Q. P. Code: 36987

(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 the **right** indicate **full** marks.

(4)Assume suitable data if necessary.

1. (a) Find the extremal of $\int_0^1 (xy + y^2 - 2y^2y')dx$. **(5)**

(b) State Cauchy-Schwartz inequality in R^3 and verify it for $u = (-4, 2, 1)$ and $v = (8, -4, -2)$. **(5)**

(c) If $\lambda_1, \lambda_2, \lambda_3, \ldots\ldots \lambda_n$ are eigen values of A, then show that $\frac{1}{\lambda_1}, \frac{1}{\lambda_2}, \frac{1}{\lambda_3}, \ldots\ldots \frac{1}{\lambda_n}$ are the eigenvalues of A^{-1}. **(5)**

(d) A random variable X has the following probability mass distribution;

X:	0	1	2
$P(X=x)$:	$3c^3$	$4c-10c^2$	$5c-1$

, Find c and determine $P(X<1)$. **(5)**

2. (a) Evaluate $\int_0^{1+i} z^2\,dz$, along (i) the line $y = x$, (ii) the parabola $x = y^2$, Is the line integral independent of the path ? Explain. **(6)**

(b) A random variable X has the following density function

$$f(x) = \begin{cases} 2e^{-2x}, & x > 0 \\ 0, & x \le 0 \end{cases}$$

, Find the m.g.f. and hence, its mean and variance. **(6)**

(c) Calculate R (Spearman's rank correlation) and r (karl-pearson's)from the following data:

X:	12	17	22	27	32
Y:	113	119	117	115	121

, Interpret your result. **(8)**

3. (a) Let $V = R^3$, Show that W is a subspace of R^3, where $W = \{(a,b,c): a + b + c = 0\}$, that is W consists of all vectors where the sum of their components is zero. **(6)**

(b) Evaluate $\int_C \frac{e^{2z}}{(z+1)^4} dz$ where C is the circle $|z-1| = 3$. **(6)**

(c) Show that the matrix A is diagonalizable. Also find the transforming matrix and the diagonal matrix where $A = \begin{bmatrix} 4 & 1 & -1 \\ 2 & 5 & -2 \\ 1 & 1 & 2 \end{bmatrix}$. **(8)**

4.(a) Find the extremals of $\int_{x_0}^{x_1}\left(2xy+y'^2\right)dx$. **(6)**

(b) A transmission channel has a per-digit error probability $p=0.01$. Calculate the probability of more than 1 error in 10 received digits using (i) Binomial and (ii) Poisson distribution. **(6)**

(c) Obtain Taylor's series and two distinct Laurent's series expansion of

$f(z)=\dfrac{z-1}{z^2-2z-3}$, indicating the region of convergence. **(8)**

5.(a) Verify the Cayley-Hamilton Theorem for matrix A and hence find A^{-1} if it exists.

where $A=\begin{bmatrix}0 & c & -b\\ -c & 0 & a\\ b & -a & 0\end{bmatrix}$ **(6)**

(b) Let R^3 have the Euclidean inner product. Use Gram-Schmidt process to transform the basis $\{u_1,u_2,u_3\}$ in to an orthonormal basis where $u_1=(1,1,1), u_2=(-1,1,0), u_3=(1,2,1)$ **(6)**

(c) The marks obtained by 1000 students in an examination are found to be normally distributed with mean 70 and standard deviation 5. Estimate the number of students whose marks will be (i) between 60 and 75 (ii) more than 75. **(8)**

6. (a) Using Rayleigh-Ritz method, solve the boundary value problem using a two degree polynomial as initial solution.

$I=\int_0^1\left(2xy+y^2-y'^2\right)dx;\ 0\le X\le 1$, given $y(0)=y(1)=0$. **(6)**

(b) Show that $A=\begin{bmatrix}4 & -2 & 2\\ 6 & -3 & 4\\ 3 & -2 & 3\end{bmatrix}$. is derogatory and find its minimal polynomial. **(6)**

(c) Using Cauchy residue theorem, evaluate the following integrals:

(i) $\int_0^{2\pi}\dfrac{d\theta}{5+3\sin\theta}$ **(4)**

(ii) $\int_{-\infty}^{\infty}\dfrac{x^2}{(x^2+a^2)(x^2+b^2)}dx, a>0, b>0.$ **(4)**

SE/Sem-IV (Choice based)/EXTC/EDC-II/M-18

Q.P. Code: 40107

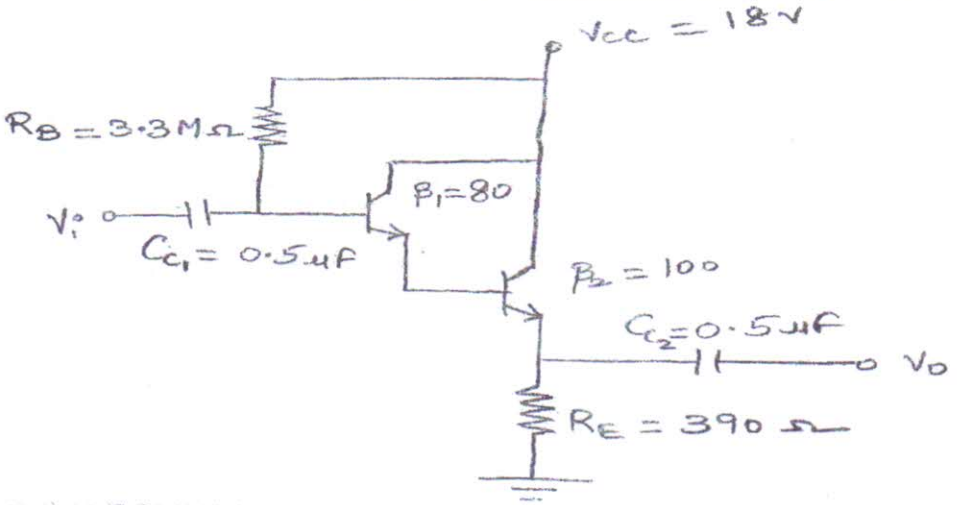
(3 Hours) [Total Marks: 80]

N.B. (1) Question **No. 1** is **compulsory.**
(2) Solve any **three** questions from remaining **five** questions.
(3) **Figures** to the right indicate **full marks.**
(4) Assume suitable data if necessary and mention the same in answer sheet.

1. Attempt any **Four** of the following: **20**

(a) Draw a neat labelled diagram of Depletion Type MOSFET and explain its operation.

(b) Find the value of I_E and V_{CE} for the given Darlington configuration:



Given: $\beta_1 = 80$, $\beta_2 = 100$, $V_{BE} = 1.6V$.

(c) Differentiate Small Signal Amplifier and Large Signal Amplifier.

(d) State Barkhausen's Criteria and explain basic principle of an Oscillator.

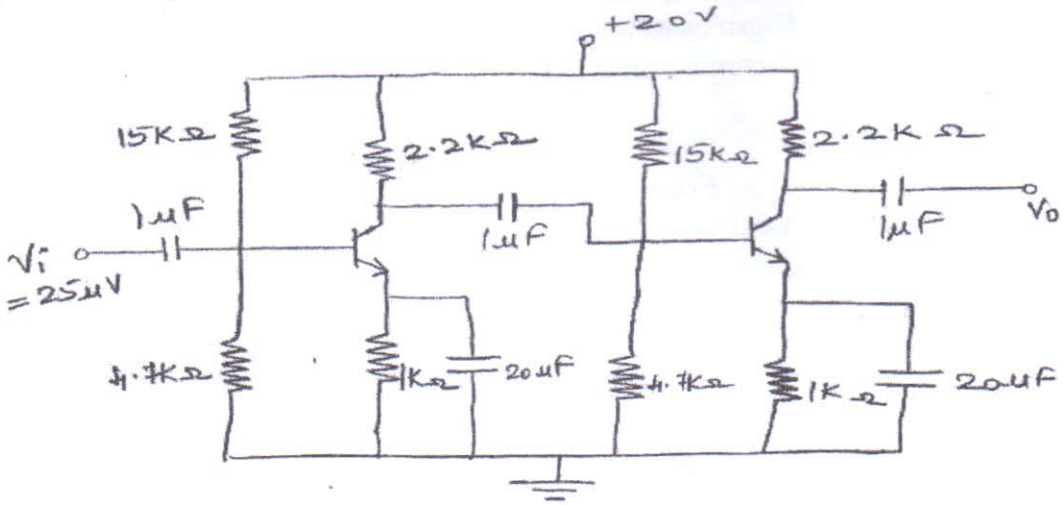
(e) Give the advantages of negative feedback.

2. (a) Design a two stage RC coupled CS Amplifier to meet following specifications: $A_v \geq 100$, $V_o = 4V$, $I_{DQ} = 1.2$ mA, $f_L = 20$ Hz. **15**

Assume: $g_{mo} = 5m\mho$, $I_{DSS} = 7mA$, $r_d = 50k\Omega$, $V_P = -4V$. Assume suitable V_{DD}.

(b) Compare RC Coupled, Direct Coupled and Transformer Coupled Amplifiers. **05**

3. (a) Determine input impedance, output impedance, voltage gain and current gain for the given cascaded BJT amplifier as shown in the figure below: 10



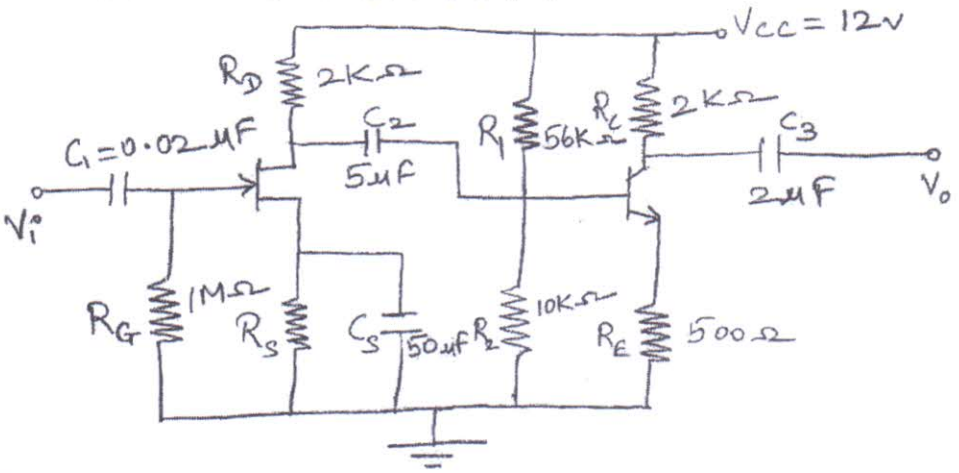
Given: $h_{fe} = 200$ and $h_{ie} = 1.3k\Omega$.

(b) Find the necessary condition for oscillations to occur and frequency of oscillations of Hartley Oscillator. Also, explain its working. 10

4. (a) With the help of neat block diagram, derive expression for R_{IF}, R_{OF}, G_{mF} for Current Series Negative Feedback Amplifier. Give significance of the above mentioned parameters. 08

(b) For the circuit shown below, determine the following: 12

i. R_S
ii. Q-point of each stage.
iii. AC equivalent model.
iv. Lower Cut-off Frequecny (f_L).



Given: $V_{GS} = -1V$, $I_{DSS} = 8mA$, $V_P = -4V$ for JFET and $h_{ie} = 1k\Omega$, $h_{fe} = 100$, $V_{BE} = 0.6V$ for BJT.

sem-IV (choice based) / ETRX / Linear control System / M-18

Q. P. Code: 21731

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.

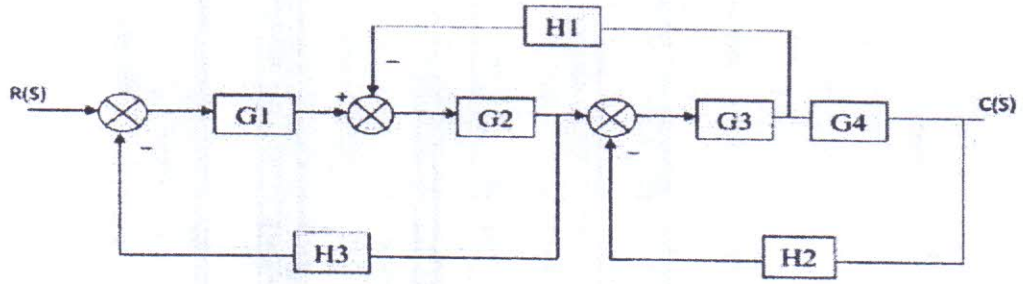
(b) Explain any five rules of Root Locus Plot in detail.

(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.

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6| Sem-IV (Choice Based) | EXTC | Signals & Systems | M-18

Q.P. Code: 40395

[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 five questions.
3. Assume suitable data if necessary and state it clearly.
4. Figures to right indicate full marks.

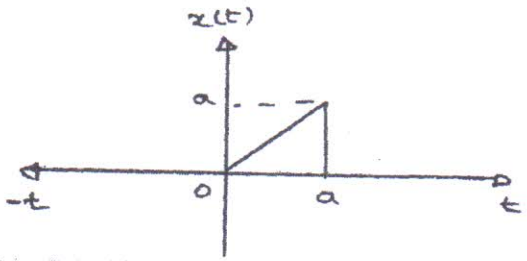
1. Answer **any four** questions from given questions. 20

(a) Explain any five types of elementary signals with mathematical equations and graphical plot.

(b) Find the fundamental period of the signal $x(t)=\sin\left(\frac{2\pi t}{6}\right)-\cos \pi t$

(c) Explain the application of Signals and System in Multimedia Processing.

(d) Find x(-2t) and x(3t + 2)



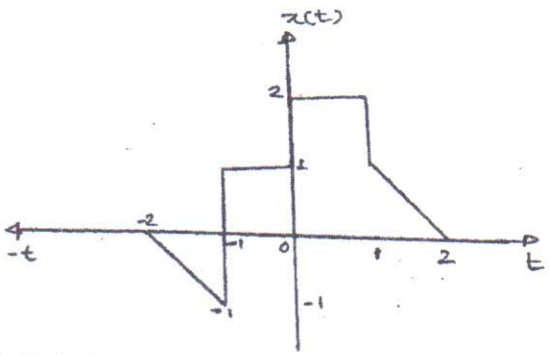
(e) Test the given system for linearity, causality, stability, memory and time variant.

$$y=x(t^2)$$

(f) If system matrix find the sate transition matrix. $A=\begin{bmatrix}-3 & 1\\ -2 & 0\end{bmatrix}$

2. (a) Sketch the following signals for the given signal shown. 10

a) x(-t) b) x(2t + 5) c) x(2t) d) x(t/2) e) -2x(t)



S.E. (E) Sem IV Choice Base May 2018
Prin. of Comm. Engg.

Q.P. Code : 50776

(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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