SE, Elect. & Telecomm, Sem.-IV, Choicebase, FH2018 04/06/1[illegible]

Principles of Comm. Engg.

NEW

Q.P.Code: 39180

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

NB:

1. Q. 1 is compulsory
2. Attempt any three questions out of remaining five.
3. Figure to the right indicate full marks.
4. Assume suitable data if required and mention the same in solution.

Q.1 Solve the following 20

a) Distinguish between narrowband and wideband FM.
b) What is companding?
c) Why AGC is required in radio receivers?
d) Explain aliasing error and aperture effect.
e) Explain various types of noise affecting communication system.

Q.2a) What are the drawbacks of delta modulation? Explain adaptive delta modulation in detail. 10

b) What is signal multiplexing? Explain TDM and FDM in detail. 10

Q.3 a) State and prove sampling theorem for low pass bandlimited signals. 10

b) Explain practical diode detector with suitable diagram. 10

Q.4 a) What are different methods of FM generation? Explain reactance modulator in detail. 10

b) Explain how PPM is generated from PWM 10

Q.5 a) Explain superheterodyne receiver 10

b) Explain VSB transmission 10

Q.6 Write note on (any four) 20

1. Quadrature amplitude modulation
2. Amplitude limiting and thresholding
3. Double spotting
4. Low level and high level modulation
5. PCM and DPCM

BE, sem.-IV, Elect. & Telecomm, Choice base, FH2018

11/05/18

Am-IV

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 $\int_0^1 \left(xy+y^2-2y^2y'\right)dx$. **(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 $\lambda_1,\lambda_2,\lambda_3,......\lambda_n$ are eigen values of A, then show that $\frac{1}{\lambda_1},\frac{1}{\lambda_2},\frac{1}{\lambda_3},........\frac{1}{\lambda_n}$ 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 $\oint_C \frac{e^{2z}}{(z+1)^4}dz$ 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 | 17/05/18

Q.P. Code: 40107

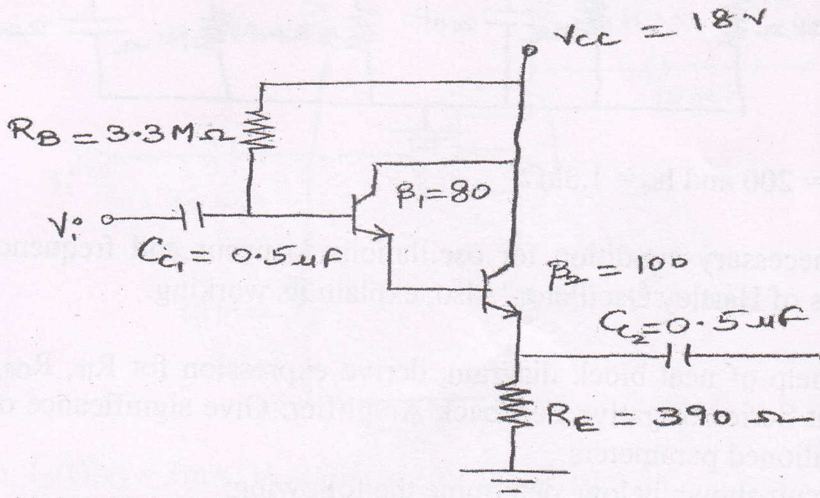
(3 Hours) **[Total Marks: 80]** EXTRA

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.

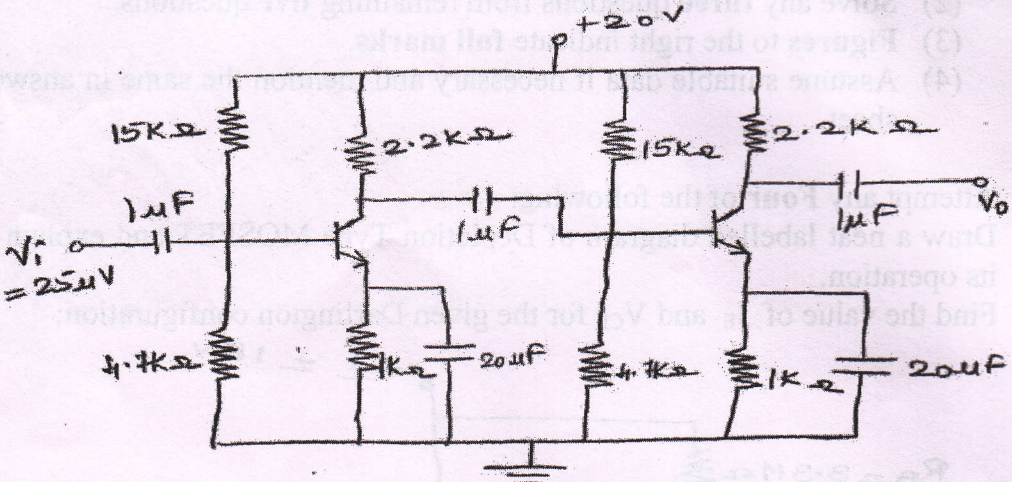
(e) Give the advantages of negative feedback.

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℧, I_{DSS}=7mA, r_d= 50kΩ, 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**



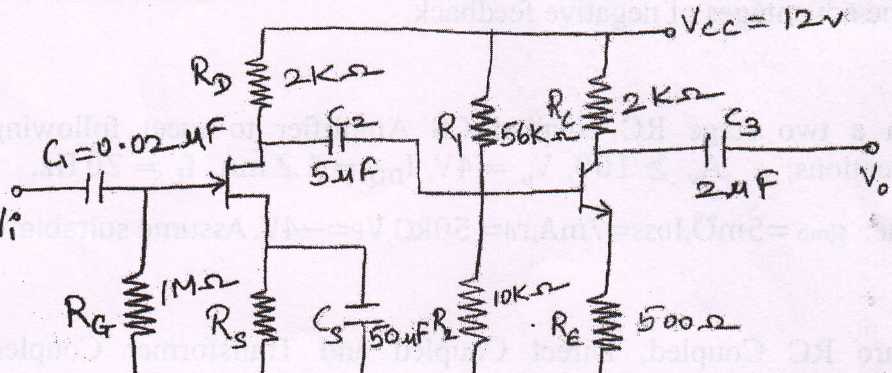
Given: h_{fe} = 200 and h_{ie} = 1.3kΩ.

(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).

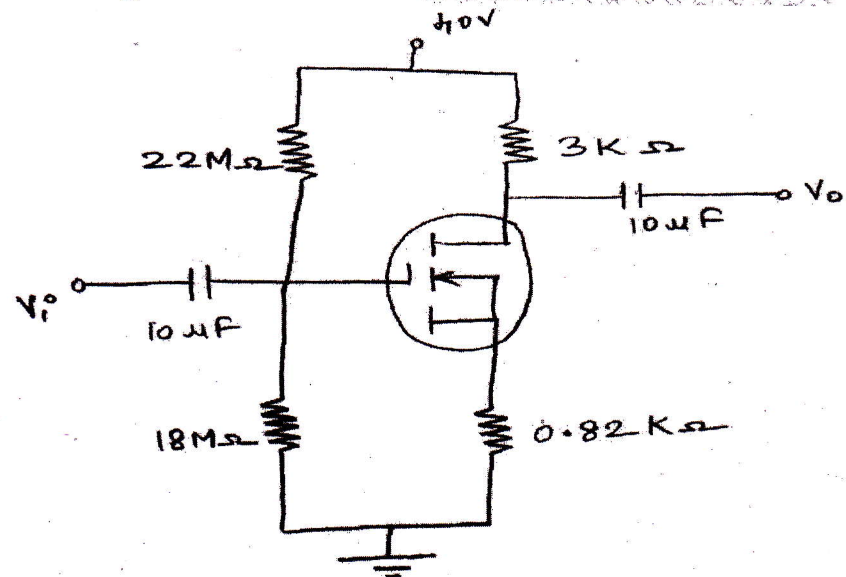


Given: V_{GS} = -1V, I_{DSS} = 8mA, V_P = -4V for JFET and h_{ie} = 1kΩ, h_{fe} = 100, V_{BE} = 0.6V for BJT.

5. (a) Design an RC phase shift Oscillator to generate 5kHz sine wave with 20V peak to peak amplitude. Assume $h_{fe} = 150$ and $h_{ie} = 1k\Omega$. **10**

(b) Draw circuit diagram of Class B Push Pull Power amplifier and explain its working. Find its maximum efficiency and maximum power dissipation in each transistor. What is cross-over distortion? How it can be overcome? **10**

6. (a) Determine I_{DQ} and V_{DSQ} for the given network of Enhancement type MOSFET arrangement. **05**



Given: $I_D(ON) = 3mA$, $V_{GS}(ON) = 10V$, $V_{GS}(Th) = 5V$.

(b) In Colpitts Oscillator, $C_1 = 0.2\mu F$, $C_2 = 0.02\mu F$. If the frequency of oscillator is 10 kHz, find the value of inductor. Also, find the required gain for oscillation. **05**

(c) Write a Short Note on: Cascode Amplifier. **10**

SE | IV | choiceband | EXTC | 23/05/18 | LIC

Sub:- Linear Integrated Circuits

Q. P. Code: 21793

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

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

Q.1 Attempt any 4 questions:

(a) How precision rectifiers are different than simple diode rectifiers? [05]

(b) Compare ideal op-amp with practical op-amp. [05]

(c) Find v_N, v_P, and v_O in the circuit of Fig. 1(c) if v_S is 9 V. [05]

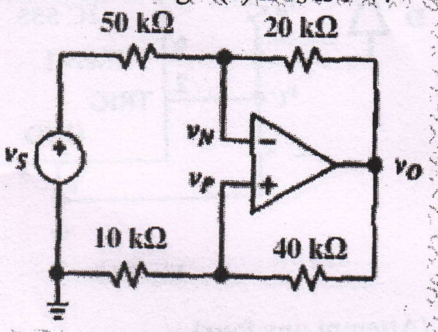


Fig. 1(c)

(d) Design a circuit for $V_O = 2V_1 - 3V_2$ using single op-amp and few resistors. [05]

(e) Explain how a resistor can be simulated by a switch capacitor circuit. [05]

Q.2 (a) Design a voltage regulator using IC 723 to give V_o = 4 V to 32 V and output current of 2 A. [10]

(b) Explain *R*-2*R* ladder type digital to analog convertor. [10]

Q.3 (a) Explain analog to digital conversion using successive approximation method. [10]

(b) Draw a neat circuit diagram of a *RC* phase shift oscillator using op-amp. Derive its frequency of oscillation. What are the values of *R* and *C* for frequency of oscillation to be 1 kHz? [10]

Q.4 (a) What is an instrumentation amplifier? Draw a neat circuit of an instrumentation amplifier using 3 op-amps. Derive its output voltage equation. [10]

(b) With the help of a neat diagram and voltage transfer characteristics explain the working of an inverting Schmitt trigger. Derive the expressions for its threshold levels. [10]

Q.5 (a) Draw the circuit diagram of a square and triangular waveform generator using op-amp and explain its working with the help of waveforms. [10]

(b) Analyze the circuit given in Fig. 5(b). Draw the waveforms at output terminal v_O and across the capacitor C. Comment on the duty cycle of output waveform. Take diode D as an ideal diode and assume R_A is equal to R_B. [10]

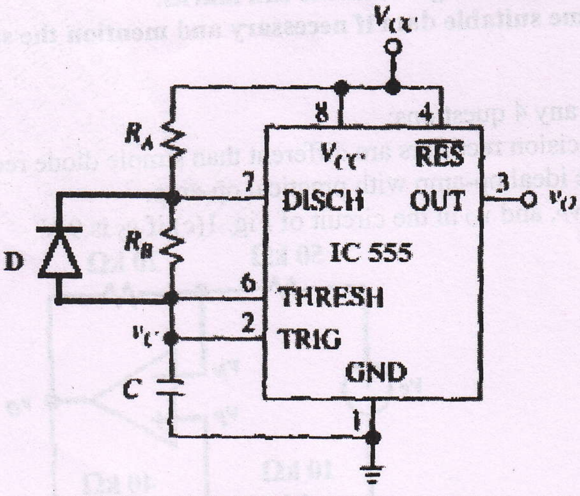


Fig. 5(b)

Q.6 Short notes on: **(Attempt any four)**

(a) Sample and hold circuit. [05]
(b) Three terminal fixed voltage regulator. [05]
(c) Monolithic switching regulator. [05]
(d) XR2206 waveform generator. [05]
(e) Wilson current source. [05]

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| SE | IV | Choice Based | EXTC | SS | 29/05/18
Sub:- Signals & Systems

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.

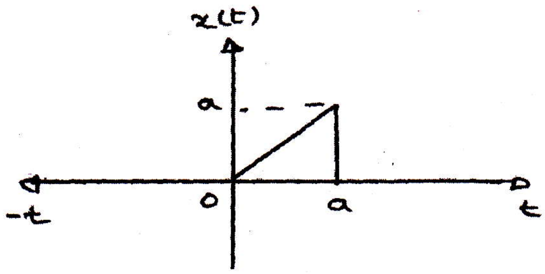
1. Answer **any four** questions from given questions. **20**

(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)



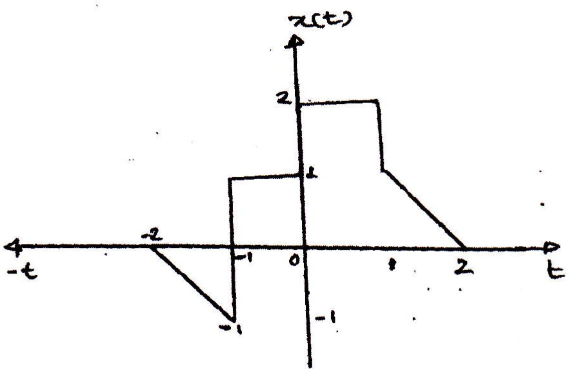
(e) Test the given system for linearity, causality, stability, memory and time variant.

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

(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)



Turn Over

(b) Using unilateral Laplace transform find the output of the system given by: where and **10**

$$\frac{d^3y}{dt^3}+6\frac{d^2y}{dt^2}+11\frac{dy}{dt}+6y(t)=x(t) \text{ where } x(t)=e^{-4t}u(t) \ \& \ y(0^-)=1, \left.\frac{dy}{dt}\right|_{t=0^-}=1 \left.\frac{d^2y}{dt^2}\right|_{t=0^-}=1$$

3. (a) Find inverse Z-Transform of X(z), $X(z)=\dfrac{1+2z^{-1}+z^{-2}}{1-\frac{3}{2}z^{-1}+\frac{1}{2}z^{-2}}$ **10**

(b) Given DT sequence: **10**

$$x(n)=0.4\delta(n+2)+0.2\delta(n+1)+0.1\delta(n)+0.2\delta(n-1)+0.4\delta(n-2)$$

Determine the following:

i. Xe^{jw}
ii. $|Xe^{jw}|$
iii. Phase $\{X(e^{jw})\}$
iv. $_0\int^{2\pi}|X(e^{jw})|^2\,dw$

4. (a) Determine the state model of the governed by the equation. **10**

$$y[n]=-2y[n-1]+3y[n-2]+0.5y[n-3]+2x[n]+1.5x[n]+1.5x[n-1]+2.5x[n-2]+4x[n-3]$$

(b) Find the Fourier transform of **10**

$$x(t)=\begin{cases}\cos\pi t & -\frac{1}{2}\le t\le \frac{1}{2}\\ 0 & otherwise\end{cases}$$

i. From the definition of Fourier transform
ii. Using the convolution theorem of Fourier transform

5. (a) Determine DTFS for the sequence $x(n)=\cos^2((\pi/8)n)$ **08**

(b)
i. Find Laplace transform of $\frac{d}{dt}\sin t\, u(t)$ **04**
ii. Find the Z Transform of signal $\cos(\omega_0 n)\, u[n]$ **04**

(c) Find the canonic (direct form II) realization of $H(z)=\dfrac{1-\frac{7}{4}z^{-1}-\frac{1}{2}z^{-2}}{1+\frac{1}{4}z^{-1}-\frac{1}{8}z^{-2}}$ **04**

6. (a) Find the autocorrelation function $R_{xx}(\tau)$ of sine wave signal. **08**
(b) Explain the concept ROC in Z-Transform and Laplace Transform. **06**
(c) Discuss applications of Signals in Control System. **06**
