marks)**

Module-3

5 a. What are the functions of signal conditioning equipment? **(05 Marks)**

b. What is an op-amp? State the characteristics of an op-Amp. **(05 Marks)**

c. What you mean by filter and filtering? How are the filters classified? **(06 Marks)**

OR

6 a. Draw the block diagram of a generalised Data Acquisition system and explain it briefly. **(06 Marks)**

b. Explain the working of a multi channel analog multiplexed data acquisition system. **(05 Marks)**

c. Explain briefly the R-2R Ladder D/A converter and PWM. **(05 Marks)**

Module-4

7 a. With the help of a block diagram, explain the working of telemetering system. **(05 Marks)**

b. Explain briefly the amplitude modulation and frequency modulation. **(06 Marks)**

c. What is a modem? Explain with interfacing block diagram. **(05 Marks)**

OR

8 a. Explain inductance type pressure transducers. **(04 Marks)**

b. Define :
   i) Atmospheric pressure
   ii) Gauge pressure
   iii) Absolute pressure
   iv) Static pressure
   v) Total pressure, with the help of schematic diagram. **(06 Marks)**

c. Give the construction and working of a hot filament congation gauge. List its advantages and disadvantages. **(06 Marks)**

Module-5

9 a. What is "Seebeck effect"? explain with a neat diagram the construction and working of a thermoelectric pyrometer. **(08 Marks)**

b. Briefly explain: i) Rotometer ii) ELbow menter. **(08 Marks)**

OR

10 a. Explain briefly : i) DC tachometer generator ii) AC tachometer generator **(08 Marks)**

b. Explain : i) Piezo electric accelerometer ii) Ultra sonic Liquid level gauge. **(08 Marks)**

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15EE61

Sixth Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. Distinguish between open loop and closed loop systems with examples. **(08 Marks)**

b. Write the differential equations for the mechanical system shown in Fig.Q1(b). Obtain F-V and F-I analogous electrical networks. **(08 Marks)**

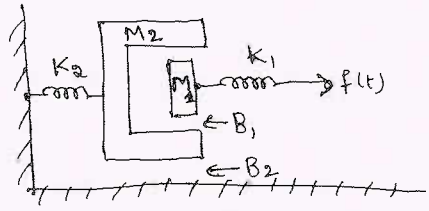

Fig.Q1(b)

OR

2 a. List the requirements of an ideal control system. **(04 Marks)**

b. Obtain the equivalent spring constant for the system shown in Fig.Q2(b). **(06 Marks)**

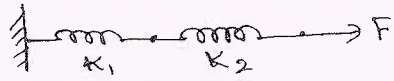

Fig.Q2(b)

c. Derive the transfer function of armature controlled dc motor. **(06 Marks)**

Module-2

3 a. Determine C(s)/R(s) using block diagram reduction rules for Fig.Q3(a). **(06 Marks)**

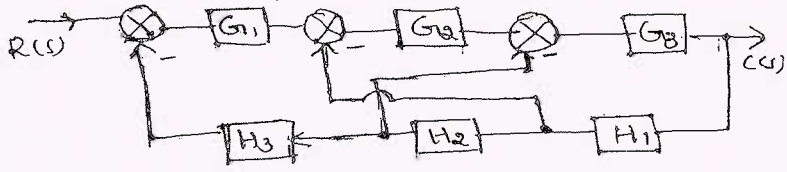

Fig.Q3(a)

b. Explain Mason's gain formula indicating each term. **(04 Marks)**

c. For the signal flow graph shown in Fig.Q3(c), determine the T.F C(s)/R(s) using Mason's gain formula. **(06 Marks)**

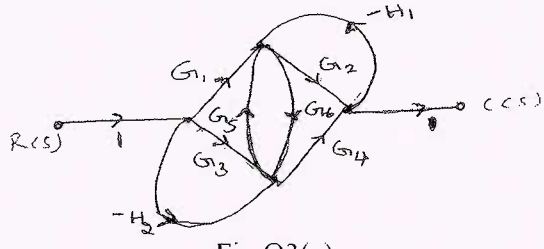

Fig.Q3(c)

OR

4 a. For the network shown in Fig.Q4(a), draw the SFG and obtain the T.F using Mason's rule.

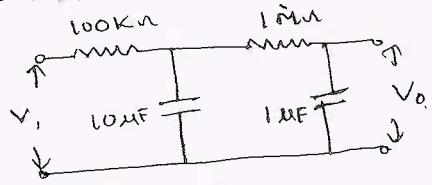

Fig.Q4(a) **(08 Marks)**

b. Draw the signal flow graph for the block diagram show in Fig.Q4(b) and determine C(s)/R(s). **(08 Marks)**

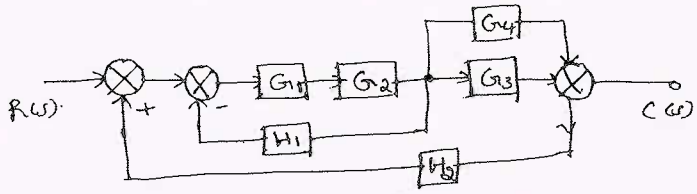

Fig.Q4(b)

Module-3

5 a. For a control system shown in Fig.Q5(a), find the values of K_1 and K_2 so that $M_P = 25\%$ and $T_P = 4$ sec. Assume unit step input. **(08 Marks)**

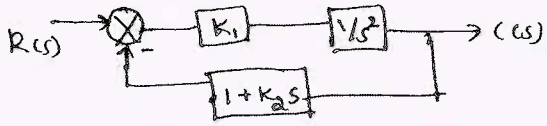

Fig.Q5(a)

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

$s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$ **(08 Marks)**

OR

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

b. Determine the location of roots with respect to s = –2, given that the characteristic equation is $s^4 + 10s^3 + 36s^2 + 70s + 75 = 0$ **(06 Marks)**

c. By applying Routh's criterion, discuss the stability of the closed loop system as a function of k for the following open loop transfer function

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

Module-4

7 a. The open loop transfer function of a control system is given by

$$G(s) = \frac{k}{s(s+2)(s^2+6s+25)}$$

Sketch the complete root locus as K is varied from 0 to infinity. **(10 Marks)**

b. Write a note on frequency domain specifications. **(06 Marks)**

OR

8 a. The open loop transfer function of a unity feedback system is

$$G(s) = \frac{k}{s(1+0.2s)(1+0.05s)}$$

Draw the Bode plot. From the graph

(i) Determine the value of k for a gain margin of 10 dB. What is the corresponding phase margin?

(ii) Determine the value of k for a phase margin of 40°. What is the corresponding gain margin? **(12 Marks)**

b. List the advantages of root locus method. **(04 Marks)**

Module-5

9 a. The open loop transfer function of a control system is

$$G(s)H(s) = \frac{1}{s^2(s+2)}$$

Sketch the Nyquist plot. Ascertain the stability. **(10 Marks)**

b. Explain giving equations, the function of integral control. **(06 Marks)**

OR

10 a. Explain PID controller and discuss the effect on the behaviour of the system. **(10 Marks)**

b. Discuss the advantages of Nyquist plot. **(06 Marks)**

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15EE62

Sixth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Power System Analysis – I

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Show that the per unit impedance of a transformer is the same when referred to either primary or secondary side. **(04 Marks)**

b. Draw the circuit model of synchronous generator, transmission lines and transformer. **(04 Marks)**

c. The OLD of an unloaded power system is as shown in Fig.Q1(c). Reactance of Tr. Line are shown in figure. Draw the per unit impedance diagram. Choose a base of 50 MVA. 13.8 KV in G, circuit. The ratings are as under.

$G_1 \rightarrow$ 20 MVA, 13.8 KV, X″ = 0.2Pu, $T_1 \rightarrow$ 25MVA, 220/13.8 KV, X = 10%

$G_2 \rightarrow$ 30 MVA, 18 KV, X″ = 0.2Pu, $T_2 \rightarrow$ 3, 1ϕTr% each 10 MVA, 127/18 KV, X = 10%

$G_3 \rightarrow$ 30 MVA, 20 KV, X″ = 0.2Pu, $T_3 \rightarrow$ 35MVA, 220/22 KV, X = 10%. **(08 Marks)**

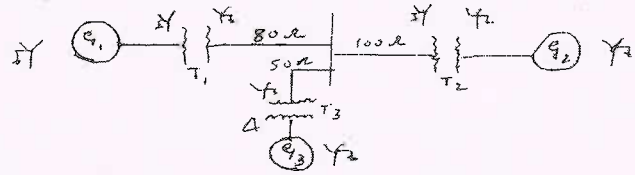

Fig.Q1(c)

OR

2 a. What is per unit quantity? Mention its advantage. **(04 Marks)**

b. How is the per unit impedance value in a given base are changed to per unit impedance value on new base. **(04 Marks)**

c. Draw the impedance diagram for the power system shown in Fig. Q2(c). The ratings of the components are as under,

$G_1 \rightarrow$ 25 MVA, 11 KV, x = 15% $G_2 \rightarrow$ 30 MVA, 12.5 KV, x = 20%

$M_1 \rightarrow$ 15 MVA, 11 KV, x = 12% $M_2 \rightarrow$ 25 MVA, 11.5 KV, x = 15%

$T_1 \rightarrow$ 30 MVA, 13/132 KV, x = 25% $T_2 \rightarrow$ 35 MVA, 132/11 KV, x = 20%

Choose a base of 132 KV on (100 + j150)Ω Tr. Line at 30 MVA base. **(08 Marks)**

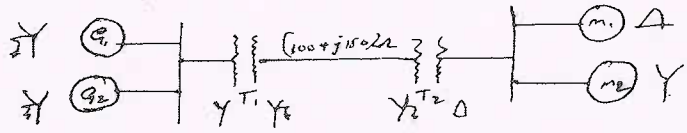

Fig.Q2(c)

Module-2

3 a. With the help of oscillogram of short circuit current of a synchronous generator operating on no load distinguish between subtransient, transient and steady state reactances. Also show that $X_d'' < X_d' < X_d$ with equivalent circuit diagram. **(08 Marks)**

b. A generator is connected to a synchronous motor through transformer. Reduced to a common base, the per unit subtransient reactance of generator and motor are 0.15 and 0.35 respectively. The leakage reactance of the transformer 0.1 pu. A 3ϕ short circuit fault occurs at terminals of the motor when terminal voltage of generator is 0.9 Pu, and output current of the generator is 1pu at 0.8 pf leading. Find the sub transient current in the fault, generator and motor. **(08 Marks)**

OR

4 a. Explain clearly how circuit breakers are rated. **(04 Marks)**

b. For the radial network shown in Fig.Q4(b), a 3ϕ fault occurs at 'F'. Determine the fault current. Choose a base of 100 MVA and base KV of 33 KV in overhead transmission line. **(12 Marks)**

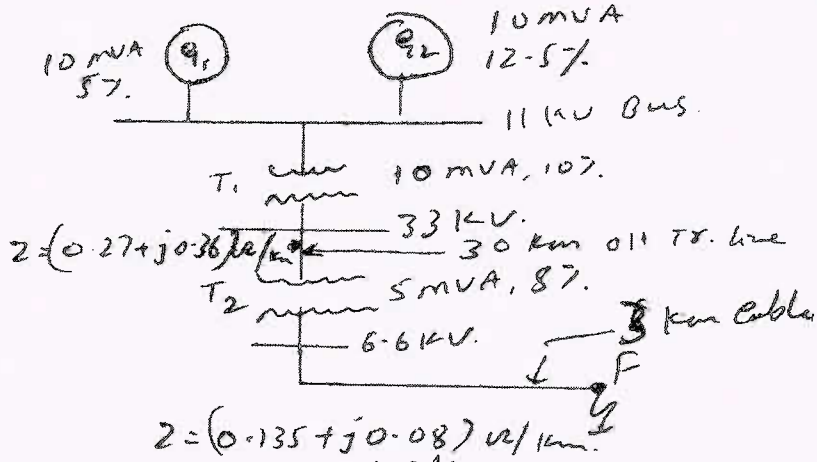

Fig.Q4(b)

Module-3

5 a. Derive an expression for the 3ϕ, complex power in terms of symmetrical components. **(08 Marks)**

b. Draw the Zero sequence network for different combination of 3ϕ transformer bank. **(04 Marks)**

c. A balanced Δ connected load is connected to a 3ϕ symmetrical supply. The line currents are each 10A in magnitude. If fuse in one of the line is blown out. Determine the sequence component of the line current. **(04 Marks)**

OR

6 a. Derive an expression for symmetrical components of voltage in terms of phase voltage. **(06 Marks)**

b. Draw the positive, negative and Zero sequence network for the power system shown in Fig.Q6(b). Choose a base of 50MVA, 220KV in the 50Ω transmission line and mark all reactance in per unit. The ratings are as under :

$G_1 \rightarrow$ 25 MVA, 12 KV, X″ = 20%, $G_2 \rightarrow$ 25MVA, 11KV, X″ = 20% T_1 to $T_4 \rightarrow$ 20MVA. 11/220 KV, X = 15%.

The negative sequence reactance of each synchronous machine is equal to the subtransient reactance. The Zero sequence reactance of each machine is 8%. Assume that the zero sequence reactance of line are 250% of their positive sequence reactance. **(10 Marks)**

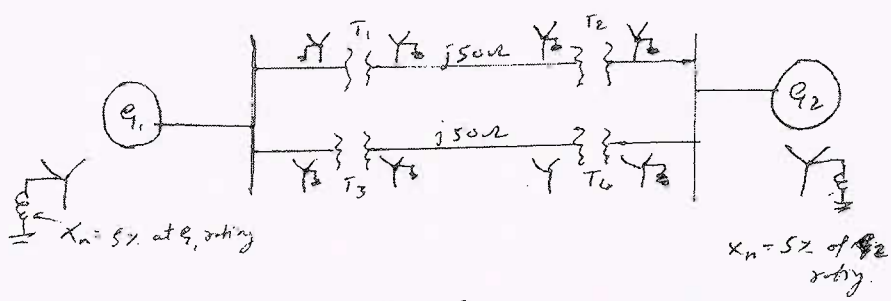

Fig.Q6(b)

Module-4

7 a. A double line to ground fault occurs at the terminals of an unloaded generator. Derive an expression for fault current, Draw the connection of sequence network. **(06 Marks)**

b. A 25MVA, 11KV, 3ϕ generator has a subtransient reactance of 20%. The generator suppliers 2 motor over transmission lines with transformer at both ends as shown in Fig.Q7(b). The motors have rated input of 15 MVA and 7.5MVA, both 10 KV, with 25% subtransient reactance. The 3ϕ transformer are both rated 30MVA, 10.8/121KV, ΔY, with leakage reactance of 10% each. The series reactance of the line is 100Ω. Calculate the fault current when a LG fault occurs at F. The motors are loaded to draw 15 MVA and 7.5MVA at 10KV and 0.8pf leading. Assume that negative sequence reactance is equal to positive sequence reactance. The Zero sequence reactance are marked in the Fig.Q7(b). **(10 Marks)**

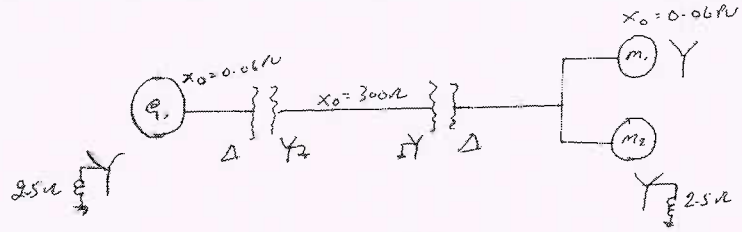

Fig.Q7(b)

OR

8 a. Derive an expression for fault current if LL fault occurs through a fault impedance Z_f in a power system. Show the connection of sequence network to represent the fault. **(06 Marks)**

b. A 3ϕ, 50MVA, 11KV, star connected neutral solidly grounded generator operating on no load at rated voltage give the following fault currents for the fault specified.
3ϕ fault → 2000A, LL fault-1800A, LG fault 2200A. Determine the 3 sequence reactance in ohm and per unit. **(10 Marks)**

Module-5

9 a. Derive swing equation for a synchronous reactance. **(08 Marks)**

b. A 3ϕ power system consists of a synchronous generator connected to a infinite bus bar through a loss less double circuit transmission line. A fault occurs on the transmission line. The maximum power transfer for the system when unfaulted is 5Pu and immediately prior to the instant of the fault the power transfer is 2.5pu. The power angle curves during fault and post fault conditions have peak values of 2pu and 4pu respectively. Determine the critical clearing angle. **(08 Marks)**

OR

10 a. Derive the power angle equation as applied to salient pole synchronous machine. **(07 Marks)**

b. Explain the terms :
i) steady state stability
ii) transient stability
iii) dynamic stability as applied to power system **(03 Marks)**

c. A 50HZ, 4P, turbo generator rated 100MVA, 11KV, has an inertia constant of 8 MJ/MVA.
i) Find the stored energy in the rotor at synchronous speed
ii) If the mechanical input is suddenly raised to 80 MW for an electrical load of 50MW, find rotor acceleration not neglecting mechanical and electrical losses.
iii) If the acceleration calculated in part (ii) is maintained for 10 cycles, find the change in torque angle and rotor speed in revolution per minute at the end of this period. **(06 Marks)**

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CBCS SCHEME

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15EE63

Sixth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Digital Signal Processing

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Find the 4-point DFT of the sequence, $x(n) = 6 + \sin\frac{2\pi n}{4}$, $0 \le n \le 3$. **(08 Marks)**

b. Given the sequence $x(n) = \cos\frac{\pi n}{2}$ and $h(n) = 2^n$. Compute the 4-point circular convolution. **(08 Marks)**

OR

2 a. State and prove the following properties of DFT i) Periodicity and ii) Linearity. **(06 Marks)**

b. Consider a FIR filter with impulse response h(n) = {3, 2, 1, 1} if the input is x(n) = {1, 2, 3, 3, 2, 1, -1, -2, -3, 5, 6, -1, 2, 0, 2, 1}. Find the output y(n), use overlap-add method, assuming the length of block is 7. **(10 Marks)**

Module-2

3 a. Why FFT is needed? What is the speed improvement factor in calculating 04-point DFT of a sequence using direct computation and FFT algorithm? **(06 Marks)**

b. Compute the 8-point IDFT of the sequence $\alpha(k)$ = {0, 2 + 2j, -j4, 2 – 2j, 0, 2 + 2j, j4, 2 – 2j} using the inverse radix-2 DIT algorithm. **(10 Marks)**

OR

4 a. What are the differences and similarities between DIT and DIF-FFT algorithm? **(06 Marks)**

b. Using DIF FFT algorithm, compute the sequence x(n) = {1, 2, -1, 2, 4, 2, -1, 2}. **(10 Marks)**

Module-3

5 a. Transform $H(s) = \frac{s+a}{(s+a)^2 + b^2}$ in to a digital filter using impulse invariance technique. **(08 Marks)**

b. Show that the bilinear transformation maps.

i) The jΩ axis in s-plane on to the unit circle, $|z| = 1$.

ii) The left half s-plane, Re(s) < 0 inside the unit circle, $|z| < 1$. **(08 Marks)**

OR

6 a. Mention the difference between Butterworth and Chebyshev filters. **(04 Marks)**

b. Determine the H(z) for a lowest order Butterworth filter satisfying following constraints:

$\sqrt{0.5} \le |H(e^{jw})| \le$ $\quad 0 \le |w| \le \pi/2$

$|H(e^{jw})| \le 0.2 \quad 3\pi/4 \le w \le \pi$, with $T = 1$ sec . Apply impulse invariant transformation. **(12 Marks)**

Module-4

7 a. Obtain the cascade realization of system function, $H(z) = 1 + \frac{5}{2}z^{-1} + 2z^{-1} + 2z^{-3}$. **(04 Marks)**

b. Design the digital filter using Chehyshev approximation and bilinear transformation to meet the following specifications:

i) Passband ripple = 1dB for $0 \le w \le 0.15\pi$

ii) Stopband attenuation $\ge$ 20dB for $0.45\pi \le w \le \pi$ **(12 Marks)**

OR

8 a. Obtain the direct form-I, direct form – II, cascade and parallel form realization for the following system:

$y(u) = 0.75y(n-1) - 0.125y(n-2) + 6x(n) + 7x(n-1) + x(n-2)$. **(12 Marks)**

b. Obtain the direct form-I structure for the given impulse response of a filter:

$h(u) = \left(\frac{1}{2}\right)^n [u(n) - u(n-3)]$. **(04 Marks)**

Module-5

9 a. The frequency response of a linear phase FIR filter is given by,

$H(e^{jw}) = e^{j3w}[2 + 1.8\cos 3w + 1.2\cos 2w + 0.5\cos w]$.

Find the impulse sequence of the filter. **(12 Marks)**

b. Mention the advantages and disadvantages of frequency sampling method. **(04 Marks)**

OR

10 a. Compare IIR filter and FIR filter. **(08 Marks)**

b. Design an FIR filter (lowpass) using rectangular window with passband gain of 0dB, cut-off frequency of 200Hz, sampling frequency of 1kHz. Assume the length of the impulse response as 7. **(08 Marks)**

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15EE64

Sixth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Electrical Machine Design

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing one full question from each module.
2. Missing data, if any, may be suitably assumed.

Module-1

1 a. Explain the clearly the factors which impose limitations on the design of electrical machines. **(08 Marks)**

b. Discuss modern machine manufacturing techniques in the design of electrical machines. **(08 Marks)**

OR

2 a. What are the desirable properties of insulating materials used in electrical machines? Give the classification of insulating materials based on thermal considerations with examples of materials used in each class. **(08 Marks)**

b. What are desirable properties of conducting materials used in electrical machines? Explain any two conductors with their properties. **(08 Marks)**

Module-2

3 a. Discuss the various factors which govern the choice of number of poles in DC machines. **(08 Marks)**

b. Find the main dimensions and the number of poles of a 37 kW, 230 V, 1400 rpm shunt motor so that a square pole face is obtained. The average gap density is 0.5T and ampere-conductor per metre is 22000. The ratio of pole arc to pole pitch is 0.7 and full load efficiency is 90%. **(08 Marks)**

OR

4 a. Discuss the design of shunt field winding of a DC machines. **(06 Marks)**

b. A 8 pole, 500V, dc shunt generator with all the field coils connected in series requires 5000 AT/pole. If the poles are of rectangular dimensions 12×20 cm and winding cross section is 12×2.5 cm, determine the cross sectional area of wire, number of turns and dissipation in watts/cm^2 based on the outside and two end surfaces of the coils. The conductor of circular cross section is used. $\rho = 0.021\ \Omega/m/mm^2$ and insulation increases the diameter of conductor by 0.02 cm. Allow a voltage drop in the field regulator of 50V. **(10 Marks)**

Module-3

5 a. Derive the output equation of a 3 phase core type transformer. Also derive the volts per turn equation. **(08 Marks)**

b. Determine the main dimensions of core and window, number of turns and cross sectional area of the conductors of a primary and secondary winding of a 3 phase core type transformer, 350 kVA, 11000/3300V, star-delta, 50 Hz. Assume volts/turn = 11; Maximum flux density = 1.25T; $A_i = 0.6\ d^2$; $a = 0.9\ d$; window space factor = 0.27; $H_w = 3W_W$, current density = 2.5 A/mm^2. **(08 Marks)**

OR

6 a. Discuss the design of tank and cooling tubes of a transformer. **(08 Marks)**

b. Calculate the No-load current a power factor of a 3300/220V, 50 Hz, single phase, core type transformer with the following data:
Mean length of magnetic path 300 cm, gross area of iron core 150 cm^2, specific iron loss at 50 Hz and 1.1 T is 2.1 W/kg, Ampere turns/cm for transformer steel at 1.1T is 6.2. The effect of joints is equivalent to that of an airgap of 1 mm in the magnetic circuit. Density of iron is 7.55 gm/cc. Iron factor is 0.92. **(08 Marks)**

Module-4

7 a. Discuss the factor affecting the length of airgap of a 3 phase induction motor. **(06 Marks)**

b. Determine the diameter of stator bore and core length of a 70 HP, 415 V, 3 phase, 50 Hz, star connected, 6 pole, induction motor for which q = 32,000 A-c/m, B_{av} = 0.51 T. Take efficiency as 90% and power factor as 0.91. Assume pole pitch is equal to core length. Estimate the number of stator conductors required for a winding in which the conductors are connected in 2 parallel paths. Assume number of slots/pole/phase = 3. **(10 Marks)**

OR

8 a. Derive expression for rotor bar and end ring current of squirrel cage induction motor. **(06 Marks)**

b. Discuss design of slip-ring rotor of a 3 phase induction motor. **(05 Marks)**

c. Determine the Magnetizing current, No load current and power factor of a 15 HP, 6 pole, 440 V, delta connected slip ring. Induction motor having the following data:
Number of stator slots = 54, stator conductor per slot = 28, flux/pole = 8.25 milliwaber, airgap area/pole 183.5 cm^2, gap length = 0.55 mm, iron loss = 510 W; friction and windage loss =110 W; gap contraction coefficient = 1.33, iron parts of the magnetic circuit requires 20% of ampere turns required for gap. Stator winding factor = 0.96. **(05 Marks)**

Module-5

9 a. Derive the output equation of a 3 phase synchronous machine. **(08 Marks)**

b. Determine the main dimensions of the stator bore, number of stator conductors and slots of a 3 phase, star connected, 8 pole, alternator rated at 300 kVA, 50 Hz. Assume q = 280 A-c/cm B_{av} = 0.6T, square pole faces and pole arc = 0.65 pole pitch. Voltage rating = 3300 V. Take number of slots/pole/phase = 3.5. **(08 Marks)**

OR

10 a. Discuss the factors to be considered while selecting number of armature slots in a synchronous machine. **(06 Marks)**

b. What are the steps involved in the design of field winding of a salient pole alternator? **(06 Marks)**

c. A 500 kVA, 3.3 kV, 50 Hz, 600 rpm, salient pole alternator has 180 turns/phase. Estimate the length of airgap if the average flux density = 0.575 Wb/m^2. Pole arc/pole pitch = 0.66, SCR = 1.2, gap extension factor = 1.15. The mmf required for the gap is 82% of the No load field mmf. KW_1 = 0.955. **(04 Marks)**

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15EE662

Sixth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Sensors and Transducers

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Explain the classification of transducers based on the power requirement, type of output and electrical principles involved. **(09 Marks)**

b. Briefly explain the operation of linear and angular motion potentiometer with neat diagrams. **(07 Marks)**

OR

2 a. A platinum resistance thermometer (RTD) has a resistance of 100Ω at 25°C. The resistance temperature coefficient of platinum is 0.00392Ω/Ω°C.

i) Find its resistance at 50°C

ii) If the thermometer has a resistance of 200Ω, calculate the value of temperature. **(07 Marks)**

b. With neat diagrams, explain the working of capacitive transducers based on :

i) Change in area of the plates

ii) Change is distance between the plates. **(09 Marks)**

Module-2

3 a. Derive the gauge factor for a single uniform length of a conductor (wire) shown in Fig Q3(a)

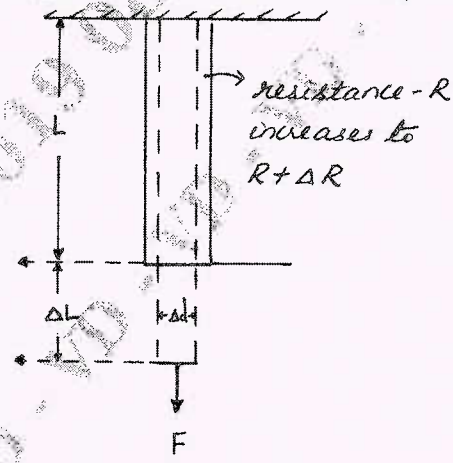

Fig Q4 **(10 Marks)**

b. With a supporting diagram, explain the operation of a pneumatic proximity sensor. **(06 Marks)**

OR

4 Obtain the mathematical expressions for the output voltage of strain gauges using wheat stone bridge for ;

a. Quarter bridge

b. Half bridge

c. Full bridge configurations shown in Fig Q4. **(16 Marks)**

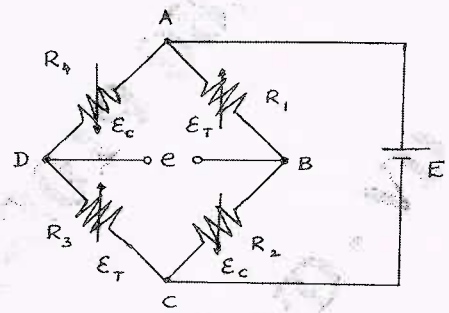

Fig Q4

Module-3

5 a. Describe a general measurement system with a neat block diagram and hence explain signal conditioning and its necessity. **(08 Marks)**

b. With a neat circuit diagram, explain the operation of weighted resistor digital – to – analog converter. **(08 Marks)**

OR

6 a. Describe a general data acquisition system with a neat block diagram. **(08 Marks)**

b. With a neat circuit diagram, explain the operation of successive approximation analog – to – digital converter. **(08 Marks)**

Module-4

7 a. Explain the construction and working operation of a voltage telemetering system with supporting diagram. **(08 Marks)**

b. With a neat diagram, explain the operation of a Pirani gauge **(08 Marks)**

OR

8 a. Explain the construction and working operation of a current telemetering system with the aid of a supporting diagram. **(08 Marks)**

b. With a neat diagram, explain the working of an ionization gauge. **(08 Marks)**

Module-5

9 a. Describe the measurement of shaft power using Eddy current dynamometer with a neat diagram. **(08 Marks)**

b. Explain the theory operation of electromagnetic flow meters with suitable diagram. **(08 Marks)**

OR

10 a. With a neat diagram, explain the measurement of small displacement using LVDT. **(08 Marks)**

b. Explain the theory of operation of level measurement using LASER with a neat diagram. **(08 Marks)**