QP code: 10083469

TE Sem VI Electrical R-19 Cscheme

(3 Hours) **Total Marks: 80**

NB: 1) Question **No. 1** is **compulsory**.
2) **Answer** any **THREE** questions out of the remaining **FIVE** questions.
3) Assume suitable data if **necessary** and **justify** them.
4) **Figure** to the **right** indicates **marks**.

1. a) Explain time grading & current grading protection of the radial feeder. 5
   b) What are the difficulties experienced in plain differential protection of transformers? 5
   c) State advantages & disadvantages of static relay. 5
   d) Write a short note on ELCB. 5

2. a) Explain different ways of connections of earth fault relay and their applications. 10
   b) What is primary and back-up protection? Explain types of back-up protections. 10

3. a) With a neat diagram, explain construction and working of vacuum circuit breaker. 10
   b) Explain three stepped distance protection provided to long transmission lines. 10

4. a) Write a short note on the following:- 10
   i) Instrument transformers used in protection.
   ii) Contactors.
   b) Explain the different abnormal conditions observed in motors and protection provided against them. 10

5. a) Explain the construction, working and applications of HRC fuse. 10
   b) What are incipient faults? Explain the protection provided to power transformers against them. 10

6. a) Explain the working of a numerical relay with a block diagram. 10
   b) Explain negative phase sequence protection & field failure protection provided to generator. 10

****

QP code : 10081136

TE sem VI Electrical R-19 C scheme

Duration – 3 Hours **Total Marks – 80**

Note: - (1) Question No.1 is compulsory.
(2) Attempt any three questions out of the remaining five questions.
(3) Assume suitable data if necessary and justify the same.

Q 1	Answer the following.	**20M**
(a)	Discuss the steps taken by the microcontroller when an interrupt occurs.	**5M**
(b)	What is timer roll over? Specify the significance of TMR0IF.	**5M**
(c)	Explain the Compare instructions used in PIC18F microcontroller.	**5M**
(d)	Explain STACK and STACK pointer in PIC18F.	**5M**
Q 2 (a)	Explain the memory organization (RAM and ROM) of PIC 18F microcontroller.	**10M**
Q 2 (b)	Build a C code to transmit a character 'Y' serially at 9600bps continuously. Assume XTAL = 10MHz.	**10M**
Q 3 (a)	Explain the different types of instruction sets and mention two examples of each set.	**10M**
Q 3 (b)	Write an Assembly language program to separate odd and even numbers from a given set of 10 numbers. Store the even numbers in the memory location starting from 20H and the odd numbers in the memory location starting from 30H onwards. Use register indirect addressing mode.	**10M**
Q 4 (a)	Explain the registers SPBRG, TXREG and RCSTA registers associated with serial communication in PIC 18F.	**10M**
Q 4 (b)	With a neat diagram, demonstrate a PIC microcontroller-based system to operate a stepper motor in forward and reverse directions using push buttons.	**10M**
Q 5 (a)	Illustrate the different addressing modes used in PIC18F458.	**10M**
Q 5 (b)	Describe the steps to program the Timer0 in 16-bit mode to generate a 1 ms delay. XTAL = 10MHz.	**10M**
Q 6	Write a short note on (Attempt any two)	
(a)	PWM signal generation using CCP module	**10M**
(b)	Seven Segments LED Interfacing with PIC 18 Microcontrollers.	**10M**
(c)	DC Motor interfacing with PIC18 Microcontroller	**10M**

QP code : 10085104

TE sem VI Electrical R-19 C scheme

Duration :3 Hr. **Marks:80**

Note :

- **Question No.1 is compulsory.**
- Solve **ANY THREE** questions from the **remaining** five questions.
- Figure to the right indicates full marks.
- Assume suitable data wherever required, but justify the same.

Q. 1 Solve **any four** questions from following. (Each question carries 5 marks) **20**

a) Define controllability and observability in state space. Which form of State space representation is best to directly observe the controllability and observability of system and why? **05**

b) Digital compensator is given by G(s)=10/(S+5). Obtaine the discrete transfer function for T=0.02 msec. **05**

c) Realize a PD controller with passive network. Given the controller transfer function $Gc(s) = \frac{s+3}{s+10}$ **05**

d) For a system with $G(s)=\frac{35(s+5)}{s(s+3)(s+10)}$, determine the corner frequencies, intial slope and magnitude of the bode plot at ω=0.1 rad/sec. **05**

e) The open loop transfer function G(s) of a plant has 3 poles: one at origin and the other two at -1 anc -3 respectively. The constant %OS line corresponds to 10% overshoot intersect the Root locus at the point A. Evaluate the settling time corresponding to the point A. **05**

Q. 2 **a)** Design an integral controller to yield a 16% overshoot, 0.6sec. peak time and zero steady state error for a step input for the following plant. Analyse the designed system and verify the zero steady state error. **10**

$$\dot{x} = \begin{bmatrix} -2 & 1 \\ 0 & -4 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u; \qquad y = [1 \quad 1]\, x$$

b) Identify the active and passive compensators which can be used to improve only the steady state response for the given system. Model the compensators with the corresponding typical Transfer functions and pole-zero plots. Also, draw the corresponding compensator circuits. **10**

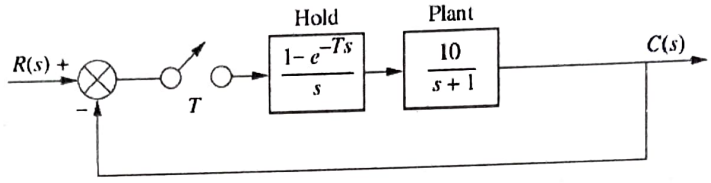
Q. 3 **a)** Design a lag compensator for the unity feedback system with forward path $G(S) = \frac{K}{S(S+8)(S+30)}$ to meet percentage overshoot of 10% and K_v=10. Use frequency response analysis. **10**

b) Explain the selection criteria of cpmpensators. Explain the steps in lag-lead compensator design using frequency domain analysis. **10**

Q. 4 **a)** A unity feedback system with forward path transfer function $G(s)=\frac{K}{(s+2)(s+4)(s+6)}$ has 15% overshoot. Analyse the system with the help of root locus and determine the dominant pole and gain K for the given % overshoot. **10**

b) Analyse the system given in Q. 4a) to determine the current peak time for 15% overshoot, design a PD controller to reduce the peak time by a factor of 1.5. Draw the compensated root locus and verify the design. **10**

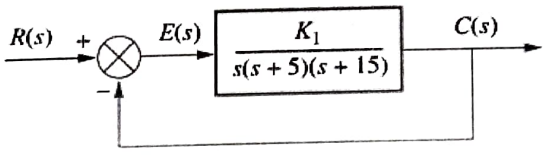
Q. 5 **a)** Determine the range of T that will make the system stable and the range that will make the system unstable. **10**



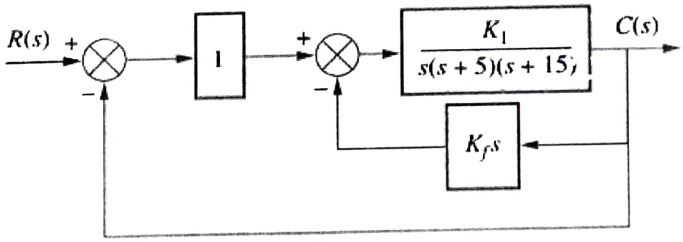
b) Design a lag compensator using root locus technique with open loop transfer function $G(S)=\frac{K}{S((S+2)(S+8)}$ to meet damping ratio =0.5, settling time=5 and velocity error >5 **10**

Q. 6 **a)** $G(s)=\frac{20(s+2)}{s(s+5)(s+7)}$. Analyse the system for controllability and if controllable, determine the transformation matrix to do the state feedback controller design in phase variable form, if the plant is represented in the parallel form. **10**

b) What is rate feedback controller. Given the system of Figure (a), design rate feedback compensation, as shown in Figure (b), to reduce the settling time by a factor of 4 while continuing to operate the system with 20% overshoot. **10**



(a)



(b)

****

QP code : 10086606

TE sem VII Electrical R-19 Cscheme

Time (3 Hours) **80 Marks**

Note: (1) Question no. 1 compulsory
(2) Attempt any 3 question out of remaining five questions.
(3) Draw neat diagram wherever necessary.

Q 1. Attempt **any Four** out of Six questions **(5 marks each)** **(20)**

a. Determine the Fourier series representation of $x(t) = 2Sin(2\pi t - 3) + Sin(6\pi t)$
b. State the conditions for an LTI system to stable and casual.
c. Determine whether the continuous time signal $x(t) = 3\cos(4t + \frac{\pi}{3})$ is periodic, determine its fundamental period.
d. State four important properties of DTFT.
e. Determine the z-transform and ROC of the signal $x(n) = 3^n u(-n-1)$
f. Describe the following signals with their graphical and mathematical representations.
(i)Step (ii) Ramp (iii) Impulse.

Q 2. a. Determine the transfer function and the impulse response for the casual LTI system described by the difference equation **(10)**

$$y(n) = \frac{1}{4}y(n-1) - \frac{3}{8}y(n-2) = -x(n) + 2x(n-1)$$

b. Determine whether the system $y(n) = nx(n)$ is **(10)**
(i) Time invariant
(ii)) Linear
(iii) Causal
(iv) Stable

Q3. a. Categorize the following signal as a energy signal or a power signal, find the energy or time averaged power of the signal. **(10)**

$$x(t) = \begin{pmatrix} t, & 0 \le t \le 1 \\ 2-t, & 1 \le t \le 2 \\ 0, & otherwise \end{pmatrix}$$

b. Design a Bandpass FIR filter using rectangular window for N=11 samples **(10)**

$$H_d(e^{j\omega}) = \{1\ , \quad \frac{\Pi}{4} \le |\omega| \le \frac{3\Pi}{4}\}$$
$$\{0\ , \quad \text{otherwise}\}$$

Q4. a. Determine inverse Z-transform of $X(z) = \frac{z^2-3z}{z^2+\frac{3z}{2}-1}$ **(10)**

When ROC is $\frac{1}{2} < |z| < 2$

b. Discuss the method of Bilinear transformation for design of IIR filter **(10)**

Q5. a. Explain any five properties of DFT **(10)**

b. Given x(n) = {1,2,4,8,16,32,64,128) Find X(k) using DIT-FFT algorithm. **(10)**

Q6. a) An LTI system is described by the equation: **(10)**

Y(n) = x(n) + 0.8 x(n-1) +0.8 x(n-2) -0.49 y(n-2)
Determine the transfer function of the system, sketch poles and zeroes on the z-plane.

b) Find y(n) by using convolution if x(n) = [1,3,5,3] and h(n) = [2,3,1,1]. **(10)**

10

Paper / Subject Code: 89306 / Electric Traction (DLOC)

QP code : 10081970

TE sem VI Electrical R-19 C scheme

Time: 3 hrs

Marks: 80

Note: - 1. Question No. 1 is compulsory

2. Attempt any **three** questions out of remaining **five** questions

3. Assume suitable data if necessary & justify the same

4. Figures to the right indicates marks

Qu.1 Attempt **any Five**.

(a) Discuss the factors on which final choice of traction system depends [4]

(b) Distinguish the characteristics of urban, suburban and main line services [4]

(c) Discuss the suitable characteristics of traction motor in brief. [4]

(d) Describe the advantages and drawbacks of semiconductor converter controlled traction drives. [4]

(e) Write a note on Kando system [4]

(f) Draw the layout of 2*25 KV AC traction system of power distribution. Describe it in brief. [4]

Qu.2 (a) Derive the expression of specific energy consumption. State the factors affecting specific energy consumption [10]

(b) Sketch the layout of 132/25 kV traction substation & illustrate it in brief. [10]

Qu.3 (a) Discuss 25 KV AC traction using Thyristors converter controlled DC motor. Why a converter with multistage control is employed. Describe the operation of multistage converter in brief. [10]

(b) Discuss the operation of DC track circuit used in traction railway signaling [10]

Qu.4 (a) Discuss the protection scheme required for overhead lines in traction [10]

(b) Define the Tractive efforts. Derive the expression for total tractive efforts [10]

Qu.5 (a) An electric train has quadrilateral speed time curve as follows

1. Uniform acceleration from rest at of 2 Kmphps for 30 sec
2. Coasting for 50 sec.
3. Duration of braking 20 sec. [10]

If the train is moving Up Gradient of 10%, tractive resistance is 40 N/tonne, rotational inertia effect 10 % of dead weight, duration of station stop 15 seconds and overall efficiency of transmission gear and motor as 75%. Calculate 1) Total distance travelled by train (2) Schedule Speed

(b) Describe the operation of AC traction drive using PWM voltage source inverter induction motor drive. State the advantages of using PWM technique in traction drive. [10]

Qu.6 (a) Discuss the pantograph current collection technique used in overhead system. List the advantage of pantograph current collection technique [10]

(b) Write a short note on **Any TWO** [10]

(1) Spacing and location of Traction substation

2) Sectioning and paralleling post.

3) Types of Interlocking in railway signaling

****

ap code : 10081092

TE sem VII Electrical R-19 Cscheme

(3Hrs) **Marks: 80**

N.B.

1. **Question No.1 is Compulsory.**
2. Answer any three out of remaining five questions
3. Assume any suitable data wherever required but justified the same
4. Illustrate answer with sketches wherever required

Q 1		**Attempt any FOUR**	
	a)	Illustrate the application of flywheel as an energy storage device.	**(05)**
	b)	Illustrate the operation of seasonal thermal energy storage.	**(05)**
	c)	Illustrate the energy storage process in pressurized gas.	**(05)**
	d)	Explain the V2X mode of operation of an electric vehicle.	**(05)**
	e)	Justify the necessity of an energy storage in electrical power system.	**(05)**
Q 2	a)	Draw the schematic of superconducting magnetic energy storage (SMES) and also, elaborate it's working.	**(10)**
	b)	Compare the performance of super capacitor as an energy storage device over a capacitor	**(10)**
Q 3	a)	Explain the working of pumped hydro energy storage technology also mention its advantages, disadvantages, and applications.	**(10)**
	b)	Illustrate in detail, any five energy storage technologies.	**(10)**
Q 4	a)	Draw load curves with and without energy storage system and state the advantages of energy storage devices from load curve point of view.	**(10)**
	b)	Explain any two battery technologies which can be used as an electrochemical energy storage.	**(05)**
	c)	Explain with a neat diagram how energy can be stored and utilized from a solar pond?	**(05)**
Q 5	a)	Illustrate the process of battery sizing for standalone application.	**(10)**
	b)	Illustrate the term "Hybrid Energy Storage System" and its applications.	**(05)**
	c)	Illustrate the principle of operation of fuel cell.	**(05)**
Q 6	a)	Define SoC of energy storage. Illustrate the types SoC estimation techniques.	**(10)**
	b)	What is the necessity of series connection of super capacitor?	**(05)**
	c)	Describe battery system model in brief.	**(05)**

****