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

N.B. 1) Question No.1 is Compulsory.
2) Attempt any three questions from remaining five questions.
3) Figures to right indicate full marks.

1. Attempt the Following;-
(a)Explain the properties of SF 6 gas that make it suitable for arc quenching. (5)
(b)Explain loss of Excitation in case of transformer. (5)
(c) Where and why isolators, contactors and circuit breaker are used in power system. (5)
(d)Explain the different types of fault occur in transformer. (5)

2.a) What are the protection provided for rotor of an alternator. (10)
b) Draw and explain a scheme for motor against single phasing. (10)

3. a)Explain restricted earth fault protection of alternator. How 100% winding is protected? (10)
b) Explain construction & working principle of Vacuum circuit breaker. (10)

4. a) what are the different types of fuse available .explain the constructional detail of HRC fuse with its advantages over other types. (10)
b) Explain the differential protection given to delta star power transformer. (10)

5. Write a short note on.
a) Electromagnetic relay (5)
b) DC relay (5)
c) power swing (5)
d) Frequency relay (5)

6. a) what type of protection provided for induction motor. (10)
b) Explain protection provided for different types of bus zones. (10)

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(3 Hours) **(Maximum Marks 80)**

Note:-
1. Q.1 is compulsory
2. Solve ANY THREE questions out of remaining.
3. ASSUME SUITABLE DATA wherever necessary.

Q.1 (20)

a) Derive an expression for distribution factor Kd.
b) Explain operating principle of BLDC.
c) Explain nature of OCC and SCC of an alternator.
d) Explain any one method of starting of synchronous motor.

Q.2 (20)

a) Explain armature reaction in synchronous alternator for different power factor loads.

b) A three phase 8 pole, 750rpm star connected synchronous alternator has 72 slots having 12 conductors per slot. Winding is chorded by 2 slots. Find distribution factor and pitch factor for the winding. Also find line voltage induced if flux is 0.06Wb.

Q.3 (20)

a) Explain hunting in synchronous machines.
b) A 20MVA three phase 11KV, 12 pole, 50Hz salient pole synchronous motor with negligible armature resistance has reactance X_d=5 ohms and X_q=3 ohms, at full load, unity power factor and rated voltage find excitation voltage and power.

Q.4 (20)

a) A 3300kVA, 3 phase, star connected 6600V, 8 pole, 50Hz, cylindrical alternator has synchronous reactance of 20% and it is running parallel with infinite bus. Calculate synchronizing power and corresponding synchronizing torque per mechanical degree of phase displacement i) at no load ii) At full load 0.8 pf lag.
b) Explain V curves of synchronous motor. Draw phasor diagram.

Q.5 (20)

a) Explain Blondel's two reaction theory.
b) Explain slip test to calculate Xd and Xq.

Q. 6 (20)

a) Explain power angle characteristics for salient pole synchronous machine.
b) Explain excitation circles and power circles.

[Time: 3 Hours] **[Marks:80]**

Please check whether you have got the right question paper.

N.B: 1. Question.No.1 is compulsory.
2. Attempt any three from the remaining.
3. Assume suitable data if required.

Q.1 a) Write properties of DFT. Explain any two in detail. **(05)**

b) Determine the periodicity of the following continuous time signal **(05)**

$x(t) = 5\cos 4\pi t + 3\sin 8\pi t$

c) State sampling theorem and explain how aliasing error occurs. **(05)**

d) Find x(n) considering all possible region of convergence. **(05)**

$x(z) = \frac{10z}{(z-1)(z-2)}$

Q.2 a) Design a linear phase FIR low pass filter a length seven with cut-off frequency 1rad/sec using rectangular window. **(10)**

b) Determine whether the system is static causal, time invariant, linear and stable **(10)**

i) $y(t) = x(t+1) + x(t^2)$

ii) $y(t) = x(t-5) - x(2-t)$

Q.3 a) The system transfer function of analog filter is given by **(10)**

$H(S) = \frac{S+0.1}{(S+0.1)^2+16}$

Obtain the system transfer function of digital filter using BLT which is resonant at $Wr = \frac{\pi}{2}$.

b) Sketch the following signal:- **(05)**

$x(t) = 2u(t) + tu(t) - (t-1)\,u(t-1) - 3u(t-2)$

c) Separate out the even and odd component of:- **(05)**

$x(n) = \{1, 3, 2, 1, -2\}$
$\uparrow$

Q.4 a) Obtain linear convolution using circular convolution for:- **(10)**

$x(n) = \{1, 3, 2,\}$ and $h(n) = \{1, 2\}$
$\uparrow$ $\uparrow$

b) What is ROC? How stability can be obtained by ROC, explain with example. **(05)**

c) Determine the inverse Z-transform y:-

$$X(Z) = \frac{Z^{-1}}{\left(1-\frac{1}{2}Z^{-1}\right)(1-\frac{1}{3}Z^{-1})}$$

for the following condition:-

1. Causal 2. Anti-causal 3. Stable

Q.5 a) A LTI system is described by the difference equation:- **(10)**

$y(n) = x(n)+2x(n-1)-6y(n-1)-8y(n-2)$

Find Impulse response.

b) A 8 point sequence is given by **(10)**

$x(n) = \{2, 2, 2, 2, 1, 1, 1, 1\}$

Compute radix x-2 DITFFT.

Q.6 Write short notes on **any two**. **(10)**

1. properties of Z transform **(05)**
2. advantages and disadvantages of FIR system
3. energy / power signal

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(3 Hours) [Total Marks: 80]

N.B: 1. Q. No. 1 is compulsory

2. Attempt any three questions from the rest

3. make any suitable assumption wherever required

4. write one complete question answer in sequence at one place.

1. Answer any four (20)
   a. Write features of PIC 18 microcontroller.
   b. Explain status registers of PIC 18 microcontroller
   c. Differentiate serial and parallel communication
   d. Explain different method of interrupt applicable for PIC 18
   e. What is watch dog timer
2. a. Explain, with example, different addressing modes used in PIC 18 instructions. (10)
   b. Explain the bus architecture of PIC 18. (10)

3. a. Write an assembly level program to multiply hex number 30H and 02H stored in REG1 and REG2 and save the result in REG4 and REG5. (10)

   b. Write an assembly level program to flash an LED connected at PB1 at a frequency of 1 sec. (10)

4. a. write short note on assembler and assembler directives. (10)

   b. what is prescalar? (5)

   c. Explain synchronous and asynchronous communication. (5)

5. a. Explain timer zero control register of PIC 18 (TCON0) (10)

   b. Explain the interrupt architecture of PIC 18 Microcontroller. (10)

6. write short note on any two. (20)

   a. Programming model of PIC 10

   b. Method of programming timer in PIC 18

   c. Memory Architecture of PIC 18

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

Note:- (1) Q no. 1 is compulsory
(2)Solve any three questions from Q. No. 2 to Q.no. 6.
(3)Assume suitable data whenever necessary.

Q NO.1 Solve **any four.**

(a) What are the time domain specifications needed to design a control system? **05**

(b) What is compensation? What are types? **05**

(c) Compare the analog and digital controller. **05**

(d) What is zero order hold circuit? **05**

(e) Sate the conditions for stability of system in Z-plane. **05**

Q. NO.2(a)A linear time-invariant system is described by the following differential equations:- **10**

dx1(t)/dt =-2.x1(t)+4.x2(t).

dx2(t)/dt=-2.x1(t)-x2(t) +u(t).

Comment on the controllability and stability.

Q.NO.2(b)Obtain the state transition matrix (STM)for the state model whose matrix (A)is given by:- **10**

$$A=\begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}$$

Q.NO.3(a) Obtain the transfer function for a system having state model:- **10**

$$\begin{bmatrix}\dot{x_1}\\ \dot{x_2}\end{bmatrix}=\begin{bmatrix}-2 & -3\\ 4 & 2\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}3\\ 5\end{bmatrix}u$$

$$Y=\begin{bmatrix}1 & 1\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix} \text{ and } D=\begin{bmatrix}0\end{bmatrix}$$

Q.No.3(b) Construct a state model for a system by the characterized differential equation, by phase variable method:- **10**

$$\frac{d_y^3}{dt^3}+6\frac{d_y^2}{dt^2}+11\frac{d_y}{dt}+6y+u=0$$

Q.No.4(a) A linear time invariant system is characterized by the homogenous state equation **10**

$$\begin{bmatrix}\dot{x_1}\\ \dot{x_2}\end{bmatrix}=\begin{bmatrix}1 & 0\\ 1 & 1\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}$$

Compute the solution of homogeneous equation, assuming the initial state vector $=\begin{bmatrix}1\\ 0\end{bmatrix}$

Q.No.4(b) A single input system is described by the following state equation **10**

$$\begin{bmatrix}\dot{x_1}\\ \dot{x_2}\\ \dot{x_3}\end{bmatrix}=\begin{bmatrix}-1 & 0 & 0\\ 1 & -2 & 0\\ 2 & 1 & 3\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}+\begin{bmatrix}10\\ 1\\ 0\end{bmatrix}u$$

Design a state feedback controller which will give closed loop poles at $-1 \pm j2$,-6. Use Ackermann's method.

Q.No.5(a)Consider a system described by the state model:- **10**

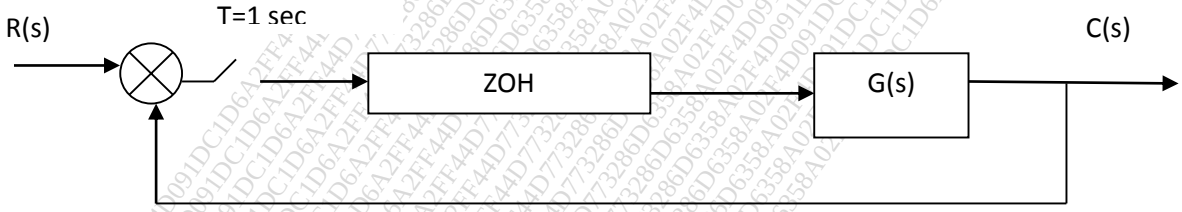
$[\dot{x}] = [A][x]$ and $[y] = [C][x]$

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

Design a full order state observer. The desired eigen values for the observer matrix are -5,-5. Use Ackermann's method.

Q.No.5(b) Find the response of the unit step input where **10**

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



Q.No.6(a) Explain the design procedure of Lag-Lead Compensator. **10**

Q.No.6(b) Explain the stability of digital control system in Z-plane. **10**

3 Hours Max. Marks -- 80

Instructions to candidates **Marks**

1) Q.No. 1 is compulsory.
2) Solve any 3 questions from the remaining 5 questions.
3) Figures on the right side indicate full marks.
4) Make suitable assumptions where required.

Q.No 1		**Answer any four.**	
	a)	What is the significance of AWGN channel ?	05
	b)	Explain Hoffman coding in brief.	05
	c)	Differentiate between FSK and PSK.	05
	d)	Derive the expression for entropy.When is the entropy maximum ?	05
	e)	Explain Correlation receiver .	05
.No 2	**a)**	Draw and explain the block diagram of a digital communication system in detail.	10
	b)	State and explain Shannon's theorem. The four symbols produced by a discrete memoryless source has probability 0.5, 0.25, 0.125, and 0.125 respectively. Determine the entropy of the source.	10
Q.No 3	**a)**	Find the probability of error of matched filter. comment on your results	10
	b)	With reference to 8-PSK explain the following: (i) transmitter and receiver with a neat block diagram along with mathematical expression for transmitted signal (ii) sketch its PSD indicating the bandwidth (iii) draw its constellation diagram and find its Euclidian distance	10
Q.No.4	**a)**	Compare BASK, BFSK & BPSK based on following parameters:- bandwidth requirement, noise immunity, transmission rate, efficiency & applications.	10
	b)	What is ISI ? How is it caused? Discuss the remedies to overcome ISI. state the Nyquist's Condition for zero ISI.	10
Q.No.5	**a)**	Why line coding is used ? Draw the various line code formats and state their important properties.	10
	b)	A (7 ,4) cyclic code is generated using the polynomial x3+ x + I i) Generate the systematic cyclic code for the data I 100. ii) Draw the encoder & show how parity bits are generated for the data I I 00.	10
Q.No.6		**Write short notes on**	
	a)	Powerline carrier communication	05
	b)	Optical fiber communication	05
	c)	Satellite communication.	05
	d)	Linear Transversal Equalizer	05

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