Time: 3 Hours **Marks: 80**

N. B. 1. Question no. **1 is compulsory**.
2. Attempt any **THREE** questions from remaining.
3. Assume suitable data if required.
4. Figure to the right indicate full marks.

Qu.1 : Solve any **Four** 20 M

(a) Explain the effect of addition of pole and zero to the system.

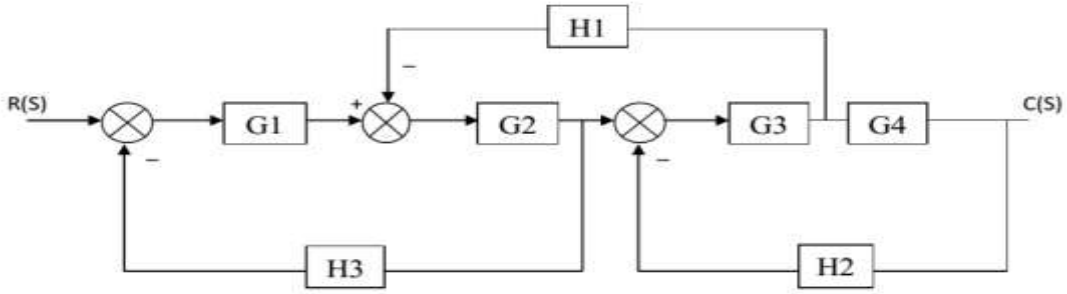
(b) Explain any five rules of Root Locus Plot in detail.

(c) Define Gain margin and Phase margin. Explain how these margins are used for stability analysis.

(d) Explain the Mason's gain formula with reference to Signal Flow Graph Technique.

(e) Explain needs of compensation in control system also explain different types of Compensation with suitable example.

Qu. 2: (a) Using block reduction technique, obtain the transfer function. 10 M



b) Construct SFG for the following set of equation. 10 M

i) Y2 = G1Y1 – G2Y4
ii) Y3 = G3Y2 + G4Y3
iii) Y4 = G5Y1 + G6Y3, Where Y4 is the output.

Obtain the overall transfer function by using Mason's gain formula.

Qu. 3: (a) Explain Controllability and Observability with the necessary condition for stability and Check Controllability and Observability for the system 10 M

$$\dot{x} = \begin{bmatrix} 0 & 6 & -5 \\ 1 & 0 & 2 \\ 3 & 2 & 4 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix} u$$

$$y = [1 \quad 3 \quad 0]x$$

(b) Explain PID Controller and Model Predictive control system in detail? Also list its advantages. 10 M

Qu. 4: (a) Construct the Routh array and determine the stability of the system whose characteristics equation is 10 M

$S^6 + 2S^5+8S^4+12S^3+20S^2+16S+16=0$

(b) Sketch the root locus for a unity feedback control system and forward transfer function is 10 M

$G(S) = \frac{K(S+3)}{S(S+2)(S+1)(S+4)}$. Find the frequency and gain K for which the root locus crosses the imaginary axis. For what range of k is the system stable?

Qu. 5: (a) Construct the Bode Plot for the open loop transfer function. Comment on Stability. $G(S)= \frac{288\ (S+4)}{S(S+1)(S^2+4.8\ S+144)}$ and H(S) = 1. 10 M

(b) State and Prove properties of State Transition matrix. Obtain the state model for the system with transfer function $\frac{Y(S)}{U(S)} = \frac{3S+4}{S^2+5S+6}$ 10 M

Qu. 6: (a) Sketch the Nyquist plot for a given open loop transfer function 10 M

$G(s).H(s) = \frac{1}{(s+1)(s+2)}$ And comment on the stability of the system.

(b) A unity feedback system has $G(S) = \frac{20(S+1)}{S^2(S+2)(S+4)}$ Find 10 M

i. All static error co-efficient (Kp, Kv, Ka).
ii. Steady State Error of ramp i/p with magnitude 4.

Q. P. Code: 36259

3 Hours Marks:80

N.B. 1) Question number 1 is compulsory

2)Attempt any three from remaining five questions.

3) Assume suitable data whenever necessary

4)Figure to the right indicates full marks

Q.1 Answer the following questions:

a) Explain the concept of Pipelining in 8086.State the importance of Queue register. 4M

b) WAP to add two 8 bit BCD numbers stored at location 1000H:2000H 4M

c) Explain the significance of following pins: $\overline{TEST}$,$\overline{LOCK}$ 4M

d) What is meant by Multiprocessor systems? Explain the advantages & disadvantages of Multiprocessor system. 4M

e) Explain the control flags: Direction flag, Trap flag, Interrupt flag. 4M

Q.2.a) Explain in detail Minimum mode of operation of 8086 processor. 10M
Also draw Read and Write timing diagrams.

b) WAP to transfer the Block of data (10 bytes) from memory location 10M
0000:C100H to 0000:C200H.

Q.3 a) Explain the block diagram of 8259 Programmable Interrupt Controller in detail.
What are different operating modes of 8259 PIC. 10M

b) Design 8086 based system for the following specifications: 10M

i) 8086 operating at 8MHz

ii) 4KB ROM and 8KB RAM

Explain the design and show memory address map

Q.4.a) Draw and explain in detail interfacing of 8086 main processor with 8087 Math Coprocessor. 10M

b) Explain following 8086 instructions using suitable examples 10M

i) XLAT ii) LOOPNE iii) DAA iv)DIV src v) CMPSB

Q.5.a) Interface 8 LEDs with 8255 in Mode 0 and write programs to display 10M

i) ON/OFF LEDs display ii) Running LEDs display

b) Explain different Bus Arbitration techniques in loosely coupled systems. 10M

Also highlight advantages & disadvantages of each.

Q.6 Write Short notes on the following (Any 3): 20M

a) Modes of operation for 8255 PPI

b) Interrupt structure of 8086 microprocessor

c) Need of 8237 DMA and its interfacing with 8086

d)Programming model of 8086

****

Q. P. Code: 36675

Total marks: **60**

Duration: 3 hrs.

N.B

1. Question 1 is compulsory
2. Solve any **THREE** out of the remaining 5 questions
3. Figures on the right indicate full marks
4. Assume suitable data if necessary

Q1. Answer any **THREE :** **(15)**

a) Explain the necessity of starter in a dc motor.
b) Explain v/f method of speed control of 3- phase induction motor.
c) State the important applications of brushless DC motor.
d) Which are the methods employed to make 1-phase induction motor self starting?

Q2. a) Develop equivalent circuit of a 3-phase Induction motor. **(8)**

b) Explain double field revolving theory in a 1-phase induction motor. **(7)**

Q3. a)Draw and explain torque-slip characteristics of a 3-phase induction motor in four modes. **(8)**

b) With neat diagram, discuss the working of a 3 point starter in a dc motor. **(7)**

Q4. a) Explain the construction and working of Permanent magnet synchronous motor. **(8)**

b) Describe the working of any one type of stepper motor. **(7)**

Q5. a)Explain the working principle of unipolar brushless dc motor. **(7)**

b) Describe the construction and working of switched reluctance motor . **(8)**

Q6. Write short notes on: **(15)**

a) Speed control methods of dc shunt motor.
b) Starting methods of 3-phase Induction motor.
c) Split phase Induction motor.

****

Q.P. Code :37278

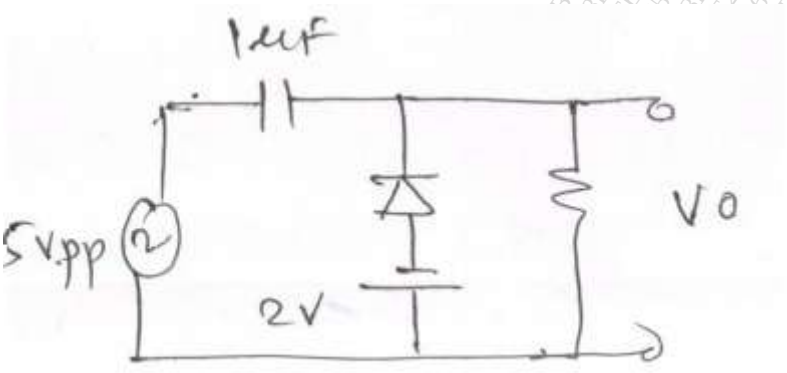
[Time: Three Hours] **[Marks:80]**

Please check whether you have got the right question paper.

N.B: **1. Q.1 is compulsory.**
2. Solve any three from remaining.
3. Assume suitable data if necessary.

Q.1 Solve any four.

1) Draw i/p and o/p waveform for the following circuit. Identify the circuit. 05



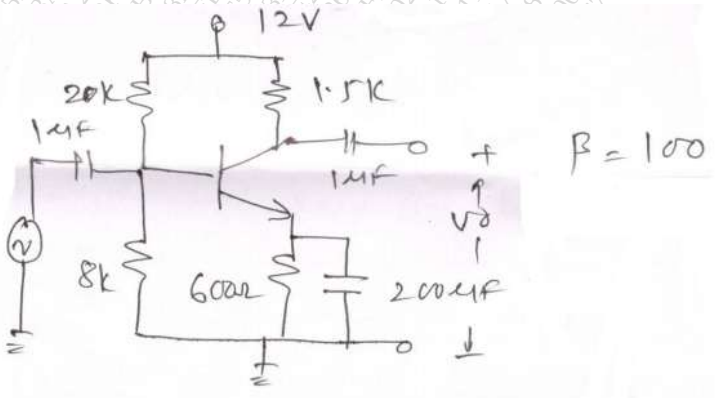
2) Explain need for cascading of amplifiers. 05

3) Derive expression for efficiency of Class A power amplifier. 05

4) Explain advantages of negative feedback. 05

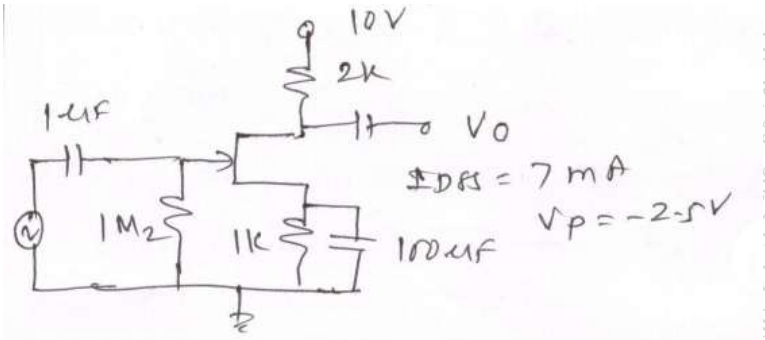
5) Compare CE amplifier with CS amplifier. 05

Q.2 a) For the given Circuit calculate Av, Ri and Ro, f_L. 10



b) Explain working of Wein bridge oscillator. Compare with RC phase shift oscillator.

Q.3 a) For the given circuit plot DC/AC load line, find operating point. 10



b) Draw two stage CS-CS amplifier and derive Av, Ri and Ro. 10

Q.4 a) Draw dual i/p balanced o/p differential amplifier. Explain its working. What is the use of swamping resistor in it? 10

b) Explain working of Class B power amplifiers. What are the techniques to remove cross over distortion? 10

Q.5 a) Draw block diagram of current series negative feedback. Derive necessary equations. 10

b) Draw high frequency model for CE amplifier. Derive expression for f_T. 10

Q.6 Solve any three:- 20

1) Hartley Oscillator working
2) Power BJTS and it's use.
3) Cascode amplifier
4) Constant current source in diff amps. (any one)

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

Please check whether you have got the right question paper

N.B : 1. Question No.1 is **compulsory.**

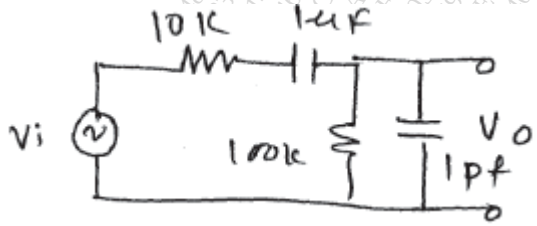
2. Attempt **any three** questions from remaining.

3. **All** questions carry **equal** marks.

4. Assume suitable data wherever necessary.

1. Attempt **any four** of the following

(a) Draw general frequency response of an amplifier. Determine corner frequencies for the following . **5**



(b) Compare MOSFET diffamp with passive load and active load. **5**

(c) Calculate max power dissipaton with and without heat sink. **5**

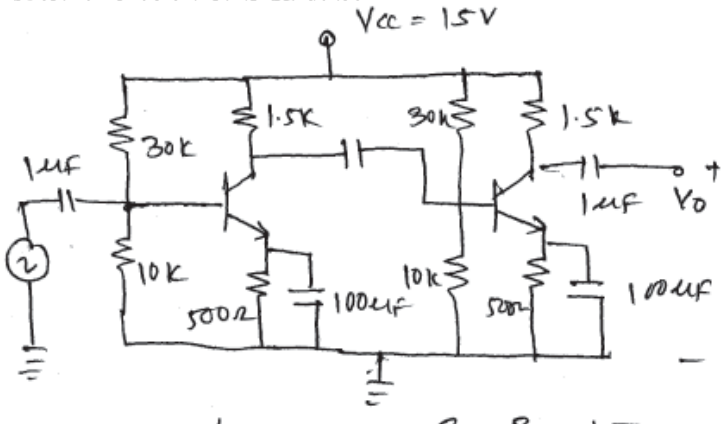
θjc = 1.5°C/W, θ_{CS} = 1° c/w, θ_{CA} = 50°C/W

θ_{JA} = 4°C/W, T_{jmax} = 100°C, T_{Amb} = 25°C

(d) State and explain Barkhausen criteria. **5**

(e) Explain working of SCR. Define I_L and I_H . **5**

2. (a) Determine voltage gain , i/p and o/p impedance for the two stage amplifier shown below. **10**



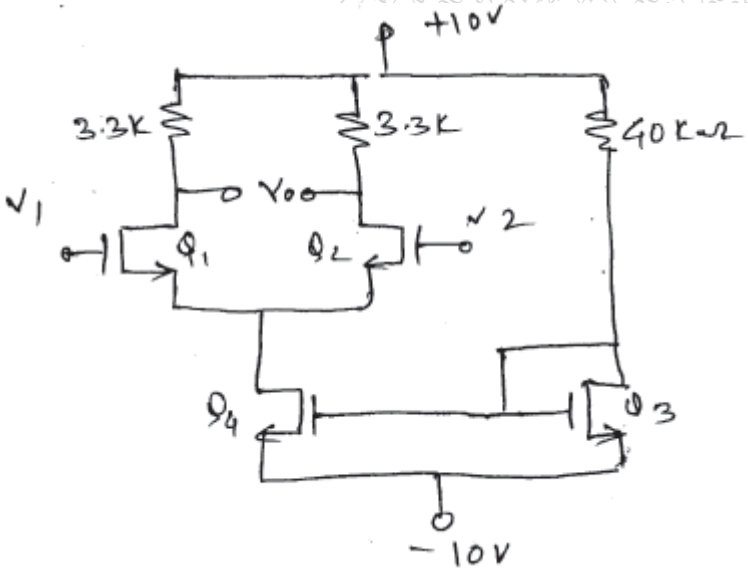
Assum $V_{BE} = 0.7V$, $\beta_1 = \beta_2 = 150$

(b) Explain working of RC phase shift oscillator. Give expression for frequency of oscillations. **10**

3. (a) Draw block diagram of voltage series negative feedback. Derive formulae for A_{vf}, R_{if}, R_{of}. **10**

(b) Explain working of UJT with the help of characteristics. Hence explain relaxation oscillator. **10**

4. (a) Determine I_{DQ} , V_{GSQ} and differential mode gain for following circuit. Assume Kn = 0.15 mA/v^2 , (VA) = 100 V VT = 1.5 V. **10**



(b) Draw circuit diagram of class A Transformer coupled amplifier. Explain working , Draw AC/DC load line. Derive expression of efficiency. **10**

5. (a) Explain high frequency response of CS-MOSFET amplifier with proper equation. Discuss effects of parasitic capacitances. **10**

(b) Explain use of constant current source in Diff amps. Give description of any one type. **10**

6. Solve **(Any Three)** **20**

(1) Cascode Amplifier working

(2) Gunn diode and it's applications

(3) Crossover distortion and methods to remove in class B amplifier

(4) Hartley oscillator.

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

N.B. : 1) Question No. **1** is **Compulsory**.

2) Answer **any THREE** questions from Q.2 to Q.6.

3) Figures to the right indicate full marks.

Q.1 (a) Verify Cauchy-Schwartz inequality for u= (2, 1,-3) v= (3, 4,-2). Also find angle between u & v. (5)

(b) If $A = \begin{bmatrix} 2 & 0 & 0 \\ 5 & -1 & 0 \\ 2 & 3 & 3 \end{bmatrix}$ find Eigen values of $A^2 + 6A^{-1} - 3I$. (5)

(c) Evaluate $\int_c \frac{z^3+2Z}{(Z-1)^2} dz$ when C is $|z| = 2$. (5)

(d) Find the extremals of $\int_{x_1}^{x_2} (x + y')y' dx$. (5)

Q.2 (a) Verify Cayley-Hamilton theorem & hence find A^{-1} , where $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & -1 \end{bmatrix}$. (6)

(b) Find the extremal of $\int_{x_1}^{x_2} (2xy - y''^2)$ dx. (6)

(c) Obtain Laurent's series expansion of $f(z) = \frac{Z+2}{(Z-3)(Z-4)}$ about $z = 0$. (8)

Q.3 (a) Evaluate $\int_0^{1+i} z^2 \, dz$ along the parabola $x = y^2$. (6)

(b) Show that $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ is derogatory & find its minimal polynomial. (6)

(c) Reduce the following quadratic form into canonical form & hence find it's rank, index, signature &value class (8)
$x^2 + 2y^2 + 3z^2 + 2yz + 2xy - 2zx$.

Q.4 (a) Find unit vector orthogonal to both $u = (-6,4,2)$ $v = (3,1,5)$. (6)

(b) Evaluate $\int_{-\infty}^{\infty} \frac{x^2}{(x^2+1)(x^2+4)}\,dx$. (6)

(c) Show that matrix $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$ is diagonalizable. Also find its diagonal and transforming matrix. (8)

Q.5 (a) Using Rayleigh-Ritz method find solution for the extremal of the functional $\int_0^1 (2xy + y^2 - (y')^2)\,dx$ given $y(0) = y(1) = 0$. (6)

(b) Find an orthonormal basis for the subspace of IR^3 using Gram-Schmidt process where $s = \{(1,0,0), (3,7,-2), (0,4,1)\}$ (6)

(c) Find the curve C of given length 'l' which encloses a maximum area. (8)

Q.6 (a) If $A = \begin{bmatrix} \pi & \frac{\pi}{4} \\ 0 & \frac{\pi}{2} \end{bmatrix}$ find $cos\ A$. (6)

(b) Check whether the set of all pairs of real numbers of the form $(1, x)$ with operations

$(1, a) + (1, b) = (1, a + b)$ and $k(1, a) = (1, ka)$ is a vector space , where k is real number. (6)

(c) Find the singular value decomposition of $A = \begin{bmatrix} 2 & 3 \\ 0 & 2 \end{bmatrix}$. (8)

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Time: 3 hours **Marks: 80**

N.B. (1) Question number 1 is compulsory.

(2) Attempt any 3 questions from remaining.

(3) Assume suitable data if required.

(4) Figure to the right indicates full marks.

Q1. Attempt any four . **[20]**

a) Explain open loop & closed loop control systems by giving suitable examples & also highlight their merits & demerits.

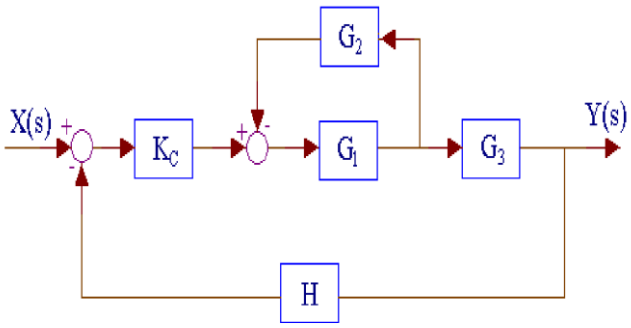
b) What are the properties of state transition matrix?

c) What is a compensator? Why is it required?

d) Explain Mason Gains' Formula with its need.

e) Explain the effect of addition of pole and zero to a system.

Q2. A) Find the transfer function C(s)/R(s) of the following system using block diagram technique. **[10]**



Q2. B) Consider Unity feedback control system with open loop transfer function given as **[10]**

$$G(s) = \frac{k(s+1)(s+2)}{(s+0.1)(s-1)}$$

Plot the Root Locus and find the gain at which system is critically damped.

Q3. A) Write a note on advances in control system. **[10]**

Q3. B) Obtain the state variable model of the transfer function – **[10]**

$$\frac{Y(s)}{R(s)} = \frac{s+3}{s^3+5s^2+8s+4}$$

Q4. A) Check controllability and observability for the system described by [**10**]

$$\dot{x} = \begin{vmatrix} 0 & 6 & -5 \\ 1 & 0 & 2 \\ 3 & 2 & 4 \end{vmatrix} x + \begin{vmatrix} 0 \\ 1 \\ 2 \end{vmatrix} u$$

$$Y = [1 \quad 2 \quad 3]\, x$$

Q4. B) Determine the stability of the system having characteristic equation [**10**]

$$S^5+s^4+2s^3+3s+5 = 0$$

Q5. A) Construct the Bode Plot for the following transfer function. Comment on stability. [**10**]

$$G(s) = \frac{K}{(s+3)(s+5)(s^2+2s+2)}$$

Q5. B) List the performance specifications of Time Response Analysis and derive any four of them. [**10**]

Q6. Write in short

A) Explain with example Adaptive Control System. [**20**]

B) Compare PI,PD, PID Controller.

C) Explain the stability of $s^5+2s^4+2s^3+4s^2+4s+8 = 0$ using Routh Method.

D) Draw polar plot for the transfer function given by

$$G(s) = \frac{1}{(1+s)(1+4s)}$$

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Q. P. Code: 38423

(3 Hours) Total Marks : 80

N.B.: (1) Question no. 1 is compulsory.
(2) Attempt any 3 questions from remaining Q. 2 to Q. 6.
(3) Use statistical tables wherever required.
(4) Figures to right indicate full marks.

Q1

a Find the coefficient of correlation from the following data: N=10 ,$\sum X$=225 5
$\sum Y$=189 , $\sum(X-22)^2$=85 $\sum(Y-19)^2$=25

b Evaluate $\int_c logzdz$ where c is IzI =1 5

c Find the projection of u=(3,1,3) along and perpendicular to v=(4,-2,2) 5

d Find an eigen values of(i) Adj(A) (ii) $24A^{-1}+2A-I$ Where A= $\begin{pmatrix}1&2&3&-2\\0&2&4&6\\0&0&4&-5\\0&0&0&6\end{pmatrix}$ 5

Q2

a Find the extremal of $\int_0^1(y^{"2}+x^2-y^2)dx$ 06

b Use Gram-Schmidt process to transform the basis {u_1 ,u_2 ,u_3} in to orthonormal bases where u_1 =(1 ,1 ,1) ,u_2 =(0,1,1),u_3=(0,0,1) 06

c Show that the matrix A=$\begin{bmatrix}-9&4&4\\-8&3&4\\-16&8&7\end{bmatrix}$ Also find diagonal and transforming matrix 08

Q3

a If X is a normal variable with mean 10 and standard deviation 4,Find 06
(i)P[$|X-4|$<1] (II)p [5<x<18] (iii)P[X<12]

b Seven dice are thrown 729 times .How many times do you expect at least four dice to show 3 or 5 06

c Using Rayleigh –Ritz method find solution for the extremal of the functional 08
$\int_0^1(2xy-y'^2-y^2)dx$ given y(0)=0 and y(1) =0

Q4

a For the 50 students in the class mean of X is 62.4 and 16Var(X) = 9 06
Var(Y).Regression line of X on Y is 3Y-5X +180=0 Find (i)Mean of Y (ii)Correlation r between X and Y (iii)Regression line of Y on X

b Evaluate $\int_c \frac{z+1}{(z^3-2z^2)}dz$ where c is (i) $|z|$=1 (ii)$|z-2-i|$=2 (ii) $|z-1-2i|$=2 06

c Check whether the set of all pairs of real number of the form (1,x) with operations 08
(1,y)+(1,x)=(1,y+x) and k(1,y)=(1,ky) is a vector Space

Q5

a Using Cauchy residue theorem evaluate $\int_0^\infty \frac{1}{(x^2+1)(x^2+9)}dx$ 06

b If A=$\begin{bmatrix}1&0&0\\1&0&1\\0&1&0\end{bmatrix}$ find A^{50} 06

c Find M.G.F. of Poisson distribution .Hence find it's mean and variance 08

Q6

a Is the matrix A derogatory? justify your answer where A= $\begin{bmatrix} -2 & 0 & 1 \\ 1 & 1 & 0 \\ 0 & 0 & -2 \end{bmatrix}$ 6

b A random variable X has the following p.d.f. 6

f(x) =kx^2e^{-x} for x >0 .and f(x)=0 otherwise .Find (i) k (ii) mean (iii) variance (iv)M.G.F. (v) c.d.f. of X (vi) P[0<X<1]

c Find all possible Laurent's series of f(z) =$\frac{z^2-1}{z^2+5z+6}$

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Q. P. Code : 40468

[Time: 3 hours] [Max Marks 80]

1) Question no. 1 is compulsory
2) Solve any three from the remaining five questions.
3) Assume suitable additional data if necessary.

Q1) Answer the following questions: (20)
a) Explain the feature of pipelining and queue in 8086 architecture.
b) Explain the significance of TEST*, RESET and MN/MX* signals in 8086 processor
(* indicates bar).
c) List the steps taken by 8086 processor in response to receiving an interrupt.
d) In 8086 bus cycle, explain the significance of ALE signal.
e) Explain the flag register for 8086 processor.

Q2)a) List and explain with examples addressing modes of 8086 processor. (10)
b) Explain with the help of neat diagram interfacing of 8086-8087 closely coupled configuration system. (10)

Q3)a) With the help of memory map interface the following to an 8086 based system operating in minimum mode: (14)

a) 32K bytes of EPROM memory using 8k byte devices.
b) 32K bytes of RAM memory using 8k byte devices.
c) One 16 - bit input and output port.

b) Explain the following 8086 instructions (ANY THREE)
a) CMPSB b) DIV AX c) LOOPE again d) REP SCASB e) XLATB (06)

Q4) a) Write a detailed note on the interrupt structure of 8086 processor. (10)
b) Explain the need for DMA and modes of DMA data transfer typically made use of by the DMA controller IC - 8237. (10)

Q5) a) b) Explain the Intel Pentium processor's pipelining and superscalar architecture. (10)
b) With the help of a neat flowchart/algorithm write a program in 8086 assembly to arrange a set of ten 8-bit numbers initialized in data segment in ascending order. (10)

Q6) Write short notes on: [ANY TWO]
a) Programmable interrupt controller – 8259. (10)
b) Intel Pentium processor – Branch Prediction Logic (10)
c) Programmable peripheral interface – 8255, need for and operation in Mode – 1. (10)

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

N.B: 1) Question no. 1 is compulsory.

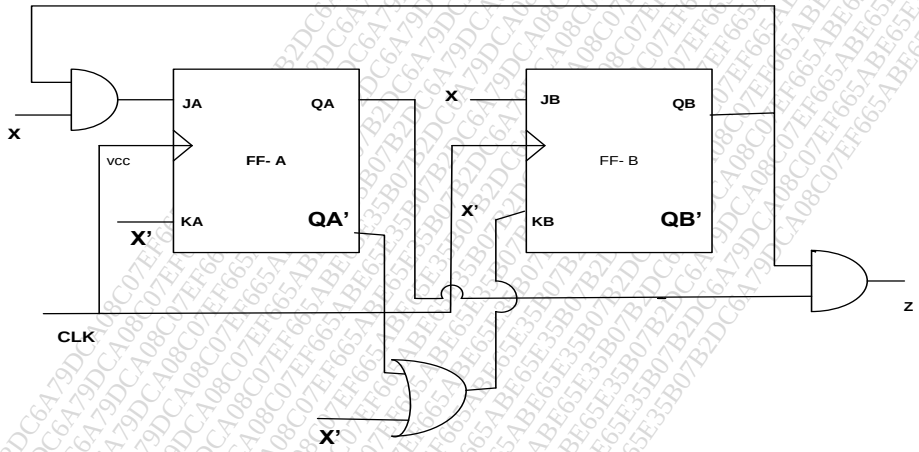
2) Attempt any three out of the remaining five questions

3) Use suitable data, wherever necessary.

Question 1: Attempt **any four** questions from the following. (20)

I. I) Differentiate between Mealy Machine and Moore Machine
II. Draw the Standard symbols for ASM Charts.
III. Compose VHDL code for Implementation of D Flip Flop
IV. Differentiate between signal and Variable.
V. Differentiate between IC 7490, IC 7492, IC 7493

Question 2 (A) Analyse the sequential circuit shown below. Derive the excitation equation, Transition table and state diagram. (10)



Question 2 b) Draw the data unit for the following RTL description (10)

Module; Data Mover
Memory: A [2]; B [2]; C [2].
Inputs: X [2].
Outputs: Z [2].

1. A ← X.
2. C ←$\bar{A}$.
3. B ← X [1], X [0].
4. C ← A V B.
5. Z = C.

End sequence.

Question 3(A) Shown below is the state table for sequential machine, using implication chart method, eliminate redundant states and obtain minimized state diagram. (10)

X1X2	00	Z	01	Z	10	Z	11	Z
A	D	0	D	0	F	0	A	0
B	C	1	D	0	E	1	F	0
C	C	1	D	0	E	1	A	0
D	D	0	B	0	A	0	F	0
E	C	1	F	0	E	1	A	0
F	D	0	D	0	A	0	F	0
G	G	0	G	0	A	0	A	0
H	B	1	D	0	E	1	A	0

Question 3(B): Construct ASM chart of sequence detector which detects the sequence 1001. The output Z becomes 1 along with the last correct bit of the sequence. (10)

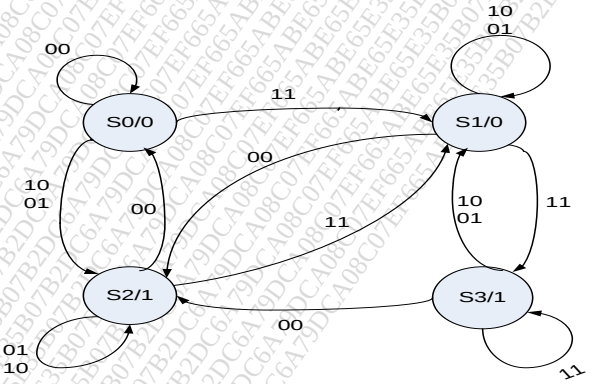
Question 4(A): Create VHDL code for Implementation of 4:1Multiplexer using two different architecture modelling styles.

Question 4(B): Design a MOD 61 up counter using IC 74163 and explain its working. (10)

Question 5(A): Design full subtractror using PLA. (10)

Question 5(B): Explain input-output block architecture for FPGA 4000 family. (10)

Question 6 (A): Write VHDL code for the state diagram given below. (10)



Qustion 6(b): Evaluate the value of output variable for following signal declarations. (10)

```
SIGNAL a: BIT: = '1';
SIGNAL b: BIT_VECTOR (3 DOWNTO 0):= "1100";
SIGNAL c: BIT_VECTOR (3 DOWNTO 0):= "0010";
X1 <= c & b;      ------  X1< =_____
X2 <= b XOR c;   ------  X2< =_____
X3 <= b sll 2;      ------  X3< =_____
X4 <= b rol 3;      ------  X4< =_____
X5 <= a AND NOT b (0) AND NOT c(1); ----X5<=_____
```

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Q.P. Code : 50770

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

Note : (i) Question 1 is compulsory and Solve any three from the remaining five questions
(ii) Assume suitable data if necessary.
(iii)Figures to the right indicate full marks

Q.1. Answer any **four questions** from the following: [20]

a Compare AM and FM..

b What is multiplexing? Compare TDM with FDM.

c Discuss the need for Pre emphasis and De emphasis circuits with waveforms.

d With a neat circuit diagram and waveforms , explain the working of envelope detector. What are its merits and demerits?

e Explain the working of TRF Receiver with a neat block diagram. What are its merits and demerits?

Q.2.a Explain the generation and detection of DSB-SC with neat diagrams [10]

b. Bring out the salient features of Vestigial Side Band system(VSB). [04]

c. A sinusoidal carrier has amplitude of 6v and frequency 20 KHz is amplitude [06]

modulated by a sinusoidal voltage of amplitude 3v and frequency 2 KHz. Modulated

voltage is developed across a 50Ω resistance. **i)** find the modulation index and Write the equation for modulated wave and d ii) calculate total power and sideband power in the modulated wave **iv)** Draw the two sided spectrum of modulated wave and find its BW.

Q.3.a With the help of a neat circuit diagram, explain the working of Ratio detector. Compare its features with that of Foster Seelay discriminator. [10]

b. Draw the functional block diagram of Super-heterodyne receiver with waveforms at the output of each block. Explain the functions of each block. [10]

Q.4.a With a neat block diagram ,discuss the working of Linear Delta modulation , Bring out its advantages and disadvantages [10]

b. State and Prove Sampling theorem for low pass signals. Draw the spectrum of sampled signal for fs > 2W , fs < 2W, fs = 2W. What is Aliasing error? How can you overcome it? [10]

Q.5.a. Explain the terms with reference to Radio receivers: Selectivity, Sensitivity, Fidelity and Double spotting, AGC [10]

b. Discuss the generation and demodulation of PPM signal. For a sinusoidal modulating signal, draw PPM, and PWM pulses. [10]

Q.6 **Write short notes on any four:** [20]

a) Indirect method of FM wave generation
b) PCM Transmitter and receiver
c) Noise triangle
d) Product demodulator of SSB-SC
e) Companding

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

NB: 1. Question number 1 is compulsory
2. attempt any 3 questions from the remaining five questions
3. Assume suitable data wherever needed

Q.1 **Attempt any 5 questions** 20

a) Why do we modulate a signal for transmission? Explain.

b) A single tone FM signal is given by
$e_{FM}(t) = 20 \cos(16\pi 10^6 t + 25 \sin 2\pi 10^3 t)$.
find the modulation index, modulating frequency , deviation , carrier frequency and power in the FM signal

c) Compare Amplitude Modulation and Frequency Modulation in terms of
i) bandwidth, ii) signal quality, iii) effect of noise on the signal and iv) range

d) Draw a well labeled diagram of a super-heterodyne receiver.

e) Explain Shannon's Sampling theorem and explain aliasing error.

f) Compare TDM and FDM.

Q.2 a) An AM signal is produced by modulating a carrier signal with peak voltage of 10V and frequency of 100KHz by an information signal with max. modulating frequency of 5KHz and max amplitude 4V. Determine: 10

a) Frequency limits for lower and upper sideband
b) Bandwidth of AM
c) Total power of the modulated wave if the load resistance, $R_L = 10\ \Omega$
d) Draw the power spectrum.
e) Calculate the total transmitted current.

b) What are the methods employed for generation of SSB? Explain the third method of SSB generation with its advantages and disadvantages. (10)

Q.3 a) Explain the indirect method of FM generation. (8)

b) What is image frequency and its rejection? Also explain double spotting. (6)

c) In a Super heterodyne receiver having no RF amplifier , the loaded Q of the antenna coupling circuit is 80. If the IF is 455Khz, calculate the image frequency and its rejection ratio for tuning at (i) 100 kHZ (ii) 20 MHz. (6)

Q.4 a) What is multiplexing in communication system? Draw a block diagram of frequency division multiplexing to transmit 5 SSB signals. (6)

b) Draw and explain the transmitter and receiver of Delta modulation. What is meant by slope overload distortion? (10)

c) Bring out the merits and demerits of adaptive Delta modulation (4)

Q.5. a) With the help of a neat block diagram explain the generation and detection of a PPM signal. Also explain the merits and demerits of a PPM transmission. (8)

b) Explain the terms :Selectivity , Fidelity , Sensitivity , AGC (8)

c) Explain companding (4)

Q.6 **Write short notes : any four** (20)

a) Block diagram of PCM Transmitter and receiver
b) T1 digital carrier system
c) TRF receiver , its merits and demerits
d) Foster Seelay discriminator method
e) Pre-emphasis and deemphasis circuits

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