

Total No. of Printed Pages: 02

T.E - (ETC) (Sem-V) (Revised Course 2019-2020)

EXAMINATION DECEMBER 2023

Soft Computing

[Time: 3 Hours]

[Max. Marks:100]

**Instructions:** Answer any five questions by selecting two questions from part A, two questions from part B and one question from Part C.

## PART A

- Q1 a) Compare Supervised and Unsupervised learning. 06  
 b) Implement ANDNOT function using McCulloch-Pitts neuron (take binary data) 08  
 c) Compare and contrast fuzzy logic with crisp logic. 06

- Q2 a) Explain block diagram of expert systems. 06  
 b) Design a Hebb net to implement OR function (consider bipolar inputs and targets) 06  
 c) Design a computer software to perform image processing to locate objects within a scene. The two fuzzy sets representing a plane and a train image are:

$$Plane = \left\{ \frac{0.2}{train} + \frac{0.5}{bike} + \frac{0.3}{boat} + \frac{0.8}{plane} + \frac{0.1}{house} \right\} \text{ and}$$

$$Train = \left\{ \frac{1}{train} + \frac{0.2}{bike} + \frac{0.4}{boat} + \frac{0.5}{plane} + \frac{0.2}{house} \right\}$$

Find the following: a) plane  $\cup$  train b) plain  $\cap$  train c) plane' d) train' e) plane | train f) (plane  $\cup$  train)' g) (plain  $\cap$  train)' h) plane  $\cup$  plane'

- Q3 a) Discuss the general methodology of problem solving with fuzzy inference system with suitable diagram. Compare an Artificial Neural Network (ANN) with Fuzzy Inference Systems (FIS) for problem solving. 10  
 b) Classify the two-dimensional input pattern shown in figure using perceptron network. The symbol "\*" indicates the data representation to be + 1 and "." indicates data to be -1. The patterns are I-F. For pattern I, the target is + 1, and for F, the target is -1.

```

* * *      * * *
. * .      * * *
* * *      * . .
  "I"      "F"

```

## PART B

- |    |  |    |
|----|--|----|
| Q4 | a) Explain the different methods of selection in GA.   | 08 |
|    | b) Compare ANN and DNN.  | 06 |
|    | c) Explain pooling function of Convolutional Neural Network.   | 06 |
| Q5 | a) Explain difference between feasible and infeasible solution with suitable example in case of GA? How to handle infeasible solution? | 06 |
|    | b) List advantages, disadvantages and applications of Fuzzy-Genetic hybrid systems.  | 08 |
|    | c) Explain Ant colony algorithm with neat diagram.   | 06 |
| Q6 | a) Explain different stopping and termination criteria in case of GA.  | 08 |
|    | b) Explain types of Neuro Fuzzy hybrid systems in detail.  | 08 |
|    | c) What is difference between phenotype and genotype representation of individuals in GA?  | 04 |

**PART C**

- |    |   |    |
|----|---|----|
| Q7 | A) Explain various activation functions used in ANN.  | 06 |
|    | B) Suppose health of a person depends on his age and medical history. Design fuzzy inference system. Write atleast 3 fuzzy if-then rules. Draw the necessary membership graphs. | 10 |
|    | C) Determine the crisp $\lambda$ -cut relation when $\lambda = 0.1, 0.3$ and $0.9$ for the following relation:  | 04 |

$$\tilde{R} = \begin{bmatrix} 0 & 0.2 & 0.4 \\ 0.3 & 0.7 & 0.1 \\ 0.8 & 0.9 & 1.0 \end{bmatrix}$$

- |    |  |    |
|----|--|----|
| Q8 | a) What is an inspiration behind particle swarm optimization algorithm? Explain particle swarm optimization algorithm with neat diagram. | 10 |
|    | b) Explain in detail Genetic Neuro Hybrid Systems.   | 10 |

Total No. of Printed Pages: 4

T.E - (Electronics & TC / Electronics & Comm) (Sem-V)(Revised Course 2019-2020)

EXAMINATION DECEMBER 2023

Digital Signal Processing

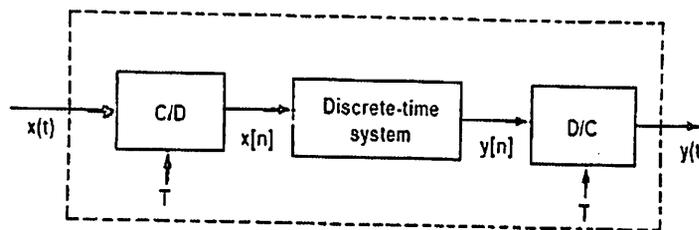
[Time: 3:00 Hours]

[Max. Marks:100]

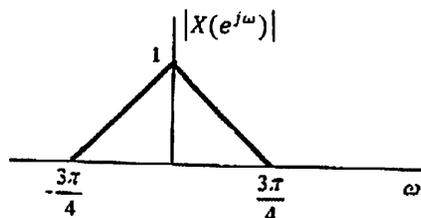
- Instructions:**
1. Assume suitable data wherever necessary
  2. Attempt any two full questions from Part A, any two full questions from Part B and any one full question from Part C

**PART A**

- Q1 a) Consider the following system shown in the Figure, with the discrete-time system an ideal lowpass filter with cutoff frequency  $\pi/8$  rad/sec **6m**

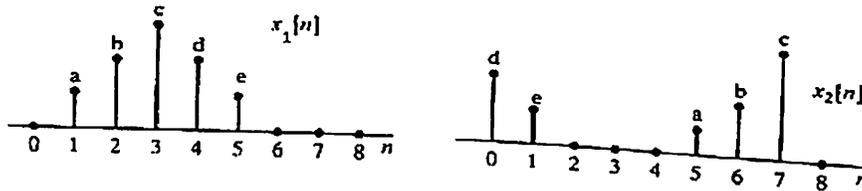


- i. If  $x(t)$  is band limited to 5 KHz, what is the maximum value of 'T' that will avoid aliasing in the C/D Converter?
  - ii. If  $1/T=10$  KHz, what will be the cutoff frequency of the effective continuous filter be?
- b) Explain the polyphase decomposition of Decimation Filter **5m**
- c) The spectrum of the discrete time signal is shown in the figure, Draw the spectrum of the decimated signal for the Decimation factors 2, 3 and 4 **9m**



- Q2 a) Find the circular convolution of the following sequences **8m**
- $x(n) = (-1)^{-n} 0 \leq n \leq 3$  and  $h(n) = \{1, -1, 1\}$
- using DFT and IDFT method

- b) Two eight point sequence is shown in Figure. Its DFT is  $X_1[k]$  and  $X_2[k]$  find the relationship between them 6m



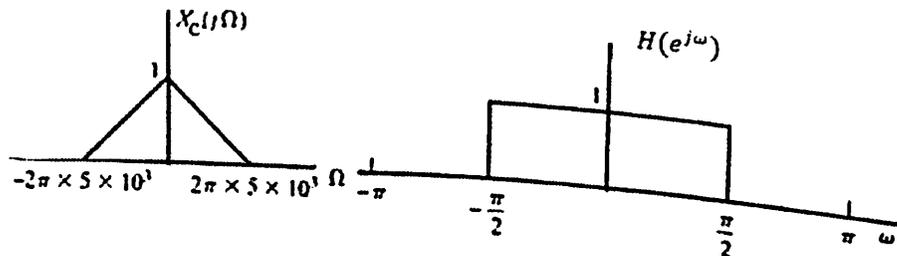
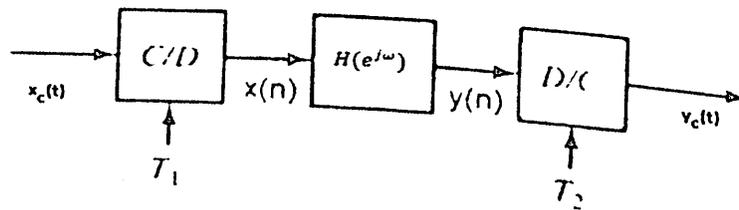
- c) Compute the 4-point DFT of the sequence,  $x[n]=\{1,2,1,0\}$ . Also find  $y[n]$  if  $Y[k]=X[k-2]$  6m

- Q3 a) Given  $x(n)=\{1,2,-1,1\}$  and  $h(n)=\{1,-2\}$ . Find  $y(n)$  using DFT-IDFT method such that  $y(n)$  is non aliased. 10m

- b) State and explain any two properties of DFT 4m

- c)  $X_c(j\Omega)$  and  $H(e^{j\omega})$  are shown in Figure. Sketch and label the Fourier Transform of  $x[n]$ ,  $y[n]$  and  $y_c(t)$  for each of the following cases. 6m

- i)  $1/T_1 = 1/T_2 = 2 \times 10^4$   
 ii)  $1/T_1 = 2 \times 10^4$  and  $1/T_2 = 10^4$



## Part -B

- Q4 a) A Causal LTI DT System has the system function 8m

$$H(z) = \frac{1 + z^{-1}}{(1 - z^{-1})(1 - 0.2e^{j\frac{\pi}{4}}z^{-1})(1 - 0.2e^{-j\frac{\pi}{4}}z^{-1})}$$

Realize using Direct form-I, Direct Form-II, Cascade and parallel forms

- b) Design a Butterworth Digital filter using impulse invariant transformation satisfies the following specifications 12m

$$\begin{aligned} 0.8 \leq |H(e^{j\omega})| \leq 1 & \quad 0 \leq \omega \leq 0.3\pi \\ |H(e^{j\omega})| \leq 0.2 & \quad 0.8\pi \leq \omega \leq \pi \end{aligned}$$

- Q5 a) Design an ideal low pass filter with a frequency response of 10m

$$\begin{aligned} H_d(e^{j\omega}) = e^{-j5\omega} & \quad 0 \leq |\omega| \leq 0.25\pi \\ 0 & \quad 0.25\pi \leq |\omega| \leq \pi \end{aligned}$$

Using hanning window with length N=11

- b) Design a Linear phase filter of length N=11 using frequency sampling method for the following specification 10m

$$\begin{aligned} H\left(\frac{2\pi k}{11}\right) = 0.8 & \quad K = 0,1,2 \\ 0.6 & \quad k = 3 \\ 0 & \quad k = 4,5 \end{aligned}$$

- Q6 a) Design a Digital chebyshev filter that satisfies the following constraints. 12m

$$\begin{aligned} 0.9 \leq |H(e^{j\omega})| \leq 1 & \quad 0 \leq \omega \leq 0.25\pi \\ |H(e^{j\omega})| \leq 0.24 & \quad 0.5\pi \leq \omega \leq \pi \end{aligned}$$

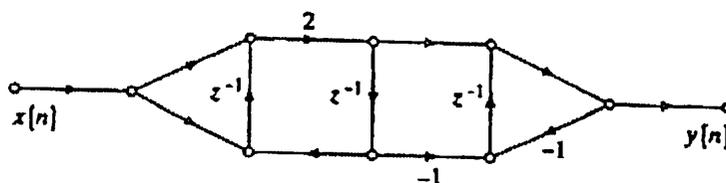
Realize the filter using bilinear transformation method. Assume T=1 sec

- b) Determine the magnitude response of symmetric linear phase FIR filter with N is even 8m

Part -C

- Q7 a) With a neat sketch describe the process of decimation by an Integer factor of D. **10m**  
 Obtain the expression for the output Spectrum. Also sketch the signals at various stages and why filters are required after the decimator
- b) Compute the 8-point DFT of the sequence  $x[n]=\{1,-1,1,-1,1\}$  using DIT FFT **10m**  
 algorithm by choosing appropriate N. Show your steps clearly with the intermediate results.

- Q8 a) A Linear Time invariance system is realized by using the following graph **10m**



- i) What is the system function of the system?
- ii) Write the difference equation relating input  $x[n]$  and output  $y[n]$
- iii) Realize using minimum number of storage elements
- b) Explain the subband coding of speech signals **5m**
- c) Compare commonly used window functions to design a FIR filter with respect to magnitude response, sidelobe and functional equations **5m**

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T.E. - (Electronics & TC) (Sem-V) (Revised Course 2019-2020)

EXAMINATION DECEMBER 2023

Analog and Digital Communication

[Time: 3:00 Hours]

[Max. Marks:100]

- Instructions:**
1. Assume suitable data only if necessary
  2. Answer any two questions from PART-A
  3. Answer any two questions from PART-B
  4. Answer any one question from PART-C
  5. All symbols, abbreviations and notations have their usual meaning

**PART A**

- Q1 a] Define multiplexing with respect to communication systems. With the help of a neat diagram, explain the operation of a typical FDM system. Explain the importance of a guard band. **08**
- b] Explain the working of an envelope detector using suitable diagrams. What is the effect on demodulation if the time constant is made too large or too small? **06**
- c] An A.F. signal  $20\sin(2\pi \times 500t)$  is used to amplitude modulate a carrier of  $50\sin(2\pi \times 10^5t)$ . Calculate **06**
- i) Modulation index
  - ii) Sideband frequencies
  - iii) Bandwidth required
  - iv) Total power delivered into the load of  $600\Omega$
- Q2 a] When modulating frequency in an FM system is 300Hz, modulating voltage is 1.3V and the modulation index is 50, calculate maximum frequency deviation. What is the modulation index when modulating frequency is reduced to 250Hz and the modulating voltage changed to 2.6V? **06**
- b] Are frequency and phase modulation schemes interrelated? Illustrate and **07**

mathematically prove that one can be obtained from the other.

- c] Explain the various stages of a typical PCM communication system. 07
- Q3 a] Write a note on the types of transmission media. 06  
b] Differentiate between FM and AM. 06  
c] i) Explain the term aliasing and its effects. How can we avoid aliasing? 04  
ii) Find the Nyquist rate and Nyquist interval for  $x(t)=5\cos 1000\pi t \cos 4000\pi t$  04

**PART B**

- Q4 a] With the help of neat diagrams and waveforms explain the generation and detection of Amplitude Shift Keying (ASK). What are the advantages and disadvantages of ASK? 09  
b] Draw and explain the working of a DPSK receiver. What is the advantage of the DPSK scheme over BPSK? 06  
c] Explain the power spectral density of a typical BFSK and define its bandwidth. 05
- Q5 a] What is a 'superheterodyne' receiver? With the help of a block diagram, explain each stage of such a receiver? 07  
b] Derive an expression for the peak signal to RMS noise output voltage ratio for a receiver using integrator and dump circuit. 07  
c] Write a note on image frequency and its rejection. 06
- Q6 a] Explain with neat block diagram M-ary PSK transmitter and receiver. Give geometrical representation of M-ary PSK signal. 10  
b] What is a 'Matched Filter'? Derive an expression for probability of error when a matched filter is employed. 10

**PART C**

- Q7 a] Explain the need for modulation in communication systems. 06

- b] Derive the formula for the instantaneous value of an FM voltage and define the modulation index. If  $m_f$  is doubled is by halving the modulation frequency what will be the effect on the maximum deviation? 06
- c] Draw and explain the operation of the balanced modulator used for DSB-SC generation. 08
- Q8 a] What is BFSK? Compare its merits and demerits with BPSK 05
- b] Compare BPSK and QPSK. 06
- c] Write a note on calculation of the Optimum Filter Transfer Function. 09

Total No. of Printed Pages: 03

T.E. - (ETC / ECE) (Sem-V) (Revised Course 2019-2020)

EXAMINATION DECEMBER 2023

Embedded Systems

[Time: 3:00 Hours]

[Max. Marks: 100]

- Instructions:*
1. Answer any 2 questions from Part-A, 2 questions from Part-B and any 1 question from Part-C
  2. Figures to the right indicate marks
  3. All symbols & abbreviations carry their usual meanings.
  4. Assume suitable data, if necessary.

**PART-A**

- Q1 a) Explain with a neat diagram, the structure and working of 8051 PORT1. -8M-  
b) Explain the IP and IE SFR associated with interrupts in 8051. After reset the IP register is set by the instruction MOV IP, #00011100. List the sequence in which the interrupts are serviced in 8051. -6M-  
c) Write an assembly language program to generate a square wave of 5kHz frequency on pin P0.1 in 8051. Assume XTAL=11.0592MHz. Show the necessary calculations. -6M-
- Q2 a) Explain 4x4 keyboard interfacing with 8051. Write a program to detect the key press and store the detected key in Register B. -8M-  
b) What are addressing modes? Explain the various addressing modes in 8051. -6M-  
c) Draw and explain the memory organization of 8051. -6M-
- Q3 a) Write instruction/s to store value F5H in -6M-  
i) Internal RAM locations 37H-40H  
ii) External RAM address F700H.

- b) Draw a neat diagram to show external RAM memory interfacing of size 16k×8 with 8051 such that the memory map ranges from C000H-FFFFH. **-8M-**
- c) Write an Assembly language program for 8051 to transfer 10 bytes of data stored in internal RAM memory starting from 30H to memory address 50H. **-6M-**

**PART-B**

- Q4
- a) Explain the syntax of following instructions in PIC18 microcontroller with an example each: **-8M-**
    - i. BNZ
    - ii. CPFSGT
    - iii. INCFSZ
    - iv. RRCF
  - b) Explain the Compare Mode of PIC18. **-6M-**
  - c) With a neat diagram, explain the working of Timer1 in PIC18. **-6M-**
- Q5
- a) i) WAP to get data from SFRS of Port B. Add the value 5 to it and send it to the SFRs of Port C. **-4M-**
    - ii) WAP to determine if fileReg location 0×30 contains the value 0. If so, put 55H in it. **-4M-**
  - b) Explain SPI protocol. **-6M-**
  - c) PIC18 is a RISC processor using Harvard architecture. Justify. **-6M-**
- Q6
- a) Explain with a neat block diagram Capture in PIC18. **-8M-**
  - b) Explain with a neat diagram, the working of Timer0 of PIC18. **-8M-**
  - c) What happens after the following instructions are executed in PIC18. **-4M-**
    - MOVLW 55H
    - MOVWF PORTB
    - COMF PORTB, F

**PART-C**

- Q7 a) What happens after the following instructions are executed in 8051 microcontroller. **-4M-**
- MOV R1, A  
MOV @R1, A
- b) Explain how serial communication can be achieved in 8051. **-8M-**
- c) Explain direct and indirect addressing in PIC18 with an example each **-8M-**
- Q8 a) Explain direct and indirect addressing in 8051. **-4M-**
- b) Explain PWM mode in PIC18. **-8M-**
- c) Interface a stepper motor with 8051 microcontroller and write a program to rotate it in anti- clockwise direction continuously. **-8M-**



Total No. of Printed Pages: 4

T.E. - (Electrical & Electronics) (Sem-V) (Revised Course 2019-2020)

EXAMINATION DECEMBER 2023

Control System

[Time: 3:00 Hours]

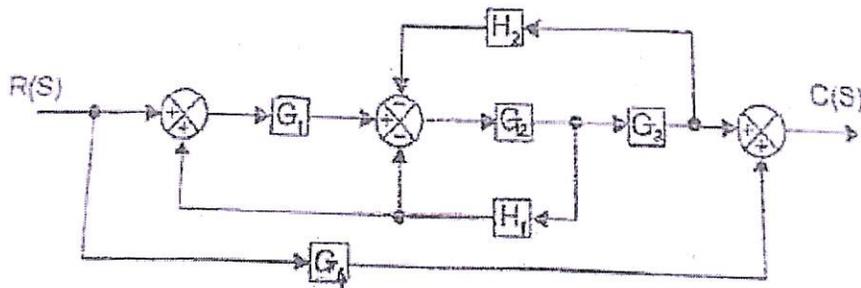
[Max. Marks:100]

- Instructions:**
- 1) Assume suitable data wherever necessary.
  - 2) Use semilog graph, normal graph papers wherever required.
  - 3) Draw suitable diagrams wherever required.

PART-A

Answer any 2 question from Part-A

- Q1
- a) With a neat diagram, explain a temperature control closed loop system. [6]
  - b) With a neat diagram, discuss the full step operation of a stepper motor. [7]
  - c) Using the block diagram reduction techniques, obtain the transfer function of the following [7]



- Q2
- a) The open loop transfer function of a unity feedback system is given by [7]
- $$G(s) = \frac{K}{s(s^2+s+1)(s+4)}$$

By applying Routh criterion, find the range of K for stability. Also find the value of K for sustained oscillations. Obtain the frequency of sustained oscillations.

- b) The open loop transfer function of a unity feedback system is

[7]

$$G(s) = \frac{25}{s(s + 5)}$$

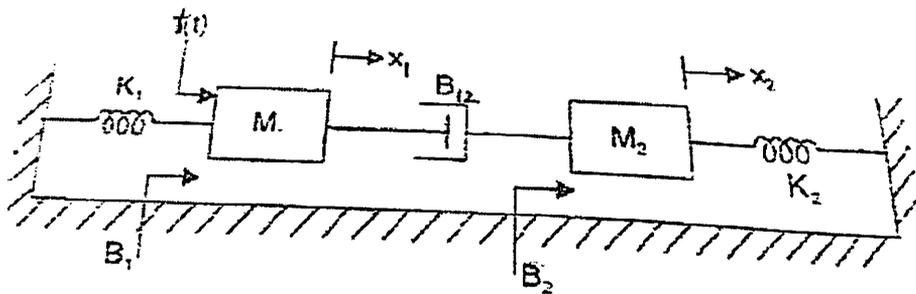
Determine the nature of response of the closed-loop system for a unit-step input. Also calculate the rise time, peak time, peak overshoot and settling time.

- c) Derive the relation for the steady state error and the static error constants for type 0, type 1 and type 2 systems with step, ramp and parabolic inputs.

[6]

- Q3 a) Write the differential equations governing the mechanical system, find the transfer function  $X_1(s)/F(s)$ ,  $X_2(s)/F(s)$  and obtain the force voltage and force current analogous circuits.

[10]



- b) Sketch the root locus of a unity feedback system with forward path transfer function given below. Obtain the value of K for a damping ratio  $\xi = 0.5$

[10]

$$G(s) = \frac{K}{s(s + 4)(s + 5)}$$

### PART-B

Answer any 2 question from Part-B

- Q4 a) The open loop transfer function of a unity feedback system is

[10]

$$G(s) = \frac{K}{s(s + 1)}$$

Design a cascade lead compensator for a velocity error constant  $K_v = 10$  and Phase Margin  $PM = 45^\circ$

- b) The open loop transfer function of a control system is given by

[10]

$$G(s)H(s) = \frac{10}{(s+2)(s+4)}$$

Using Nyquist criterion, determine the stability of the closed loop system. Draw the Nyquist Plot.

- Q5 a) Construct the Bode plot for a unity feedback control system having

[10]

$$G(s) = \frac{80}{s(s+2)(s+20)}$$

Find the gain and phase crossover frequencies, Gain margin and Phase margin and comment on the stability of the system.

- b) Consider a unity feedback system having an open loop transfer function

[10]

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

Sketch the polar plot and determine the value of K for

- i) Gain margin = 18dB
- ii) Phase margin = 60°

- Q6 a) The open loop transfer function of a unity feedback system is

[8]

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

Design a cascade lead compensator such that the dominant closed loop poles provide a damping ratio  $\xi = 0.5$  and have an undamped natural frequency  $\omega_n = 4$  rad/sec.

- b) Determine the gain margin and the phase margin of a system with open loop transfer function

[6]

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

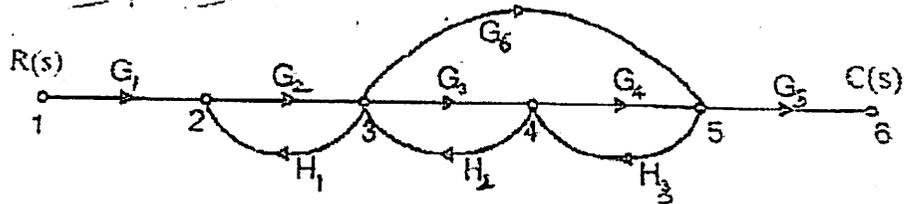
- c) What is the use of a controller? Explain the PI controller and derive its transfer function. Draw the block diagram and realise it using op-amp.

[6]

PART-C

Answer any 1 question from Part-C

- Q7 a) Obtain the transfer function of the signal flow graph using Mason's Gain formula [5]



- b) Use Routh criterion to determine the stability of the system represented by the characteristic equations. Determine the position of roots lying in the left and right half of s-plane. [5]

$$s^5 + 5s^4 + 12s^3 + 13s^2 + 3s + 6 = 0$$

- c) Define and explain the following frequency domain terms: [5]
- 1) Resonant peak
  - 2) Resonant frequency
  - 3) Bandwidth
- d) With a neat diagram obtain the transfer function of a phase lag network. [5]

- Q8 a) How is synchro used as an error detector. Explain with a neat diagram. [5]
- b) Derive the response of a first order system subjected to a unit step input. Draw the output response [5]
- c) Draw and explain the stable, marginally stable and unstable system for bode plots. [5]
- d) Explain the design of lag-lead compensator using Root locus technique [5]

Total No. of Printed Pages: 3

T.E - (Electrical & Electronics) (Sem-V)(Revised Course 2019-2020)

EXAMINATION DECEMBER 2023

Microprocessor and Microcontrollers

[Time: 3:00 Hours]

[Max. Marks:100]

Instructions:

1. Answer ANY TWO FULL questions from PART A
2. Answer ANY TWO FULL questions from PART B
3. Answer ANY ONE FULL question from PART C
4. Assume suitable data wherever necessary.
5. Figures to the right indicate full marks

**Part -A**

- Q1 a) Discuss characteristics of an embedded system. 6
- b) Explain the step by step execution of the following code for 8085 microprocessor 6
- MVI A,CAh
- LXI B,2500H
- ANI B9h
- STA 2000H
- CMA
- STAX B
- HLT
- c) Explain the memory organization of 8051 RAM 8
- Q2 a) Explain various addressing modes for 8051 microcontroller with suitable examples 8
- b) Registers R0 and R1 are sequentially loaded with values A2h and 34h respectively, write an assembly language program for 8051 microcontroller to generate delay using loop within loop concept. Calculate the delay generated 6
- c) With reference to 8085 microprocessor, explain LXI and LDA instructions with suitable examples 6
- Q3 a) Compare between 8 bit, 16 bit and 32 bit microcontrollers 8
- b) Write short note on clock and reset circuit of 8051 microcontroller 6

- c) With suitable example explain how you can select register bank and switch between banks 6

**Part –B**

- Q4 a) With neat diagram, discuss LCD interfacing with 8051 microcontroller. Discuss various commands and control signals. Write program to display message **MEMORY** at the centre of Line 1 of the display 8

- b) Explain ADC and SUBB instructions for 8051 with suitable example 6

- c) Write short note on RS232 protocol 6

- Q5 a) Write a C program to blink LED's connected to port 2 6

- b) What is meant by memory map? Obtain the memory for a microcontroller having 512 bytes of on chip RAM and 8 kB of on chip ROM 6

- c) Explain the step by step execution of following instructions for 8051 microcontroller. 8

ORG 00H

MOV A,#0F3H

SWAP A

SETB PSW 3

MOV R0,A

MOV 35H,#2CH

MOV A,35H

XRL A,R0

SETB 0D4H

MOV R0,A

END

- Q6 a) Determine count value and write assembly program for configuring 8051 timer to generate a square wave of 2 kHz frequency on P1.0. 8

- b) Answer any 2 of the following

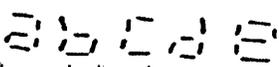
- i. Specify the full step and half step sequences for a stepper motor. A robotic arm driven by a stepper motor is interfaced with 8051

2x6=12

microcontroller. The stepper motor has a step angle of 1.2 degrees. The robotic arm is to be rotated anticlockwise by 54 degrees. Configure the microcontroller for this task and write an assembly language program for the same

- ii. Compare between synchronous and asynchronous communication
- iii. Features and uses of Bluetooth protocol

**Part –C**

- Q7 a) Specify the format of IE and IP registers in 8051. Resolve priority of interrupts given the following instructions  
 MOV IE, #8Dh  
 MOV IP, #8hh 5
- b) Explain with a neat diagram how the lower order bus is demultiplexed 5
- c) Explain internal structure of 8051 port with neat sketch 5
- d) Evaluate codes to display message  on common cathode seven segment display. Write assembly code for the same. 5
- Q8 a) Discuss various methods of delay generation 5
- b) Why do we need power saving modes? Discuss idle mode with neat sketch 5
- c) Write assembly language program to generate a triangular waveform using DAC. 5
- d) Discuss conditional branching instructions for 8051 microcontroller 5

Total No. of Printed Pages: 3

T.E - (Electrical & Electronics) (Sem-V)(Revised Course 2019-2020)

EXAMINATION DECEMBER 2023

Illumination Engineering

[Time:3:00 Hours]

[Max. Marks:100]

- Instructions:**
1. Answer any 2 questions from part A, any 2 questions from Part B & any one question from PART C
  2. Assume suitable data, if necessary

**Part A**

- Q1
- a) List and explain the different functional aspects of luminaires. 6 Marks
  - b) What is visual acuity? State and explain the different factors affecting it. 6 Marks
  - c) A 125 W HPMV lamp is fitted inside a perfect diffuser having DLOR= 60%. 8 Marks  
Diameter of diffusing surface = 40 cm. Calculate the luminance of source in the direction of 45° from vertical axis of luminaire.
- Q2
- a) Derive an expression showing relationship between lumen output and luminous intensity in a flat diffuser, indicating clearly each term used in the expression. 8 Marks
  - b) What is photometry? Explain the procedure for measurement of luminous intensity of a testing source using photometry. 6 Marks
  - c) A twin tube luminaire is provided with an acrylic diffuser of size 630 mm × 630 mm. The DLOR of luminaire is 0.55. Calculate the brightness of source surface when seen from a distance of 3m. Consider the mounting height to be 2 m above the eye level. 6 Marks
- Q3
- a) What is the significance of polar curves in illumination? Explain the procedure for drawing polar curves using Roussean's construction. 7 Marks
  - b) A photometric testing of high bay luminaire was carried out on a 400 W HPMV lamp whose bare lumen output was obtained as 47500 lm, when tested on a 240 V A.C supply, the test distance being 7m. The operating Zone varied from 0° to 90°. The average illumination level being 240 Lux. Calculate L.O.R. of Luminaire. 8 Marks
  - c) What is stroboscopic effect? Explain the different ways of minimising it. 5 Marks

**PART B**

- Q4 a) Design an illumination scheme for a plate inspection steel plant to provide an illumination level of 500 Lux, using 400 W Sodium vapour lamp luminaires. The following data is available: Reflectance of Wall = 50%, Reflectance of ceiling = 50%, Reflectance of working plane = 10%, S/ H ratio=1.25, utilization factor table is given below. Assume suitable values of maintenance factor, absorption factor and determine the number of luminaires provided. Also give their layout. Utilization factor table

Room Reflectance %			Room Index				
Floor	Ceiling	Wall	0.8	1.0	1.25	1.5	2.0
10	70	50	0.32	0.33	0.39	0.41	0.46
		30	0.26	0.28	0.33	0.36	0.41
		10	0.22	0.26	0.30	0.33	0.38
10	50	50	0.28	0.32	0.36	0.38	0.43
		30	0.24	0.28	0.31	0.33	0.38
		10	0.21	0.25	0.28	0.31	0.36

- b) List out the various factors related to the loss of light emitted by luminaires before reaching the working plane. Hence define LLF and explain in brief the factors on which it depends. 10 Marks
- Q5 a) A road with carriage way of 32m stretch is to be illuminated with lamp posts provided with HPMV lamp located at the two extreme ends and at 24 m height. Calculate the illumination level at a point which is at an equidistant from the ends of both the lamp posts. The luminous intensity v/s angular position at 1000 lm output of lamp measured w. r. t. vertical axis of the fitting is as follows:

Angle in degree	0	10	20	30	40	50	60	70
C.P.	240	270	290	260	190	130	50	15

- b) State the basis of classification of street light. Also give advantages and disadvantages of each. 6 Marks
- c) Distinguish between the following, giving at least two points of distinction between them: 4 Marks
- Flood lighting & spot lighting
  - Room index & cavity index

- d) What is the significance of surveillance lighting? Also state its types, giving one application of each. 4 Marks
- Q6 a) Design an economical flood lighting scheme for storage yard of 30 m × 15m to provide an illumination level of 150 lux using steel tubular poles of 12 m mounting height. The following photometric data of flood light projector is available:  
Round fitting with 250 W HPSV lamp having beam angle of 2 × 25°, beam factor of 0.5.  
Square fitting with 2 × 250 W HPSV lamp, having beam angle of 2 × 14° and 2 × 40 ° with beam factor of 0.6 10 Marks
- b) Briefly explain the concept of aiming of flood lights with neat diagrams. 5 Marks
- c) Explain air field lighting in detail. (Aviation lighting). 5 Marks

### PART C

- Q7 a) Distinguish between the following giving at least two points of distinction between them 6 Marks
- i) Disability glare & discomfort glare
  - ii) Hard shadows & soft shadows
  - iii) Incandescence & fluorescence.
- b) Explain the working of illuminance meter with the help of neat sketch. 4 Marks
- c) List out the various points to be considered in the selection of C.O.U. 5 Marks
- d) Discuss the salient features of intelligent LED fixtures. 5 Marks
- Q8 a) Enlist the features of good lighting & explain each in brief. 5 Marks
- b) State the different types of photometers. Which of these are widely used, when the light emitted by test source & standard source have the same colour. 5 Marks
- c) List out the various arrangements of mounting of luminaires in interior lighting design. Explain each in brief. 5 Marks
- d) Discuss the advantages of Fibre optics cable as an optical guide. 5 Marks

## PART B

- Q4 a) Design an illumination scheme for a plate inspection steel plant to provide an illumination level of 500 Lux, using 400 W Sodium vapour lamp luminaires. The following data is available: Reflectance of Wall = 50%, Reflectance of ceiling = 50%, Reflectance of working plane = 10%, S/H ratio = 1.25, utilization factor table is given below. Assume suitable values of maintenance factor, absorption factor and determine the number of luminaires provided. Also give their layout. Utilization factor table

Room Reflectance %			Room Index				
Floor	Ceiling	Wall	0.8	1.0	1.25	1.5	2.0
10	70	50	0.32	0.33	0.39	0.41	0.46
		30	0.26	0.28	0.33	0.36	0.41
		10	0.22	0.26	0.30	0.33	0.38
10	50	50	0.28	0.32	0.36	0.38	0.43
		30	0.24	0.28	0.31	0.33	0.38
		10	0.21	0.25	0.28	0.31	0.36

- b) List out the various factors related to the loss of light emitted by luminaires before reaching the working plane. Hence define LLF and explain in brief the factors on which it depends. 10 Marks
- Q5 a) A road with carriage way of 32m stretch is to be illuminated with lamp posts provided with HPMV lamp located at the two extreme ends and at 24 m height. Calculate the illumination level at a point which is at an equidistant from the ends of both the lamp posts. The luminous intensity v/s angular position at 1000 lm output of lamp measured w. r. t. vertical axis of the fitting is as follows: 6 Marks

Angle in degree	0	10	20	30	40	50	60	70
C.P.	240	270	290	260	190	130	50	15

- b) State the basis of classification of street light. Also give advantages and disadvantages of each. 6 Marks
- c) Distinguish between the following, giving at least two points of distinction between them: 4 Marks
- Flood lighting & spot lighting
  - Room index & cavity index

Total No. of Printed Pages: 3

T.E - (Electrical &amp; Electronics) (Sem-V)(Revised Course 2019-2020)

EXAMINATION DECEMBER 2023

Electric Drives

[Time: 3:00 Hours]

[Max. Marks:100]

**Instructions:**

- 1) Answer any two Questions from Part-A
- 2) Answer any two Questions from Part-B
- 3) Answer any one Question from Part-C
- 4) Assume suitable additional data if necessary

**Part-A**

- |    |  |    |
|----|--|----|
| Q1 | a) List down the advantages of electrical drives over mechanical drives. Also mention the factors on which the choice of electric drives depends.  | 08 |
|    | b) Explain the concept of load equalization. How it can be achieved?   | 06 |
|    | c) Develop the Thermal model for heating and cooling of a motor.   | 06 |
| Q2 | a) Explain the following motor duty cycles. <ol style="list-style-type: none"> <li>(i) Intermittent periodic duty with starting</li> <li>(ii) Continuous duty with starting and braking</li> <li>(iii) Short time duty</li> </ol>  | 06 |
|    | b) Describe the pole changing strategy employed for speed control of Induction motors.   | 06 |
|    | c) A 500V, 45KW, 600rpm dc shunt motor has armature resistance of $0.29\Omega$ . The field current is maintained constant. Armature reaction and brush drop may be neglected. The EMF coefficient of the machine which is the same as torque coefficient is $7.65V.s/rad$ (N.m/A). The electromagnetic torque developed by the motor under rated conditions is $775.6N.m$ . Calculate the rated armature current and hence find the speed under each of the following conditions at which the machine develops electromagnetic torque equal to the rated value. <ol style="list-style-type: none"> <li>(i) Plugging with external resistance of <math>5.5\Omega</math>.</li> <li>(ii) Dynamic braking with external resistance of <math>2.6\Omega</math>.</li> </ol> | 08 |

- Q3 a) For a three phase half controlled DC drive operating a separately excited DC motor, derive the expression for: 06
- (i) Voltage across the motor armature
  - (ii) Motor speed in terms of torque
- b) Explain the counter-current braking for a 3-Phase Induction motor. 06
- c) Explain the operation of single phase fully controlled DC drive in both continuous and discontinuous conduction modes driving a separately excited DC motor. Draw relevant circuit diagrams and waveforms. 08

**Part-B**

- Q4 a) Explain the metro system of traction. 06
- b) Explain the different speed control methods applied for traction system. 06
- c) Write a technical note on: 08
- (i) Suitability of different type of motors for Traction duty.
  - (ii) Significance of tractive effort and coefficient of adhesion
- Q5 a) Explain the suitability of electric drives for: (i) Textile mills (ii) Drilling machines 06
- b) With the help of a neat Power and control circuit diagram, explain the operation of DC motor starter using Voltage sensing relay. 06
- c) With the help of a neat Power and control circuit diagram, explain the operation of Autotransformer starter with provision for speed reversal for 3-phase Squirrel cage Induction motor. 08
- Q6 a) Give the applications of DC motor and Induction motor for industrial drives. 06
- b) Draw and explain the power and control circuit for star-delta starter using time delay relay. 08
- c) Explain the operation of starter using frequency sensing relays. Draw neat power and control circuit diagrams. 06

**Part-C**

- Q7
- a) Explain the Slip power recovery method of speed control of Slip ring Induction motor. **07**
  - b) For a DC shunt motor, derive the expression to show the relationship between Speed and Torque. **06**
  - c) Explain the buck boost control scheme for speed control of DC motor. **07**
- Q8
- a) With the help of neat Power and control circuit diagrams, explain the operation of starter for two-winding, two- speed pole changing, 3-phase Induction motor with provision for speed reversal for constant Torque operation. **10**
  - b) Draw speed time curve of electric train accelerating uniformly to speed  $V_m$ , the power is cut off and after time  $t$  when it attains  $V_m$ , coasting is allowed to continue up to the end of run, the braking being neglected. Derive an equation for  $V_m$ , indicating clearly each term used in expression. **10**

Total No. of Printed Pages: 04

**T.E - (Electrical & Electronics) (Semester-V) (Revised Course 2019-2020)**  
**EXAMINATION JUNE 2023**  
**Control Systems**

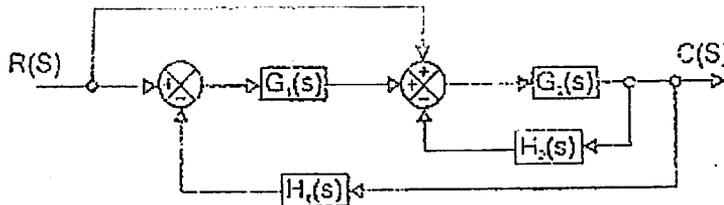
[Time: 3:00 Hours]

[Max. Marks:100]

- Instructions:**
1. Assume suitable data wherever necessary.
  2. Use semilog graph, normal graph papers wherever required.
  3. Draw suitable diagrams wherever required.
  4. Answer any five questions by selecting two questions each from part A and Part B, and one Question from Part C.

**PART-A**

- Q1 a) Derive the expression for output voltages of the synchro transmitter. Explain its working. 06
- b) With a neat diagram, explain the various parts of a closed loop control system. Derive its transfer function. 07
- c) Using the block diagram reduction techniques, obtain the transfer function of the following 07



- Q2 a) The open loop transfer function of a unity feedback system is given by 07

$$G(S) = \frac{K}{s(1 + 0.6s)(1 + 0.4s)}$$

By applying Routh criterion, find the range of K for stability. Also find the value of K for sustained oscillations. Obtain the frequency of sustained oscillations.

- b) A unity feedback control system has a open loop transfer function 07

$$G(s) = \frac{10}{s(s + 2)}$$

Find the rise time, percentage overshoot, peak time and settling time for a step input of 12 units.

- c) A system has a open loop transfer function given by

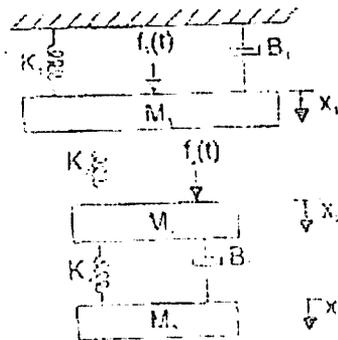
$$G(s) = \frac{K}{s(sT + 2)}$$

06

- a) By what factor K needs to be multiplied to increase the damping ratio from 0.15 to 0.6?  
 b) By what factor T needs to be multiplied to reduce the damping from 0.8 to 0.4

Q3

- a) Write the differential equations governing the mechanical system, and obtain the force voltage and force current analogous circuits. Verify the differential equations. 07



- b) Sketch the root locus of a unity feedback system with forward path transfer function given below. Obtain the value of K for a damping ratio  $\xi = 0.5$  10

$$G(s) = \frac{K}{s(s + 2)(s + 4)}$$

- c) Define the steady state error and error constants with respect to unit step, unit ramp and unit parabolic inputs. 03

### PART-B

- Q4 a) The open loop transfer function of a unity feedback system is

$$G(s) = \frac{4}{s(s + 2)}$$

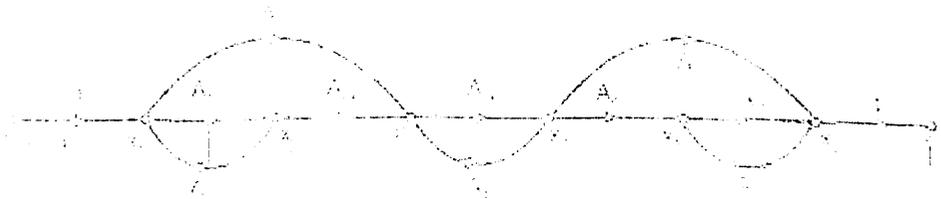
10

It is desired to modify the closed loop poles so that the undamped natural frequency  $\omega_n = 4$  rad/s is obtained without changing the value of the damping ratio. Design a suitable compensator for the system.

- b) The open loop transfer function of a control system is given by 10
- $$G(s)H(s) = \frac{(s + 2)}{(s + 1)(s - 1)}$$
- Using Nyquist criterion, determine the stability of the closed loop system. Draw the Nyquist Plot.
- Q5 a) Construct the Bode plot for a unity feedback control system having 10
- $$G(s) = \frac{80}{s(s + 2)(s + 20)}$$
- Find the gain and phase crossover frequencies, Gain margin and Phase margin and comment on the stability of the system.
- b) Consider a unity feedback system having an open loop transfer function 10
- $$G(s) = \frac{K}{s(s + 0.2s)(1 + 0.05s)}$$
- Sketch the polar plot and determine the value of K for
- Gain margin = 18dB
  - Phase margin = 30°
- Q6 a) The open loop transfer function of a unity feedback system is 08
- $$G(s)H(s) = \frac{K}{s(s + 4)(s + 5)}$$
- It is desired to have a velocity constant of 5 and damping ratio should be 0.707. Design a suitable lag compensator.
- b) Determine the gain margin and the phase margin of a system with open loop transfer function. 06
- $$G(s) = \frac{1}{s(1 + 2s)(1 + s)}$$
- c) Discuss the PI and PID controllers. Obtain their transfer functions and draw a neat block diagram. 06

**PART-C**

- Q7 a) Obtain the transfer function of the signal flow graph using Masons Gain formula 05



- a) Derive the expression for time response of a first order system to a unit step input. **05**
- b) State and explain the Nyquist stability criterion. **05**
- c) Explain the steps followed for design of a lead compensator using Bode plots. **05**
- Q8 a) With a neat diagram, explain the construction and working of a AC servomotor in position control. **05**
- b) Use Routh criterion to determine the stability of the system represented by the characteristic equations. Determine the position of roots lying in the left and right half of s-plane. **05**
- $$s^5 + 3s^4 + 2s^3 + 6s^2 + 6s + 9 = 0$$
- c) Discuss the frequency domain specification: Resonant frequency Resonant peak and bandwidth. **05**
- d) Derive the transfer function of a lag-lead compensator. **05**

Total No. of Printed Pages:03

**T.E - (Electrical & Electronics) (Sem-V)(Revised Course 2019-2020)**

**EXAMINATION JULY 2023**

**Analog and Digital Communication**

[Time: 03:00 Hours]

[Max. Marks:100]

**Instructions:**i) Attempt any **FIVE** questions by selecting **TWO** questions from **Part A**,

**TWO** questions from **Part B** and **ONE** question from **Part C**.

ii) Assume missing data if any with proper justification.

iii) Preferably write answers to each main question on a new page.

iv) Figures to the right indicate Full marks.

v) All symbols' abbreviations carry their usual meaning.

vi) Preferably, write the answers in sequential order.

**Part –A**

- |           |   |          |
|-----------|---|----------|
| <b>Q1</b> | a) What are the analog pulse modulation techniques?   | <b>7</b> |
|           | b) Draw and explain the PAM signal. How it is generated and demodulated? Also, state its merits & demerits.                           | <b>7</b> |
|           | c) Discuss the method of generation and demodulation of the PDM (or PDM) signal. Also, state its merits & demerits.                   | <b>6</b> |
| <b>Q2</b> | a) Draw the block diagram of the Pulse Code Modulation (PCM) Generator and receiver.  | <b>7</b> |
|           | b) Draw the block diagram of the Binary Phase Shift Keying (BPSK) modulator and how synchronous problem is avoided for its detection. | <b>7</b> |
|           | c) Draw the block diagram of the Quadrature Phase Shift Keying (QPSK) system and explain its working.                                 | <b>6</b> |
| <b>Q3</b> | a) Explain Differential Phase Shift Keying (DPSK) and compare it with PSK. State its advantages and disadvantages.                    | <b>7</b> |
|           | b) Explain uniform and non-uniform quantization of digital modulation schemes.  | <b>7</b> |
|           | c) Describe the generation of BFSK with a block diagram. State its mathematical expression and draw the power density spectrum.       | <b>6</b> |

## Part – B

- Q4** a) What different components make up an optical communication system? Briefly explain each component. 7
- b) Explain various topologies encountered in Data communication. State their respective advantages and disadvantages. 7
- c) State different types of Error detection and error correction strategies in Data Communication. 6
- Q5** a) Explain Cyclic Redundancy Check (CRC) for error detection. 7
- b) What are the functions carried out in Telemetry, Tracking & Command (TT&C) Subsystem? 7
- c) Consider a cellular system that consists of 34 cells with a cell radius of 1.4 km. A total frequency bandwidth can support 343 traffic channels. Find what geographical area in km can be covered and the number of channels available per cell. [ Assume N=7 reuse cellular pattern] 6
- Q6** a) Discuss the connection management followed in Bluetooth technology. And explain the frame format in Bluetooth technology. 7
- b) The range between a ground station & a satellite is 42000km. Calculate the free space loss at a frequency of 6GHz. 5
- c) What is Adhoc Networking? Distinguish Bluetooth piconet architecture and Bluetooth scatternet architecture with a neat block diagram. 3

## Part –C

- Q7** a) For a BPSK modulator with a Carrier frequency of 70 MHz and an input bit rate of 10 Mbps, determine the maximum and minimum upper and lower side frequencies, draw the output spectrum, determine the minimum Nyquist bandwidth, and calculate the baud. (Assume  $f_c = 5\text{MHz}$ ) 5
- b) Draw the block diagram of the FSK receiver and explain the operation. Determine the: 5
- (i) Peak frequency deviation
- (ii) minimum bandwidth
- (iii) Baud for FSK signal with a mark frequency of 49 kHz, space frequency of 51 kHz, and input bit rate of 2 kbps.
- c) Find the signal amplitude for minimum quantization error in a delta modulation system if the step size is 1 volt having a repetition period of 1 ms. the information signal operates at 100 Hz. 5

**TE1175**

- d) What are the types of sampling? Explain the operation of the sample and hold circuit. 5
- Q8** a) Find the LRC for the data block: 11100101 11011111 101111001 10101011 10000101. 5
- b) What is a wireless LAN? What data rates are available with a WLAN network connection? 5
- c) For a seven-cell reuse pattern find the reuse factor if the minimum distance between centres of co-channel-cells is 18 km. The radius of the cell is 3 km and the distance between adjacent cells in the seven-cell pattern is 6 km. 5
- d) Describe the services offered by MAC and MAC management sublayers of IEEE 802.11 wireless LAN. 5

Total No. of Printed Pages: 02

T.E - (Mechanical) (Sem-V)(Revised Course 2019-2020)

EXAMINATION JULY 2023

Gas Dynamics & Turbo Machinery

[Time: 03:00 Hours]

[Max. Marks: 100]

- Instructions:** 1. Answer five questions in all selecting at least two questions from each PART A and PART B and one question from PART C.  
2. Use of tables and charts is permitted.  
3. Assume missing data, if at all any, with proper justification

**PART A**

- Q1 a. A sonic velocity air jet has a temperature of 280K. Determine (i) Velocity of sound in the jet (ii) stagnation temperature and stagnation enthalpy (iii) Stagnation velocity (iv) stagnation to static pressure ratio (v) critical speed of sound (10)
- b. Derive Reynolds transport theorem and explain the final expression for conservation of the mass and momentum with the help of RTT. (10)
- Q2 a. Explain shape of Nozzle and Diffuser for the subsonic and supersonic flow. (10)
- b. Air enters a variable area duct at a pressure of 350kN/m<sup>2</sup>, a temperature of 27 °C and a velocity of 50m/s. The area of cross-section at entry is  $5 \times 10^{-2}$  m<sup>2</sup> and exit area is  $3.5 \times 10^{-2}$  m<sup>2</sup>. If the flow is isentropic, determine (i) the mass flow rate through the duct (ii) the pressure, temperature and velocity at exit from the duct and (iii) the change in impulse function (10)
- Q3 a. The average friction factor for a 50mm diameter pipe is 0.004. The Mach number of air at a particular section in the pipe is 0.25. Determine the length of pipe if the flow ends at a Mach number of 0.49. Assume Fanno flow. (8)
- b. An aircraft engine employs a subsonic inlet diffuser of area ratio 4. Air with a total stagnation pressure and stagnation temperature of  $1 \times 10^5$  N/m<sup>2</sup> and 570K approaches the diffuser with a Mach number 2.2. A shock wave stands just outside the diffuser inlet. Determine the Mach number, pressure and temperature of the air at the exit of diffuser. (8)
- c. Explain Rayleigh line in p-v plane with the help of governing equations. (4)

**PART B**

- Q4 a. Derive Euler turbine equation with the help of neat diagram (10)
- b. The following data refers to an axial flow device (10)
- i) flow velocity from exit of the nozzle = 190m/s
  - ii) Blade speed = 180m/s
  - iii) Degree of reaction = 50%
  - iv) Entry stagnation temperature = 380k
  - v) Entry static temperature = 300k
- Calculate: (i) Max Utilization factor (ii) rotor blade angle (iii) Power  
(Take mass flow rate = 10kg/s)
- Q5 a. Explain working of Pelton wheel with the help of neat diagram (10)
- b. A Kaplan turbine develops 24647.6 kW power at an average head of 39 m. (10)
- Assuming a speed ratio of 2, flow ratio of 0.6, diameter of the boss equal to 0.35 times the diameter of the runner and an overall efficiency of 90%, calculate the diameter, speed and specific speed of the turbine.
- Q6 a. A centrifugal pump is to discharge  $0.118 \text{ m}^3/\text{s}$  at a speed of 1450 r.p.m. against a (10)
- head of 25m. The impeller diameter is 250mm. its width at outlet is 50mm and manometric efficiency is 75%. Determine the vane angle at outer periphery of the impeller.
- b. Explain Unit quantities with respect to power generation turbo-machines. (10)

**PART C**

- Q7 a. Derive Prandl-Mayer equation with respect to normal shock waves. (10)
- b. Explain draft tube working in a reaction turbine with neat sketch. (10)
- Q8 a. A fighter jet MIG 21 is flying at an altitude of 3000m with a constant flight (8)
- speed of 2000Km/h. The aircraft passes directly over the ground observation post. Determine the time taken to hear the sound waves from the aircraft at the observation post after it has passed directly over it. Assume temperature of atmosphere is  $27^\circ\text{C}$ .
- b. Derive expression for utilization factor. (6)
- c. A turbine is to operate under a head of 25m at 200rpm. The discharge is  $9 \text{ m}^3/\text{s}$ . (6)
- The overall efficiency of turbine is 90%. Determine (i) specific speed (ii) power (iii) Type of turbine.

Total No. of Printed Pages: 02

T.E - (Electrical & Electronics) (Sem-V) (Revised Course 2019-2020)

EXAMINATION JULY 2023

Entrepreneurship & Intellectual Property

[Time: 3 Hours]

[Max. Marks:100]

- Instructions:** 1) Answer **any five** questions in all.  
2) Answer **any two** questions **each** from **Part- A** and **Part-B**.  
3) **One** question has to be answered from **Part – C**.  
4) Figures to the **right** indicate marks.  
5) **Avoid** writing answers in long, undifferentiated paragraph format.

**PART-A**

- Q1** a) How does an entrepreneur contribute towards the growth of an economy? (06+06+08)  
b) Explain the Sociological Theory of Entrepreneurship.  
c) Explain Danhof's classification of entrepreneurs.
- Q2** a) What are the functions of an entrepreneur? (06+08+06)  
b) Explain the term project identification. Explain in brief the contents of the feasibility report.  
c) Explain project life cycle.
- Q3** a) What are the factors governing fixed capital requirements? (6+08+06)  
b) What is a lease? Explain any one type of lease.  
c) Differentiate between equity capital and debenture capital.

**PART-B**

- Q4** a) Explain the importance of IPRs. (04+06+10)  
b) Explain the fundamental principles of the Berne Convention.  
c) Explain PCT. What is the procedure to secure the International Protection of Patents under PCT?

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- Q5** a) Explain the procedure for registering trademark. (08+08+04)
- b) What is the novelty of an invention? Explain the concept of an inventive step in patents.
- c) What works are protected under copyrights?
- Q6** a) Explain the process to be followed to register a copyright. (08+06+06)
- b) What is the difference between provisional and non-provisional patent.
- c) Explain the concepts of assignment of copyrights and license agreement.

**PART-C**

- Q7** a) What are the works in which copyright subsists? (08+06+06)
- b) Explain the purpose of Universal Copyright Convention 1952.
- c) Describe the features of a property.
- Q8** a) Explain importance of capital budgeting. (06+08+06)
- b) Explain the rights and duties of a patentee.
- c) Write a short note on Paris Convention, 1883.

Total No. of Printed Pages:02

**T.E. (E&E) SEM-V Revised Course 2019-20  
EXAMINATION JULY 2023  
OPEN ELECTIVE Electrical Drives**

[Duration : 3:00 Hours]

[Total Marks :100]

**Instructions:**

1. Answer **ANY TWO** Questions from **PART A**.
2. Answer **ANY TWO** Questions from **PART B**.
3. Answer **ANY ONE** Questions from **PART C**.
4. Use suitable data required if any.

**PART A**

- Q.1
- a) Explain four quadrant operation of motor drive system with hoist load. (7)
  - b) Explain the various methods of braking of induction motors. (7)
  - c) Explain with neat sketch the chopper control method of speed control of DC motors. (6)
- Q.2
- a) What are the different types of torque that involved in drive system? (6)
  - b) Draw and explain various load characteristics of DC shunt Motor. (7)
  - c) Draw the power circuit arrangement of three phase variable frequency inverter for the speed control of three phase induction motor and explain its working. (7)
- Q.3
- a) Draw the typical temperature rise-time curve and derive the equation for temperature rise in an electric drive. (7)
  - b) Explain various methods of braking of DC series motors with neat diagrams. (7)
  - c) With a simple block explain in the operation of a variable voltage variable frequency (VVVF) inverter fed three phase induction motor drive. (6)

**PART B**

- Q.4
- a) Draw a neat schematic diagram of a three-point starter and explain its working. (7)
  - b) What are the various types of electric braking used in traction? Discuss in detail. (6)
  - c) With the help of neat power and control circuit wiring diagram explain the speed reversal operation of a three-phase Induction motor. (7)
- Q.5
- a) Explain with diagram construction and working of a rotor resistance starter. (7)
  - b) List the various sources for Electric traction. (6)
  - c) A 250 tones train with 10% rotational inertia effect is started with uniform acceleration and reaches a speed of 50kmphs in 25 seconds on level road. Find the specific energy consumption if the journey is to be made according to trapezoidal speed- time curve. Acceleration=2kmphps; Tracking retardation=3kmphps; Distance between the station =2.4km; Efficiency=0.9; Track resistance=5 kg/tones (7)

Q.6

- a) Explain the operation of a transformer starter used in three-phase induction motor. (7)
- b) Explain with the help of schematic the operation of a starter for two winding two speed pole changing induction motor with provision for speed reversal. (7)
- c) With the help of wiring diagram explains the operation of dynamic braking in DC shunt motor. (6)

**PART C**

Q.7

- a) What are the modes of operation in electric drive system? (7)
- b) Explain why d. c series motor is used for traction purpose? (6)
- c) Explain about the speed-torque characteristics of a DC Shunt-Motor with suitable graphs and diagram. (7)

Q.8

- a) List out some applications of Electric Drives. (6)
- b) Explain about the types of supply system used in traction system. (7)
- c) Explain in detail about Slip power recovery scheme. (7)

Total No. of Printed Pages: 3

**T.E - (Electrical & Electronics) (Sem-V)(Revised Course 2019-2020)**

**EXAMINATION JUNE 2023**

**Electric Drives**

[Time: 3:00 Hours]

[Max. Marks: 100]

- Instructions:**
- 1) Answer any Two Questions from Part A
  - 2) Answer any Two Questions from Part B.
  - 3) Answer any One Question from Part C.
  - 4) Assume suitable data if required.

**PART A**

- Q1
- a) What do you mean by load equalization? How is it achieved? (4)
  - b) With neat speed torque characteristic, explain the steady state stability of motor-load system with appropriate expressions. (5)
  - c) Explain with circuit diagram and speed torque characteristics the plugging and dynamic braking operation of induction motors. (6)
  - d) Explain various components of load torque. (Friction/windage). Explain brief classifications of load torque with neat graph and related expressions. (5)
- Q2
- a) Explain the classification of motor duty. Explain in detail the effect of Heating and cooling of motors during drives. (6)
  - b) List down the factors which determine the choice of an Electric drive. Also mention the advantages of Electric drives. (6)
  - c) Explain with neat circuit diagram a two quadrant converter used in DC motor in the operation as motor and regenerative braking. How they will operate in each mode. (5)
  - d) Explain the selection of motor capacity under continuous duty constant load and continuous duty variable load. (4)
- Q3
- a) With a neat circuit diagram, explain the Chopper controlled DC motor drive. (4)
  - b) Explain the operation of single phase half controlled DC drive in discontinuous conduction modes driving a separately excited DC motor with freewheeling diode connected across the motor load. Draw neat relevant circuit diagrams and waveforms. (6)

- e) Explain working of Scherbius control of three phase induction motor and how the efficiency of the drive is improved. (4)
- d) A 6-pole rotor, 50 Hz. slip ring motor has resistance of 0.4 ohm/phase and runs at 950 rpm on full load. Calculate the resistance/phase to be inserted in the rotor circuit such that the speed is reduced to 600 rpm, the torque being (i) the same as before and (ii) proportional to square of the speed. (6)

### PART B

- Q4 a) Define (i) Average Speed (ii) Schedule Speed (iii) Crest Speed (iv) Train tractive effort v) Coefficient of Adhesion (5)
- b) List down the advantages and disadvantages of Electric traction. (4)
- c) Write a technical note on Suitability of different type of motors for Traction duty. Describe the different supply systems of Railway Electrification. (5)
- d) A train has a scheduled speed of 25km/hr between 800m apart stations. The duration of stop at the station is 20s. Maximum speed is 20% higher than average running speed and retardation is 3 kmphs. Calculate the acceleration required to provide this services. (6)
- Q5 a) With the help of neat Power and control circuit diagrams, explain the operation of starter for Two-winding, two-speed pole changing, 3-phase Induction motor with provision for speed reversal at both speeds. (6)
- b) With the help of a neat power and control circuit diagram, explain the operation of Auto-transformer starter for 3-phase Induction motor. (7)
- c) With the help of neat power and control circuit diagrams, explain the operation of starter for Single-winding, two-speed pole changing, 3-phase Induction motor with provision for speed reversal for (constant Horsepower) operation. (7)
- Q6 a) Write a short note on suitable electric drives (any two):  
 (i) Electric drives for Rolling mills  
 (ii) Electric drives for Textile mills  
 (iii) Electric drives in machine tool drives (5×2=10)
- b) Explain the process and industrial drives application in paper Mills. (4)

- c) Explain in detail the various operations like process, picking, carding, drawing, roving and spinning operation with industrial drives used for each applications. (6)

### PART C

- Q7 a) Explain the multi-quadrant operation of a motor with speed-torque characteristic operating a Lift drive. (6)
- b) With the help of a neat Power and control circuit diagram, explain the operation of DC motor starter using voltage sensing relay. (5)
- c) Describe the pole changing strategy employed for speed control of Induction motors. (5)
- d) Explain the Variable Voltage Variable Frequency (VVF control) method for speed control of 3-phase Induction motor with appropriate inverter diagram. (4)
- Q8 a) With neat diagram describe the static Kramer control methods for slip recovery power for three phase induction motor. What are the drawbacks? (6)
- b) Mention how the motor ratings are calculated under the various heating and cooling duty cycle. (5)
- c) With neat speed torque characteristic, explain the steady state stability of motor-load system with appropriate expressions. (5)
- d) Explain continuous, intermittent and short time service conditions of Electric drives. (4)

Total No. of Printed Pages: 5

**T.E - (Electrical & Electronics) (Sem-V)(Revised Course 2019-2020)**  
**EXAMINATION JUNE 2023**  
**Illumination Engineering**

[Time: 3:00 Hours]

[Max. Marks: 100]

- Instructions:**
1. Answer any 2 questions from part A any 2 questions from Part B & any one question from PART C.
  2. Assume suitable data, if necessary.

**Part A**

- |    |   |
|----|---|
| Q1 | <p>a) Enumerate the hall marks of good lighting &amp; highlight the different factors affecting them. <span style="float: right;">6</span></p> <p>b) Derive an expression for illumination level at a point on the working plane located at a distance of 'H' metres from the round source of radius 'R' metres and having luminance of 'L' Cd/m<sup>2</sup> (Lambert) indicating clearly each term used in the expression. <span style="float: right;">6</span></p> <p>c) A lamp having candles of 200 in all directions is provided with reflector which directs 60% of the total light uniformly on a circular area 20 m in diameter. The lamp is hung 12 m above this area. Calculate the illumination level on the edge of the circle. <span style="float: right;">6</span></p> <p>d) What is CRI? Also give its significance for particular applications. <span style="float: right;">2</span></p>  |
| Q2 | <p>a) Explain the different functional aspects of luminaires. <span style="float: right;">6</span></p> <p>b) A 4 Feet fluorescent tube (FT) is mounted above the front edge of a work bench Of 1.5 m x 1m, mounting height being 1.5 m. The transverse intensity of lamp in lower hemisphere is 600 cd in all directions. Calculate the illumination level at a point (i) below the edge of the tube (ii) at a corner from one end of working plane. <span style="float: right;">3</span></p> <p>c) Which of the following lamps give higher lumen output. Hence arrange the following lamps in the ascending order of their lumen output<br/>Halogen lamp, LED Lamps, metal halide lamps, CFL, HPMV lamp. <span style="float: right;">3</span></p> <p>d) Distinguish between General diffused &amp; mixed diffused lighting system w.r.t. material used for luminaire construction, working principle &amp; applications. <span style="float: right;">3</span></p> |

- Q3 a) State the different types of photometers. Which of these is widely used, when the light emitted by test source & standard source have the same colour. 5
- b) A light source having an intensity of 700 Cp (Candle power) in all directions is fitted with a reflector that directs 70% of its total light along the beam having divergence of  $20^\circ$ . What will be the average illumination level produced on the surface of the sphere normal to the beam direction at a distance of 25 m. 7
- c) What are the causes of glare? State its types & the how can they be minimised. 6
- d) What is the significance of polar curves? 2

#### PART B

- Q4 a) The service illuminance in an office is 500 Lux. The room dimensions are 8m x 6m x 2.65 m. The desk height is 0.75 m. The room surface has an average reflectance of Ceiling = 0.7, Working plane = 0.3 & wall = 0.5. DLOR = 0.5 & ULOR = 0.1, LLF = 0.7, Initial lamp lumen = 83300. Calculate the (2 + 6 + 6)
- (i) room index (ii) direct illuminance & reflected illuminances of wall, ceiling & the working plane
- (iii) Brightness of working plane, wall & ceiling.
- b) What are the criteria to be considered for selection of 6
- (i) S/H<sub>m</sub> ratio (ii) direct ratio (iii) room index & cavity index in case of interior lighting design. Also give nominal values of S/H<sub>m</sub> ratio & room index.
- Q5 a) A road with carriage way width of 9 metres is to be illuminated using 250 W. HPMV lamp, with semi cutoff luminaire. Now using single sided arrangement using two luminaires placed with spacing of 30 m between them determine the illumination level at a distance of 1.5 m from any one kerb w.r.t any one column containing the luminaire. Also determine the mounting height of luminaires, outreach & overhang. The photometric data is attached. 14
- b) State all the arrangements used in siting of street light luminaires. Give the salient features, of each. Also specify the conditions under which each is found to be suitable. 6

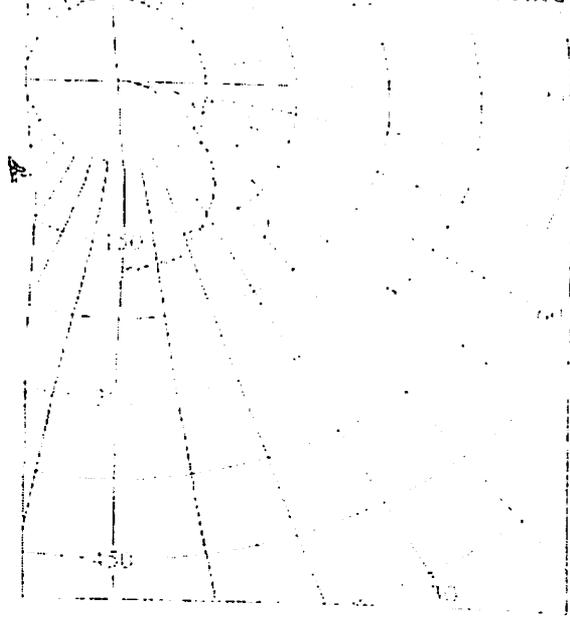
- Q6 a) Explain in brief the principles governing sports lighting 4
- b) A building frontage 50 m x 15 m is to be illuminated by using flood light projectors situated 25 m away from it. If the illumination level is 100 lux, c.o.u. as 0.5, depreciation factor as 1.5 & waste light factor as 1.2, estimate the number & size of each projector. Also sketch the layout of projectors indicating the usual adjustment provided. 12
- c) What are the criteria to be considered in the selection flood light projectors? 4

### PART C

- Q7 a) List out the different types of lighting schemes and give at least one application of each. 4
- b) Differentiate between the following, giving two points of distinction between them 6  
 (i) LED & LCD (ii) Photometry & Spectrometry  
 (iii) Natural light & artificial light
- c) List out the salient features of hospital lighting. 5  
 Also, draw a simple diagram to illustrate the lighting of hospital luminaires. 5
- Q8 a) "Stroboscopic effect is not visible in filament lamps". Comment on this statement & justify your choice. Also list out its causes & effects. 5
- b) What is the reference lumen output of lamp for plotting of polar curve? Give reason for your choice. What are the different photometric data that can be obtained using polar curve? 5
- c) List out the salient features of corridor, entrance & staircase lighting. 5
- d) List out the different types of lighting units which guide the pilot from the instant he first sees the airfield till he safely descends. 5

REF 785

RECEIVED BY SAULT STEARNS CO. 1913



EFFICIENCY SUMMARY

Height	0	10	20	30	40	50	OUTPUT LUMENS
0	133	125	75	45	25	15	0
5	133	125	75	45	25	15	0
10	133	125	75	45	25	15	0
15	133	125	75	45	25	15	0
20	133	125	75	45	25	15	0
25	133	125	75	45	25	15	0
30	133	125	75	45	25	15	0
35	133	125	75	45	25	15	0
40	119	101	100	100	100	100	100
45	106	71	100	100	100	100	100
50	91	65	100	100	100	100	100
55	80	59	100	100	100	100	100
60	69	52	100	100	100	100	100
65	50	41	100	100	100	100	100
70	39	34	100	100	100	100	100
75	28	29	100	100	100	100	100
80	17	20	100	100	100	100	100
85	10	15	100	100	100	100	100
90	14	9	100	100	100	100	100

ZONAL LUMENS AND PERCENTAGES

Zone	Lumens	% Lumens	% Luminaires
0-30	154	15.4	39.5
0-40	231	23.1	51.0
0-60	418	41.8	68.0
0-90	707	70.7	90.0
40-90	497	49.7	62.0
60-90	220	22.0	28.0
80-120	29	2.9	3.7
0-180	707	70.7	100.0

LIGHT OUTPUT RATE = 72.72%

Total No. of Printed Pages: 03

**T.E - (Electrical & Electronics) (Sem-V) (Revised Course 2019-2020)**  
**EXAMINATION JUNE 2023**  
**Microprocessors and Microcontrollers**

[Time: 3:00 Hours]

[Max. Marks:100]

- Instructions:**
1. SELECT AND ANSWER ANY TWO FULL QUESTION FROM PART A.
  2. SELECT AND ANSWER ANY TWO FULL QUESTION FROM PART B.
  3. SELECT AND ANSWER ANY ONE QUESTION FROM PART C.
  4. ASSUME SUITABLE DATA IF NECESSARY.

**PART - A**

- Q1
- a) With the aid of a block diagram explain the various building blocks in a microprocessor-based system. **07**
  - b) For 8085 microprocessors, write assembly instructions to store data A2H in Register B and data 08h in register C. Write instructions to generate delay using loop within loop concept and calculate the delay generated. **07**
  - c) Compare between 8-bit, 16 bit and 32-bit microcontrollers. **06**
- Q2
- a) Discuss the characteristics of embedded systems. **06**
  - b) Explain various interrupt sources in 8051 microcontroller. Specify their vector addresses and priority order. Assuming that serial port interrupt, Timer overflow interrupt, External interrupt1 and External Interrupt 0 occur simultaneously, resolve the priority, for the instructions specified  
MOV IE, #85h  
MOV IP, #1Ah **08**
  - c) Explain any 4 addressing modes in 8051 with suitable examples. **06**
- Q3
- a) List the salient features of 8051 microcontroller. **04**
  - b) What are SFR's? Specify the SFR memory map for 8051 microcontroller. **05**
  - c) With neat sketch explain how demultiplexing of lower order bus is achieved in 8085. **06**

TE1169

- d) For 8085 microprocessor, specify the status of the various flags on addition of 45H with F3H. 05

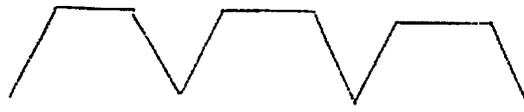
**PART – B**

- Q4 a) Explain each of the following instructions of 8051 microcontroller and specify the RAM and register contents at each step of execution. 08

```
ORG 0000H
MOV R0, #4BH
SETB PSW.4
MOV R2, #7DH
MOV A, #0C2H
XRL A, #53H
SUBB A, #0A6H
MOV @R0, A
XCH A, R2
```

END

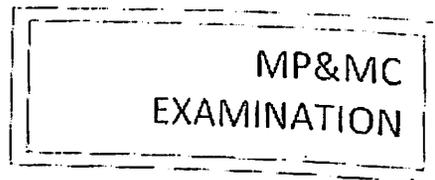
- b) Write assembly program for generating the waveform shown below on P1.2 06



- c) Explain the control logic of the timer section of 8051 microcontroller with a neat sketch. 06

- Q5 a) Explain various branching instructions of 8051 with examples. 06

- b) Explain various commands for LCD initialization. Also explain various control signals for LCD interfacing. Specify their status for sending commands and sending data. Write assembly or C program for displaying Message shown. Align the message to extreme right of the display. Draw interfacing diagram. 10



- c) Write short note on RS232. 04

TE1169

- Q6 a) Determine the values of various registers and write assembly instructions for configuring 8051 timer 0 to generate 2 kHz square wave on P1.0. Assume Crystal frequency = 12 MHz. **08**
- b) What is the significance of baud rate in serial communication? What are the typical communication baud rates? Determine the configuration values for the registers involved to transmit 8-bit data serially at a baud rate of 4800. **06**
- c) Draw ADC interfacing diagram and explain various signals involved. **06**

**PART – C**

- Q7 a) Write assembly instructions for 8085 microprocessor to add two 16 bit numbers stored at memory locations 1500h (Lower byte of number 1), 1501h (Higher byte of number 1), 1502h (Lower byte of number 2) and 1503h (Higher byte of number 2). Store the result at memory locations 1600(Lower byte), 1601 (higher byte), 1602(carry) **05**
- b) Write short note on power saving mode of operation for 8051. **05**
- c) Specify the register and RAM contents on execution of every step for 8051 microcontroller. **05**
- MOV 52H, #0A8H  
MOV 56H, 52H  
MOV R0, #56  
MOV A, @R0  
MOV B, 56H  
ADD A, 52H
- d) Explain DC motor interfacing with a neat sketch. **05**
- Q8 a) With reference to MVI A,55h instruction for 8085 microprocessor explain the terms T-state, Machine cycle, Instruction cycle. **05**
- b) Explain internal structure of 8051 port with neat sketch. **05**
- c) Write a short note programming and debugging tools. **05**
- d) Explain Zigbee protocol. **05**

Total No. of Printed Pages:2

T.E - (Electrical & Electronics) (Sem-V)(Revised Course 2019-2020)

EXAMINATION JULY 2023

OPEN ELECTIVE - Illumination Engineering

[Time: 03:00 Hours]

[Max. Marks: 100]

- Instructions:** 1) Answer **any two** questions from each of Part- A and Part-B (total 4 questions)  
2) Answer **any one** question from Part- C  
3) Assume additional data if necessary.

**PART A**

1. a. Explain the following: 6
  - i. Colour rendering index
  - ii. scotopic vision and photopic vision
- b. List the qualities of good lighting. Also explain the factors affecting good lighting. 6
- c. What is glare? List the types of glare and causes of glare. Also explain the methods to minimize the glare. 8
2. a. State and explain the laws of illumination with neat diagram and relevant expressions. 6
- b. What is photometry? Explain the procedure for photometry. Also list the types of photometry and explain any one in detail. 8
- c. A 500W lamp having M.S.C.P of 1000 is suspended 2.7 meters above the working plane. Calculate i) illumination directly below the lamp at the working plane ii) lamp efficiency iii) illumination at a point 2.5 meters away on the horizontal plane from vertically below the lamp. 6
3. a. What is a luminaire? Explain the Ingress Protection (IP) system of luminaire classification. 8
- b. What are polar curves in illumination? State its significance. Also explain the procedure for drawing polar curves. 8
- c. Classify the various types of lighting scheme and give applications of each scheme. 4

**PART B**

4. a. Define the following terms w.r.t interior lighting: 6
  - i. Room Index
  - ii. Cavity index
  - iii. Suspension height
  - iv. Space to mounting heightAlso list the factors affecting them.

- b. Explain in brief the various points to be considered w.r.t ward, operation theatre, reception room in case of Hospital lighting. 6
- c. What are the requirements of Industrial Lighting? List the various lamps that can be used in an industry. Also classify the various luminaires to be used with discharge lamps. 8
5. a. List out the factors affecting the choice of street light luminaires, selection of their mounting height and spacing between them. 8
- b. Enlist the important features of LED lighting and organic lighting. 6
- c. What is Laser? Explain its characteristics and features. Also list any two applications. 6
6. a. An illumination of 25 lux is to be produced on the floor of a room 12m x 9m. 18 lamps are required to produce this illumination in the room, if 50% of the emitted light falls on the floor. What is the power of the lamp in candela? Assume maintenance factor as 1. 5
- b. What are the guidelines to be followed for flood light? Explain in detail. 7
- c. What is Aviation lighting? Explain the different types of lights used in aviation lighting. 8

### PART C

7. a. What is stroboscopic effect? List the various ways of minimizing it. 5
- b. A 250V lamp has a total flux of 3000 lumens and takes a current of 0.8Amps. Calculate
- i. lumens per watt
  - ii. M.S.C.P per watt
- c. List the salient features of auditorium lighting. 5
- d. Write a short note on lighting for display and signalling. 5
8. a. List the various types of shadows and explain the ways of minimizing it. 5
- b. Define the following: 5
- i. luminance
  - ii. luminous intensity
  - iii. illumination
  - iv. light output ratio(LOR)
  - v. coefficient of utilization(COU)
- c. Explain in detail the various lanterns used in theatre lighting. 5
- d. How are optical fibres used in lighting? Explain in detail. 5



- c) A sphere of radius 0.5 m emits 2000 lumens uniformly in all directions. Calculate the average luminous intensity, illuminance & luminance on a surface 3 metres from its centre. 6
- Q3 a) List out the various characteristics of the colour of light & explain each of these in brief. 6
- b) What are polar curves? State their types & explain their significance 4
- c) What are the functions of photometer & illuminance meter. Also state the types of photometers 4
- d) A 4 feet fluorescent tube is mounted above the front edge of workbench 1.5 m × 1m, the mounting height being 1.5 m. The transverse intensity of lamp in lower hemisphere is 600 Cd in all directions. Calculate the illumination level exactly at the centre of work bench. 6

**Part B**

- Q4 a) What are the criteria to be considered in the selection of maintenance factor in the interior lighting design. Also give its nominal values 5
- b) What do you understand by C.O.U. List out the factors on which it depends & explain each in brief. 6
- c) List out the salient features of the following 9
- i) Corridor lighting
- ii) Hospital ward lighting
- iii) auditorium lighting
- Q5 a) How is exterior lighting different from interior lighting. Discuss in brief 4
- b) Classify the streets, giving the basis of their classifications. Also indicate the type of luminaires for each class of street. 5
- c) With the help of neat sketches, give the different locations of flood light projectors 6
- d) What is the significance of fibre optics cable in transmission of light? Also explain its working principle in brief 5
- Q6 a) Define the following terms related to street lighting, with the help of neat sketches 6
- i) Kerb ii) Central reserve iii) outreach iv) overhang
- b) List out the different application of flood light projector 4



Total No. of Printed Pages: 3

**T.E. (Electrical & Electronics) Semester-V (Revised Course 2019-20)**  
**EXAMINATION JANUARY 2023**  
**Microprocessors and Microcontrollers**

[Time: Three Hours]

[Max. Marks: 100]

**Instructions:**

1. Answer **ANY TWO FULL** questions from **PART A**
2. Answer **ANY TWO FULL** questions from **PART B**
3. Answer **ANY ONE FULL** question from **PART C**
4. Assume suitable data wherever necessary.
5. Figures to the right indicate full marks

**PART A**

- Q1 a) Explain the following instructions for 8085 microcontroller (4)  
i) LDA 2000h  
ii) LDAX B
- b) Specify the format of the flag register. explain each flag and explain various conditional branching instructions for 8085 microprocessor (8)
- c) Write a program for 8085 microprocessor to add two data bytes BCH and 7AH stored at ROM locations 1500h and 1501H respectively. Store the sum at location 2000h and the carry at location 2001h. Specify the ROM contents before and after execution of the program. (6)
- d) Explain the function of the Program Counter (2)
- Q2 a) A switch is connected to  $\overline{INT0}$  pin of 8051 microcontroller. Write an ISR to increment the contents of register R0 each time the pin is pulled low by pressing the switch. Display the value of R0 on LED's connected to Port 2. Draw interfacing diagram (8)
- b) Draw the internal structure of PORT 1 for 8051 microcontroller. Explain its working (6)
- c) Explain the memory organization of 8051 RAM (6)
- Q3 a) Explain the bus architecture of 8085 microprocessor with a neat sketch (7)  
b) What is an embedded system? Explain the characteristics of embedded systems (7)  
c) Explain the format of IE register for 8051 (2)  
d) Determine the range of memory addresses for a microcontroller with (4)  
i) 8 kB ROM and  
ii) 256 bytes RAM

**PART B**

- Q4 a) Explain each instruction and specify the register contents and RAM contents for 8051 microcontroller at each step of execution of the instructions given. (10)

```

ORG 00h
MOV A,#0B1H
ANL A,#7BH
SWAP A
SETB PSW.3
MOV R0,A
MOV 45H,#5CH
MOV A,45H
ADD A,R0
SETB PSW.4
MOV R0,A

```

END

- b) Explain the following terms
1. Assembler
  2. Compiler
  3. Cross compiler
- (3)
- c) Determine the values of the various registers to configure 8051 timer 1 to generate a 250Hz waveform with 35% duty cycle on P1.1. Write program instructions for the same. (7)
- Q5 a) Specify full step sequence and half step sequence for a stepper motor. A stepper motor has a step angle of 1.8 degrees. Determine the number of times the full step sequence has to be applied in order to rotate it by 36 degrees. Write a assembly language program for rotating the stepper motor in clockwise direction by 36 degrees. Draw a neat interfacing diagram. (10)
- b) Explain DC motor interfacing with neat interfacing diagram and program code (7)
- c) Explain various control signals required for LCD interfacing. Also specify their values for sending commands and sending data to panel (3)
- Q6 a) Draw interfacing diagram and write C program to blink LED's connected to 8051 port 1 (8)
- b) Write short notes on **any 2** of the following (8)
- i) I2C
  - ii) ADC interfacing
  - iii) Bluetooth protocol
- (6×2=12)

### PART C

- Q7 a) Compare between 8-bit, 16 bit and 32 bit Microcontroller (5)
- b) Explain Indirect and Indexed addressing modes of 8051 microcontroller with suitable examples (5)
- c) For the program code as shown below, calculate the delay encountered (5)
- ```

MOV R1,#07h
loop: MOV R2,#42h
loop1: DJNZ R2 loop1
      DJNZ R1 loop
RET

```
- d) Write assembly language program to generate a triangular waveform using DAC. Draw interfacing diagram. (5)

- Q8 a) Specify the output of the program snippet given. Specify the register and memory contents. (5)  
Assume that all registers and memory locations are reset prior to code execution
- ```
LXI D,1550h
MOV A,E
ADD D
RAR
ORI 52h
STA 2100h
```
- b) Explain with logic diagram functioning of power saving modes of operation for 8051 (5)
- c) Determine the codes to display message (5)
-  on common cathode seven segment display. Write assembly instructions for the same.
- d) Compare between synchronous and asynchronous communication (5)

Total No. of Printed Pages: 3

**T.E. (Electrical & Electronics) Semester-V (Revised Course 2019-20)**  
**EXAMINATION JANUARY 2023**  
**Illumination Engineering**

[Time: Three Hours]

[Max. Marks: 100]

- Instructions:**
- 1) Answer **any two** questions from each of Part- A and Part-B (total 4 questions)
  - 2) Answer **any one** question from Part- C
  - 3) Assume additional data if necessary.

**PART A**

- Q1** a) What is glare? List the types of glare and causes of glare. Also, explain the methods to minimize the glare. **8 marks**
- b) i. Differentiate between hard shadow and soft shadow. Also, explain the ways to minimize the same. **8 marks**
- ii. Differentiate between scotopic vision and photopic vision with relevant characteristics.
- c) List the various categories of colour rendering index. Also state its significance in lighting? **4 marks**
- Q2** a) A lamp having C.P of 300 in all directions is provided with a reflector, which directs 60 percent of the total light uniformly on to a circular area of 12m diameter. The lamp is 5m above the area. Calculate **6 marks**
- i) The illumination at the centre and edge of the surface without reflector.
- ii) The illumination at the centre and edge of the surface with reflector.
- b) What is photometry? Explain the procedure for photometry. Also list the types of photometry. **6 marks**
- c) What is the significance of polar curves in illumination? Explain the procedure for drawing polar curves using Roussean's construction. **8 marks**
- Q3** a) What is a luminaire? Explain the Ingress Protection (IP) system of luminaire classification. **8 marks**
- b) A corridor is lit by 4 lamps spaced 10 meters apart and suspended at a height of 5 meters above the centre line of the floor. If each lamp gives 200CP in all directions below the horizontal, find the illumination at a point on the floor midway between the third and fourth lamp. **8 marks**

- c) Classify the various types of lighting scheme and give applications of each scheme. **4 marks**

**PART B**

- Q4** a) Enlist the various lamps for industrial lighting along with its applications. Also, classify and explain the luminaires for high-pressure discharge lamps. **8 marks**
- b) The service illuminance in an office is 500 lux. The room dimensions are 8x6x2.65 meter. The desk height is 0.8 meter. The room surfaces have average reflectance's as  $\rho_c = 0.7$ ,  $\rho_{wp} = 0.3$  and  $\rho_w = 0.5$ . Luminaires have BZ 4 classification with DLOR of 0.5 and ULOR of 0.1, LLF is 0.7, direct ratio is 0.68, coefficient of utilization is 0.41. Calculate the luminance for working plane, walls and ceiling. **8 marks**
- c) Explain in brief the various points to be considered w.r.t operation theatre in Hospital lighting. **4 marks**
- Q5** a) List out the factors affecting the choice of street light luminaires, selection of their mounting height and spacing between them. **7 marks**
- b) A building frontage 50m x 16m is to be illuminated by flood lighting projectors situated 25 meters away. If the illumination is 100lux, C.O.U is 0.5, depreciation factor is 1.5, waste light factor is 1.2, estimate the number and size of projectors. Sketch the projectors recommended indicating the usual adjustments provided. Make suitable assumptions. **10 marks**
- c) What is Laser? Explain its characteristics and features. **3 marks**
- Q6** a) What are the guidelines to be considered for selection of flood light projectors? **7 marks**
- b) A drawing hall 40m x 25 m x 6m is to be illuminated with metal filament gas filled lamps to an average illumination of 90 lux on a working plane 1 meter above the floor. Estimate suitable number, size and mounting height of lamps. Sketch the spacing layout. Assume C.O.U of 0.5, depreciation factor of 1.2 and space to height ratio of 1.2. **9 marks**

Size of lamps	200W	300W	500W
Luminous efficiency (lm/W)	16	18	20

- c) Discuss the salient features of intelligent LED fixtures. **4 marks**

**PART C**

- Q7** a) What is stroboscopic effect? List the various ways of minimizing it. **5 marks**
- b) A 250V lamp has a total flux of 3000 lumens and takes a current of 0.8Amps. **5 marks**  
Calculate  
i) lumens per watt  
ii) M.S.C.P per watt
- c) List the salient features of Aviation lighting. **5 marks**
- d) Write a short note on lighting for display and signalling. **5 marks**
- Q8** a) Give a comparison between incandescent lamps and fluorescent tubes based on efficacy, CRI, CCT, effect of voltage variation and working hours. **5 marks**
- b) A filament lamp of 500W is suspended at a height of 4.5 meters above the working plane and gives uniform illumination over an area of 6m diameter. **5 marks**  
Assuming an efficiency of the reflector as 70% and efficiency of the lamps as 0.8 watt per candlepower, determine the illumination on the working plane.
- c) List the salient features of Theatre lighting. **5 marks**
- d) How are optical fibres used in lighting? Explain in detail. **5 marks**

Total No. of Printed Pages: 3

T.E. - (Electrical & Electronics) (Sem-V)(Revised Course 2019-2020)

EXAMINATION JANUARY 2023

Entrepreneurship & Intellectual Property

[Time: 3 Hours]

[Max. Marks: 100]

- Instructions:**
- 1) Attempt any *five* questions in *all*.
  - 2) It is *compulsory* to answer *two* questions *each* from *Part-A and Part-B*
  - 3) Answer *any one* question from *Part-C*.
  - 4) Figures to the *right* indicate marks.

**Part – A (Answer any two questions)**

**(2×20=40  
Marks)**

- Q1
- a) What defines a good Business Opportunity? Describe the five basic competitive forces that decide the profit potential of an Industry. (7)
  - b) Elaborate on Income statement. Explain how this statement is used to manage the venture over time. (7)
  - c) A project is a "temporary endeavor undertaken to create a unique product or service" Explain. (6)
- Q2
- a) "Feasibility report" acts as a guide to the business owner, it gives a complete picture whether his business idea will materialize. Explain the components of a standard feasibility report. (6)
  - b) A company is evaluating a project whose expected cash flows are as follows. (4)

Year	Cash Flows
0	₹-10,00,000
1	₹3,00,000
2	₹4,00,000
3	₹5,00,000
4	₹6,00,000

Calculate Net Present Value of the project, suggest whether the project should be accepted or rejected. (Assume discount rate as 10%).

- c) Explain the various building Blocks of a "Business Model Canvas" for an entrepreneurial venture of your choice. (6)

- d) Explain the various sources of fund to a start-up technology ventures. (4)
- Q3 a) "Feasibility studies are an excellent tool for ensuring the success of a new project". Explain (6)
- b) Why are capital budgeting decisions often the most important decision taken by a firm? (4)
- c) The Fixed costs for the years 2020-21 are ₹8, 00,000, variable cost per unit is ₹30. Each unit sells at ₹200. (6)
- i) Calculate Break Even Point.
- ii) Draw the Breakeven Chart.
- iii) What is the significance of Breakeven point?
- d) Explain the different skills required for entrepreneurship. (4)

**Part – B (Answer any two questions)**

**(2×20=40  
Marks)**

- Q4 a) A company develops a new technology that improves its main product, they plan to use the knowledge of IPR to safeguard their technology from other companies, what type of intellectual property / properties can they use to stop others from copying their invention and how will they benefit out of it. Explain (8)
- b) Why Copyright is referred to as "self-developed" IP? Elaborate on the procedure for obtaining a Copyright in India. (8)
- c) Write a short note on Patent Commercialization Path. (4)
- Q5 a) Cite one example to show how IP protections have helped the organization from revenue loss. (6)
- b) Explain how obtaining exclusive rights to intellectual property can sustain a competitive advantage. How can a company identify potentially protectable intellectual property? (6)
- c) Write short notes on (4+4)
- i) Well Known Marks
- ii) Compulsory licensing

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- Q6 a) Enumerate the classes of work which The Copyright Act, 1957 covers for protection of copyright. (7)
- b) Discuss the concepts of patentable invention and inventions not patentable. (7)
- c) What is the importance of Trademark to an organization? Explain the grounds for refusal of registration of a trade mark. (6)

**Part C- (Answer any one question)**

**(1×20=20  
Marks)**

- Q7 a) Elaborate on the procedure for obtaining a patent in India (8)
- b) Explain the role of ratio analysis in managing the new venture's financial plan. Define the different ratio types and the role they play in managing the venture. (6)
- c) What aspects are considered while ascertaining the financial feasibility of a project? (6)
- Q8 a) What is copyright? Discuss the copyright issues involved in Google Library Project. (6)
- b) "Entrepreneur and entrepreneurship are catalysts in the process of economic development of country ". Explain (6)
- c) Write short notes on (4+4)
- i) Operating Cycle.
  - ii) Payback Method

Total No. of Printed Pages: 4

**T.E - (Electrical & Electronics) (Sem-V)(Revised Course 2019-2020)**  
**EXAMINATION JANUARY 2023**  
**Control Systems**

[Time:03 Hours]

[Max. Marks:100]

- Instructions:**
1. Assume suitable data wherever necessary.
  2. Use semilog graph, normal graph papers wherever required.
  3. Draw suitable diagrams wherever required.
  4. Answer any two questions each from Part A, Part-B and any one question from Part-C.

**PART-A**

**Answer any 2 question from Part-A**

- Q1 a. Discuss the construction and working of a full step stepper motor. [6]
- b. Differentiate between open loop and closed loop control system. Discuss the closed loop temperature control system with a neat diagram [7]
- c. Using the block diagram reduction techniques, obtain the transfer function of the following [7]

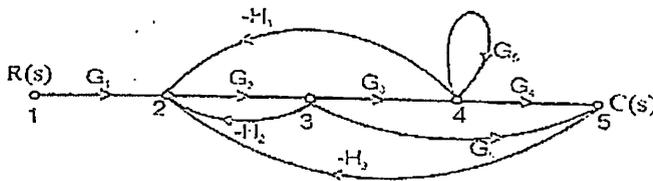


- Q2 a. A system has a open loop transfer function given by [6]
- $$G(s) = \frac{K}{S(sT + 2)}$$
- a) By what factor K needs to be multiplied to increase the damping ratio from 0.2 to 0.8?
  - b) By what factor T needs to be multiplied to reduce the damping from 0.6 to 0.3

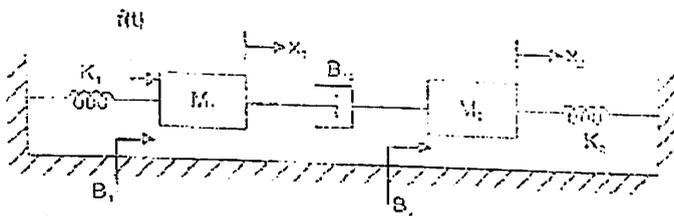
- b. The open loop transfer function of a unity feedback system is [7]
- $$G(s) = \frac{5}{s(s + 1)}$$

Find rise time, peak time, peak overshoot and settling time for a step input of 10 units

- c. Obtain the transfer function of the signal flow graph using Masons Gain formula [7]



- Q3 a) Write the differential equations governing the mechanical system, find the transfer function  $X1(s)/F(s)$  and  $X2(s)/F(s)$  and obtain the force voltage and force current analogous circuits. [8]



- b) Sketch the root locus of a unity feedback system with forward path transfer function given below. Obtain the marginal value of K for stability. [10]

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

- c) Define the following terms: [2]  
 1) critically stable  
 2) conditionally stable

**PART-B**

Answer any 2 question from Part-B

- Q4 a) Construct the Bode plot for a unity feedback control system having [10]  

$$G(s) = \frac{K}{s(s+2)(s+20)}$$

- i. Find the limiting value of K for system to be stable.
- ii. Value of K for a gain margin of 10db
- iii. Value of K for a phase margin of 50°

- b) The open loop transfer function of a control system is given by [10]

$$G(s)H(s) = \frac{K}{s(s-1)}$$

Using Nyquist criterion, comment on the stability of closed loop system.

- Q5 a) The open loop transfer function of a unity feedback system is [10]

$$G(s) = \frac{K}{s(s+2)}$$

Design a lead compensator for a velocity error constant  $K_v=18$  and damping ratio  $\xi=0.5$ .

- b) Consider a unity feedback system having an open loop transfer function [10]

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

Sketch the polar plot and determine the gain margin and phase margin

- Q6 a) A second order system has a damping ratio of 0.5 and the natural frequency of oscillation is 8rad/sec. Calculate the resonant peak and the resonant frequency. [6]

- b) Sketch the Polar plot for the function given by [8]

$$G(s) = \frac{1}{(1+sT_1)(1+sT_2)(1+sT_3)}$$

- c) Discuss the effects and limitations of Lag compensation. [6]

### PART-C

Answer any 1 question from Part-C

- Q7 a. Discuss the construction and working of a synchro transmitter. [5]

- b. Use Routh criterion to determine the stability of the system represented by the characteristic equations. Determine the position of roots lying in the left and right half of s-plane. [5]

$$s^5 + 5s^4 + 12s^3 + 13s^2 + 3s + 6 = 0$$

- c. Define and explain the following frequency domain terms: [5]

- 1) Resonant peak
- 2) Resonant frequency
- 3) Bandwidth

- d. With a neat diagram obtain the transfer function of a phase lead network. [5]

- Q8 a. Obtain the transfer function of a field control dc motor. [5]

- b. Obtain the expression for time response of a first order system to a unit step input. [5]

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- c. Define and explain Gain margin and Phase margin [5]
- d. Explain the PID controller and derive its transfer function. Draw the block diagram and realise it using op-amp. [5]

Total No. of Printed Pages: 02

**T.E - (Electrical & Electronics) (Sem-V)(Revised Course 2019-2020)**  
**EXAMINATION JANUARY 2023**  
**3)Bio- Medical Instrumentation**

[Time: 3 Hours]

[Max. Marks:100]

- Instructions:**
- 1. Answer any 2 questions from part A, any 2 questions from Part B & any one question from PART C.**
  - 2. Assume suitable data, if necessary**

**Part A**

- Q1
- State the Nernst equation, indicating each term used in expression. Draw the action potential waveform & explain repolarisation & depolarisation of a cell (6)
  - Define the following with reference to the body cell (4)
    - Resting potential
    - Action potential
    - Rate of propagation
    - Refractory period
  - Draw the basic waveform of normal ECG, stating the amplitude & time duration of each of its wave. (6)
  - List out the merits & demerits of different methods used in blood flow measurement (4)
- Q2
- List out the types of heart sounds & distinguish between them w.r.t. ECG waveforms & operation of valves in cardiovascular system. (6)
  - Explain Ear oximetry, using principle of transmission (6)
  - Explain with the help of neat sketch, the methods used for placement of electrodes in recording of EEG waveform (6)
  - With reference to blood cell counting, define MCV & MCH (2)
- Q3
- List out all the methods used in blood pressure measurement, listing out the advantages and disadvantages of each (6)
  - Derive an expression for time difference using transit time method for blood flow measurement using ultrasonic flow meter, indicating clearly each term used in expression (6)
  - What is blood cell counter? List out its types and explain the working of any one of such type of your choice with the help of neat sketch (6)
  - State the methods used for placement of electrodes in recording of ECG waveform. (2)

**Part B**

- Q4
- Distinguish between internal pacemaker & external pacemaker, giving at least three points of distinction between them (6)
  - What is diathermy? State its types and list out its functions. Give the merits & demerits of any one type of your choice (6)
  - What is the function of cardiac defibrillator? State its types. Which is more advantageous. Hence list out the advantages. (6)
  - List out the applications of biotelemetry in patient care & monitoring system (2)
- Q5
- What is the need of patient safety? List out the conditions under which electric current can be administered intentionally in patients. (6)
  - What are the limitations of conventional radiology? How can it be overcome in computed tomography? (6)
  - List out the advantages of ultrasonic imaging system (4)
  - Explain the principle of MRI (4)
- Q6
- What is dialysis? State the types of dialysis & distinguish between them (6)
  - List out the different types of defibrillators based on the placement of electrodes (3)
  - List out the methods used to prevent electrical accident & explain each in brief (5)
  - Distinguish between (i) Gross shock & micro current shock (ii) MRI Scan & X ray imaging (6)

**Part C**

- Q7
- List out merits & demerits of different methods used in blood flow measurement (5)
  - What is EMG. Explain its necessity. Explain, with the help of block diagram, function of each block of EMG recorder (6)
  - List out the physiological parameters adaptable to biotelemetry (5)
  - List out the objectives of patient monitoring (4)
- Q8
- Explain with the help of neat sketch, NMR type blood flow meter & list out its advantages. (6)
  - What is EOG. Explain its significance (5)
  - Draw the block diagram of phonocardiograph & give the function of each block. (5)
  - List out the various modes of ultrasound images & explain them in brief (4)

Total No. of Printed Pages: 2

**T.E - (Electrical & Electronics) (Sem-V)(Revised Course 2019-2020)**

**EXAMINATION JANUARY 2023**

**1) Testing & Maintenance of Electrical Machines**

**[Time: 3 Hours]**

**[Max. Marks:100]**

**Instructions:** 1) Answer TWO FULL QUESTIONS FROM PART-A and PART-B

2) Answer ONE QUESTION FROM PART-C

3) Assume additional data if necessary

**Part –A**

- |    |   |   |
|----|---|---|
| Q1 | a) Explain in detail the various types of losses in DC machines as per IS   | 7 |
|    | b) List out and briefly explain the different test carried while pre Commissioning and Commissioning of DC machines   | 8 |
|    | c) A 440V D.C Shunt motor takes no load current of 25A. The resistance of shunt field and armature are 550ohms & 1.2 ohms respectively. The full load line current is 32A. Determine the full load output & efficiency of the motor.  | 5 |
| Q2 | a) Explain the procedure to determine the efficiency of DC machine through Brake test.  | 7 |
|    | b) Explain in detail the procedure to test the temperature rise in power transformers as per IS.  | 8 |
|    | c) List out the different steps carried while commissioning of power transformer.   | 5 |
| Q3 | a) Explain the different criterions considered for locations and site selection of transformers   | 7 |
|    | b) Explain the procedure for checking Phase sequence and Polarity test in transformer.  | 8 |
|    | c) A 100KVA transformer has a heating time constant of 1 hour. The ratio of iron loss to full load copper loss is 1:5 and the temperature rise on full load is 50°C. What overload will produce a temperature rise of 60 °C at the end of a 3 hour run starting down from cold? | 5 |

**Part –B**

- |    |  |   |
|----|--|---|
| Q4 | a) Explain the requirement as per IS of civil engineering works and foundation works while installing large Induction motor. | 7 |
|----|--|---|

- b) Illustrate the procedure for high voltage test in Induction motor. 8
- c) A 2-pole, 3-phase induction motor delivers 37 hp at the shaft at a speed of 2850 rpm on 500 V, 50 Hz supply. The mechanical losses are 3.5 hp and the power factor of operation is 0.85. Calculate (a) slip (b) rotor copper loss (c) total power input if the stator losses are 2500 Watts (d) efficiency. 5
- Q5 a) Sketch out the importance of alignment in motor shaft of Induction motor and explain the mechanical test procedures for misalignment of motor shaft by 10%. 7
- b) Explain the different methods of cooling adopted in Induction motor. 8
- c) Sketch out the procedure for schedule maintenance of Induction motor. 5
- Q6 a) Explain the any two routine test required to be done on synchronous machines. 7
- b) Sketch out the procedure for schedule maintenance of Synchronous motor. 8
- c) Illustrate the procedure to test the bearings of Synchronous motor. 5

#### Part -C

- Q7 a) Explain the different SAT carried on DC machines. 5
- b) Sketch out the procedures for regular maintenance of power transformer. 5
- c) Explain special duty capabilities of Induction motor. 5
- d) Illustrate the procedure for maintenance of synchronous motor. 5
- Q8 a) Explain in detail the regular maintenance procedures carried out to various components of DC machine. 5
- b) Explain the procedure carried out for drying of windings in transformers. 5
- c) Explain the procedure to check the vibrations and balancing Induction motor. 5
- d) Illustrate the procedure for retardation test of synchronous machine. 5

Total No. of Printed Pages: 3

**T.E. (Electrical & Electronics) Semester-V (Revised Course 2019-20)**  
**EXAMINATION JANUARY 2023**  
**Electric Drives**

**[Time: Three Hours]**

**[Max. Marks: 100]**

- Instructions:**
- 1) Answer any Two Questions from Part A
  - 2) Answer any Two Questions from Part B.
  - 3) Answer any One Question from Part C.
  - 4) Assume suitable data if required.

**Part A**

- Q1**
- a) Explain in detail classification of Electric drives. (4)
  - b) List down the factors, which determine the choice of an Electric drive. Also, mention the advantages of Electric drives. (5)
  - c) Explain with circuit diagram and speed torque characteristics the plugging and dynamic braking operation of induction motors. (5)
  - d) Explain the multi-quadrant operation of a motor with speed-torque characteristic operating a Lift drive. (6)
- Q2**
- a) Explain in detail the effect of Heating and cooling of motors during drives. (5)
  - b) Explain with circuit diagram and speed torque characteristics the plugging and dynamic braking operation of dc motors. (5)
  - c) With neat speed torque characteristic, explain the steady state stability of motor-load system with appropriate expressions. (4)
  - d) Mention and describe the various (5 to 6) methods of speed control in an Induction Motor along with pole changing strategy employed for speed control of Induction motors. (6)
- Q3**
- a) Explain the operation of single-phase Semi converter, fully controlled converter and Dual converter with neat circuit diagram along with the output waveform and give the relationship for output dc voltage. (6)
  - b) Explain the operation of single phase fully controlled DC drive in continuous and discontinuous conduction modes driving a separately excited DC motor without freewheeling diode connected across the motor. Draw neat relevant circuit diagrams and waveforms. (8)
  - c) A 220V, 100A dc shunt motor running at rated speed of 1200 rpm is to be (6)

braked by plugging. The armature resistance is 0.15 ohm. Calculate  
 (i) The resistance to be connected in series with armature to limit the initial  
 braking current to twice the rated current. (ii) the initial braking torque and (iii)  
 the torque when the speed of the motor falls to 600 rpm

**PART B**

- Q4** a) List down the advantages and disadvantages of Electric traction. List down the requirements of Electric traction. (5)
- b) Draw simplified speed time curve for main line services and Sub-Urban services. Show all necessary periods? (4)
- c) List down the requirements of Electric traction. Describe the different supply systems of Railway Electrification. (4)
- d) A train has a scheduled speed of 25km/hr between 800m apart stations. The duration of stop at the station is 20s. Maximum speed is 20% higher than average running speed and retardation is 3kmphs. Calculate the acceleration required to operate this service. (7)
- Q5** a) With the help of a neat Power and control circuit diagram, explain the operation of DC motor starter using voltage sensing relay. (6)
- b) With the help of neat Power and control circuit diagrams, explain the operation of starter for Single-winding, two- speed pole changing, 3-phase Induction motor with provision for speed reversal for (constant torque) operation. (7)
- c) With the help of neat Power and control circuit diagrams, explain the operation of starter for Two-winding, two- speed pole changing, 3-phase Induction motor with provision for speed reversal at both speeds. (7)
- Q6** a) Write a short note on any two: (6x2=12)
- (i) Electric drives for Rolling mills
- (ii) Electric drives for Textile mills.
- (iii) Electric drives in drilling machines.
- b) Define: (i) Average Speed (ii) Schedule Speed (iii) Crest Speed (iv) Train tractive effort v) Coefficient of Adhesion. Give suitable relationship. (4)
- c) Explain in detail the working process in Cement industry with various industrial drives used. (4)

**PART C**

- Q7** a) With the help of a neat Power and control circuit diagram, explain the operation of DC motor starter using Time delay relay. (6)

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- b) Explain selection of motor power capacity under following conditions: (i) Continuous duty constant load motor applications (ii) Continuous duty variable load motor applications Wherever possible give the expressions (6)
- c) Explain with neat speed torque characteristic under four quadrant the various methods (dynamic, rheostatic (ac and dc), regenerative) of Electric braking used for three phase induction motor. Draw appropriate equivalent circuit and the expression for braking torque (8)
- Q8 a) Explain the selection of motor capacity under continuous duty constant load and continuous duty variable load. (5)
- b) Explain the variable voltage variable frequency (VVF control) method for speed control of 3-phase Induction motor with appropriate inverter diagram. (6)
- c) Explain working of Static Kramer and Scherbius control. (5)
- d) Draw simplified speed time curve for main line services and Sub-Urban services. Show all necessary periods? (4)