QP-10086907

TE|sem VI| C-scheme R-19| Electrical

16/12/24.

Time : 3 Hours **Total Marks: 80**

N.B. : (1) Question No.1 is compulsory
(2) Attempt any three from the remaining
(3) Figures to the right indicate full marks
(4) Assume suitable data if necessary

1.	(a)	Write a short note on: flow battery.	20
	(b)	Explain the necessity of energy storage.	
	(c)	Explain the types and applications of fuel cell.	
	(d)	Explain energy trends in batteries.	
2.	(a)	Write a short note on Supercapacitors.	10
	(b)	Explain in detail about seasonal thermal energy storage.	10
3.	(a)	Explain briefly about Compressed air energy storage (CAES).	10
	(b)	What are solar ponds? Explain with a neat diagram how energy can be stored and utilised from a solar pond?	10
4.	(a)	Explain the configurations and applications of hybrid energy storage systems (HESS).	10
	(b)	What are the Design considerations for sizing of different types of energy storage systems for various applications?	10
5.	(a)	Explain in detail about the Pumped hydro storage system. Give its applications.	10
	(b)	Explain the working principle of Rechargeable battery.	10
6.	(a)	Write a short note on Superconducting magnetic energy storage (SMES).	10
	(b)	Explain in detail about Flywheel	10

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QP-10065271
16/12/24.

TE| sem VI| C-scheme R-19| Electrical

Time: 3 Hours

Marks: 80

Note :

- **Question No.1 is compulsory.**
- Solve **ANY THREE** questions from the **remaining** questions.
- Figure to the right indicates full marks.

			Marks
Q 1	Solve **ANY FOUR** questions from following.		
	a)	What are the requirement of ideal traction system	5
	b)	What is the importance of neutral section in OHE?	5
	c)	Explain the importance of interlocking used in railway with a neat diagram.	5
	d)	Discuss the suitability of series motors for traction duty.	5
	e)	Distinguished the characteristics of urban and main line services	5
Q 2	a)	Explain the speed time curve of main line services.	10
	b)	Explain the DC Traction using Chopper Controlled Drives	10
Q 3	a)	Draw and explain the 132/25 KV layout of traction substation.	10
	b)	Derive the Quadrilateral speed time curve method. What are the benefits over trapezoidal curve method.	10
Q 4.	a)	Derive the expression for specific energy output. Explain the factors affecting Specific Energy Consumption?	10
	b)	Discuss the auxiliary circuit equipment used in traction locomotive.	10
Q 5.	a)	Discuss the booster transformer with return conductor with neat diagram.	10
	b)	Explain in brief the design requirement of overhead catenary wire	10
Q 6.	a)	Which are the different current collecting techniques? Explain any one current collecting technique in brief	10
	b)	What is the function of a signal? Explain the operation of AC track circuit	10

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TE|Sem VI|C-scheme R-19|Electrical 10/12/24

Duration: 3 Hours **Marks:80**

Note:

- **Question No.1 is compulsory.**
- Solve **any Three** questions from the **remaining** five questions.
- Assume suitable data wherever required but justify the same.
- Use of Graph paper and semilog paper is compulsory wherever applicable.

Q1 Answer any four(all questions carry equal marks) **20**

a. Write short note on ideal integral controller with respect to its characteristics and zero-pole locations.

b. Compare lag and lead compensators along with electrical equivalent circuit and pole-zero plot in S-plane

c. How Routh-Hurwitz criteria can be applied for the stability analysis for a system represented in discrete form?

d. Write the state space representation for the following system with overall transfer function as $\frac{20}{(s+7)(s+15)(s+10)}$ in cascade form.

e. Develop a flowchart for the digital compensator defined by $G_c(z)=\frac{(z+0.5)}{z^2-2.4z-1.7}$

f. List the advantages and disadvantages of controller design using state variable approach.

Q2 a. Given the plant $x' = Ax+Bu$ and $y=Cx$ with **10**

$$A=\begin{bmatrix}-1 & 1\\ 0 & 2\end{bmatrix} B=\begin{bmatrix}1\\ 1\end{bmatrix} C=[0 \quad 1]$$

Design an integral controller to yield a 15% overshoot, 4 second settling time, and zero steady-state error for a step input.

b. Given a sampler and z.o.h. in cascade with $G(s)=\frac{20}{s(s+2)}$ in the forward path of the unity feedback system. Evaluate the static error constants and the steady-state error for the system with T=0.1 second, if the inputs are (i) u(t) (ii) t u(t) **10**

Q3 a) The open loop transfer function of a uncompensated system is $G(s)=5/s(s+2)$. Design a suitable lag compensator for the system so that static error constant Kv=20/sec, phase margin is at least 55^0 and the gain margin is at least 12 dB. Use Bode plot. **15**

b) Explain the steps in lag-lead compensator design using frequency domain analysis. **05**

Q4 a. Given the following open loop plant $G(s)=\frac{10(s+5)}{(s+1)(s+2)(s+4)}$ Design a controller to yield a10% overshoot and a settling time of 0.5 sec **10**

assuming that the plant is represented in the phase variable form.

b. Check the controllability and observability of the following system. **10**

$$\dot{x} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 2 \\ 1 & -2 & -4 \end{bmatrix} x + \begin{bmatrix} 1 \\ 3 \\ 1 \end{bmatrix} u; \qquad y = [1 \quad 0 \quad 3]x$$

Q5 a. Consider a unity feedback system with open loop transfer function G(S)=K/s(s+1)(s+2). Design a suitable lag-lead compensator to acquire Kv=10, phase margin=50^0 and gain margin >=10 dB. Use frequency response analysis. **10**

b. Design a lag compensator using root locus technique with open loop transfer function G(S)=k/s(s+2)(s+8) to meet damping ratio =0.174. Steady state error to be improved by the factor of 10. **10**

Q6 a. Consider the following open loop plant G(s) $=\frac{25}{s(s+3)(s+4)}$ which is represented in observer canonical form. Design an observer with a transient response described by ζ=0.45 and w_n=30. Assume, the plant is represented in observer canonical form. Do the design with a suitable observer third pole. **10**

b. Given a sampler and z.o.h. in cascade with G(s)=$\frac{3K}{(s+3)}$ in the forward path of the unity feedback system. Find the range of K to make the system stable with T=0.2 second using the digital system formulation. **10**

TE|sem VI| C-scheme R-19| Electrical| QP-10054688

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

5/12/24

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 questions. (Any four) **20M**

a) Differentiate between Microprocessor and Microcontroller. **5M**

b) Explain status register and Bank select register of PIC 18 Microcontroller. **5M**

c) Differentiate between serial and parallel communication. **5M**

d) Write a short note on Assembler directives. **5M**

e) Explain Instruction pipelining in PIC 18 Microcontroller. **5M**

Q 2 a) Classify the different interrupting sources of pic18 microcontroller and hence explain the simplified vectored interrupt process with GIE and PEIE. **10M**

Q 2 b) What is stack and subroutine? Explain the instructions associated with stack & subroutine. **10M**

Q 3 a) What is mean by addressing modes? Explain the different addressing modes used in Pic18 microcontroller. **10M**

Q 3 b) Write a C18 program using Timer 0 to generate square wave of 2500 Hz frequency on all pins of PORTC. Use 16-bit programming technique with no prescaler, The internal frequency of micro controller is 10MHz. **10M**

Q 4 a) Explain the SPBRG, TXSTA and RCSTA registers used in serial communication. **10M**

Q 4 b) A switch is connected to pin RD7(PORTD.7). Write a C program to monitor the status of the switch and perform the following: (Draw the diagram) a) If the SW=0 (Open), Stepper motor moves Clockwise. b) If the SW=1 (Closed), Stepper motor moves Anticlockwise. **10M**

Q 5 a) Explain the Capture, Compare and PWM module (CCPx) of Pic18 microcontroller. **10M**

Q 5 b) Explain the Analog to digital (ADC) module along with the control registers associated with it used in PIC18 microcontroller. **10M**

Q 6 Write a short note on

a) LCD interfacing with PIC18 Microcontroller. **10M**

b) DC motor interfacing with PIC18 Microcontroller. **10M**

QP code : 10055307

Paper / Subject Code: 89301 / Power System Protection & Switchgear

TE sem VI Electrical R-19 C scheme

VI | Electrical/PSPS
15/05/2024

Duration : 3 Hours **Total Marks : 80**

Instructions:
1. Question No. 1 is compulsory
2. Attempt **any three** questions out of remaining **five** questions.
3. Assume suitable data, if necessary and justify the same.

Q1. Answer the following questions. **20**

a) Mention at least five differences between a fuse and a circuit breaker. 5
b) Explain the properties of SF6 gas that makes it suitable for arc quenching. 5
c) Explain time-graded protection of radial feeder. 5
d) What are the advantages and disadvantages of static relays over electromagnetic relays. 5

Q2. a) Draw and explain construction and working of Pantograph Isolators. 10
Q2. b) Explain the working and cut off characteristics of HRC Fuse. 10

Q3. a) Explain with neat diagram, the construction and working of Vacuum Circuit Breaker. 10

Q3. b) Explain the construction and working principle of Induction Disc Relay. 10

Q4. a) Explain the differential protection given to delta-star power transformer . 10
Q4. b) What are the desirable qualities of protective relays? Explain in detail. 10

Q5.a) What is the working principle of distance relays? Differentiate between different types of distance relay. 10
Q5.b) State various abnormal conditions of induction motor. Explain motor protection against single phasing. 10

Q6. a) Explain the three-step protection provided for transmission line. 10
Q6. b) Write a short note on Numerical Relay. 10

QP code : 10056446

TE sem VI Electrical R-19 C scheme

VI | Electrical | S & S

Time (3 Hours) Marks: 80

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. Check whether the given system y(n) = | x(n) | is linear/non-linear, time variant/time invariant, static/dynamic, stable/unstable, causal/non causal systems.
b. Explain Sampling theorem in detail.
c. Discuss Rectangular, Hamming windows used to design FIR filters.
d. Find the 4-point DFT of the sequence x(n)= {1 , -2 , 3 , 2}.
e. Explain ROC and its properties.
f. Explain minimum phase, maximum phase and mixed phase systems with examples.

Q 2. a. Obtain the Z-transform of (10)
(1) x(n) = n(n+1) u(n)
(2) x(n) = u(-n).

b. Determine the periodicity of the following (10)
(1) x(t) = 2 cos 3t + 3 sin 7t
(2) x(t) = 5 cos 4πt + 3 sin 8πt

Q3. a. A LTI is described by the equation 2y(n) + 3y(n-1) + y(n-2) = u(n) + u(n-1) – u(n-2). Find response of the system when the initial conditions are given by y(-1) = 2 and y(-2) = -1 and when unit step is applied as the input. (10)

b. Design a digital low pass FIR filter for a following specification (10)

$$H_d(\omega) = \begin{cases} e^{-j\omega\tau} & \text{for } \omega \le \omega_c \\ 0 & \text{otherwise} \end{cases}$$

Using rectangular window of length =7 & Wc=1rad/sample.

Q4. a. Determine inverse Z-transform of $X(z) = \frac{1}{1-1.5\,z^{-1}+0.5\,z^{-2}}$ (10)
for ROC (1) | z | > 1 (2) | z | < 0.5 (3) 0.5 < | z | < 1

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

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

b. Compute DFT for the sequence x(n) = {0.5,0.5,0.5,0.5,0,0,0,0) using radix -2 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)
