SE (Sem IV) ExTC NN-Dec 2013 4-12 13
Electromagnetic wave theory

25-10-13-DTP6-AK-17

Con. 5845-13 **LJ-10651**

(3 Hours) **[Total Marks : 100**

N.B. : (1) **Question** No. **1** is **compulsory**.
(2) Attempt any **four** from remainig **six** questions.
(3) **Figures** to the right **indicate** full marks.
(4) Use suitable data whenever required.

1. (a) State and prove Gauss Law. **5**
(b) What do you mean by method of images ? **5**
(c) Explain polarization for electromagnetic wave. **5**
(d) Define and explain vector Magnetic Potential. **5**

2. (a) Find out capacitance of spherical capacitor form by two concentric sphere of radius 'a'and 'b'where a < b. **10**
(b) Derive the expression for electric field intensity due to intinite surface charge. **10**

3. (a) Circular loop conductor carrying current of 1 Amp. is placed in X-Y plane centered at origin. Find expression for magnetic field intensity at any point on Z-axis. **10**

(b) Four like charges of 40 μ c each are placed at four corners of a square. The square diagonal is 12 meters. Find force on 200 μ c charge located 5 meters above the center of a square. **10**

4. (a) Define Poynting Vector and explain each term in its integal form. **10**
(b) Write Ditterential form of Maxwell equation and explain the same. **10**

5. (a) Derive the wave equation for uniform plane wave in free space. **10**
(b) Derive Laplace and Poisson's Equation. **10**

(a) State and explain Uniqueness Theorem. **10**
(b) State and explain Stroke's Theorem and Biot-Servert's Law. **10**

7. (a) Derive Boundary conditions for Electrostatic and Magneto statics. **10**
(b) Describe Reflection of Uniform Plane Wave. **10**

S.E (EXTC) (Sem-IV) (Rev.) Exam.
5/12/13 Nov-Dec., 2013
EDC-II

20 : 2nd half.13-Avi(aq)

Con. 7940-13. **LJ-10537**

(3 Hours) **[Total Marks : 100**

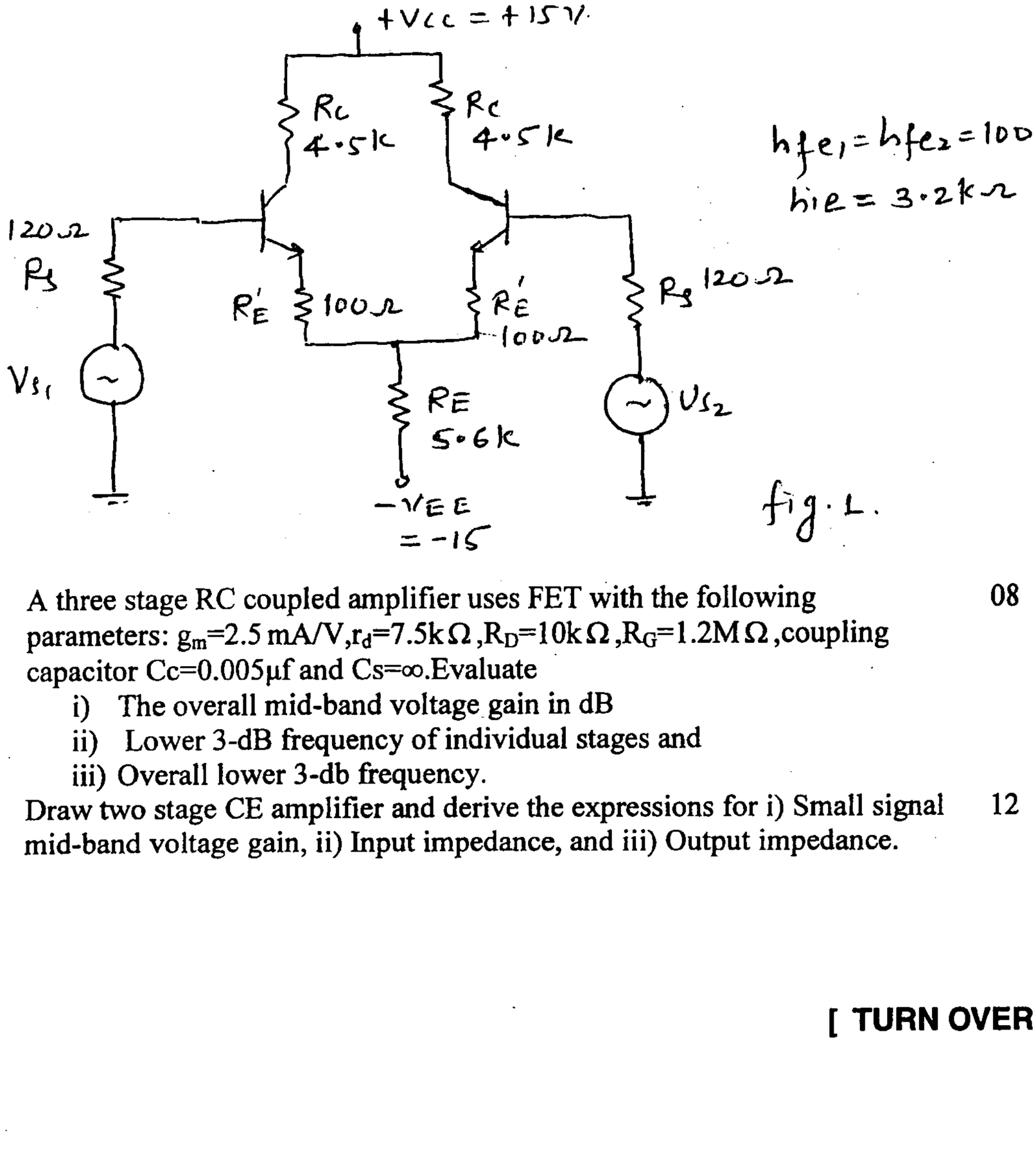
N.B. : (1) Question No. **1** and **2** is **compulsory**.
(2) Answer any **three** from **remaining** questions.
(3) **Figures** to the **right** indicate **full** marks.
(4) Assume suitable **data** if **required**.

Q1. a Design two stage R-C coupled amplifier using BC-547B transistor for the following parameters: $Av \geq 600$, $V_{CC}=12V$, $S_{ICO} \leq 10$, llower cutoff frequency $F_l=10Hz$. 15

b For the above designed amplifier determine; Av, V_{Omax}, Rin, and Ro . 05

Q2. a Design large signal transformer coupled class A power amplifier to provide 6w output power to the 4 ohms load. 10

b For the differential amplifier shown in fig.1 determine: 10
i) D C bias conditions,
ii) Differential mode gain Ad ,
iii) Common mode gain AC, and
iv) Differential mode input impedance and output impedance.



$h_{fe_1} = h_{fe_2} = 100$
$h_{ie} = 3 \cdot 2k\Omega$

fig. 1.

Q3. a A three stage RC coupled amplifier uses FET with the following parameters: $g_m=2.5\,mA/V$, $r_d=7.5k\Omega$, $R_D=10k\Omega$, $R_G=1.2M\Omega$, coupling capacitor $Cc=0.005\mu f$ and $Cs=\infty$. Evaluate 08
i) The overall mid-band voltage gain in dB
ii) Lower 3-dB frequency of individual stages and
iii) Overall lower 3-db frequency.

b Draw two stage CE amplifier and derive the expressions for i) Small signal mid-band voltage gain, ii) Input impedance, and iii) Output impedance. 12

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Con. 7940-LJ–10537 -13. 2

Q4. a For the feedback amplifier shown in fig. 2, (i) Identify the type of feedback and (ii) Derive the expression **for** A_{VF}, R_{IF}, **and** R_{OF} using negative feedback approach. 12

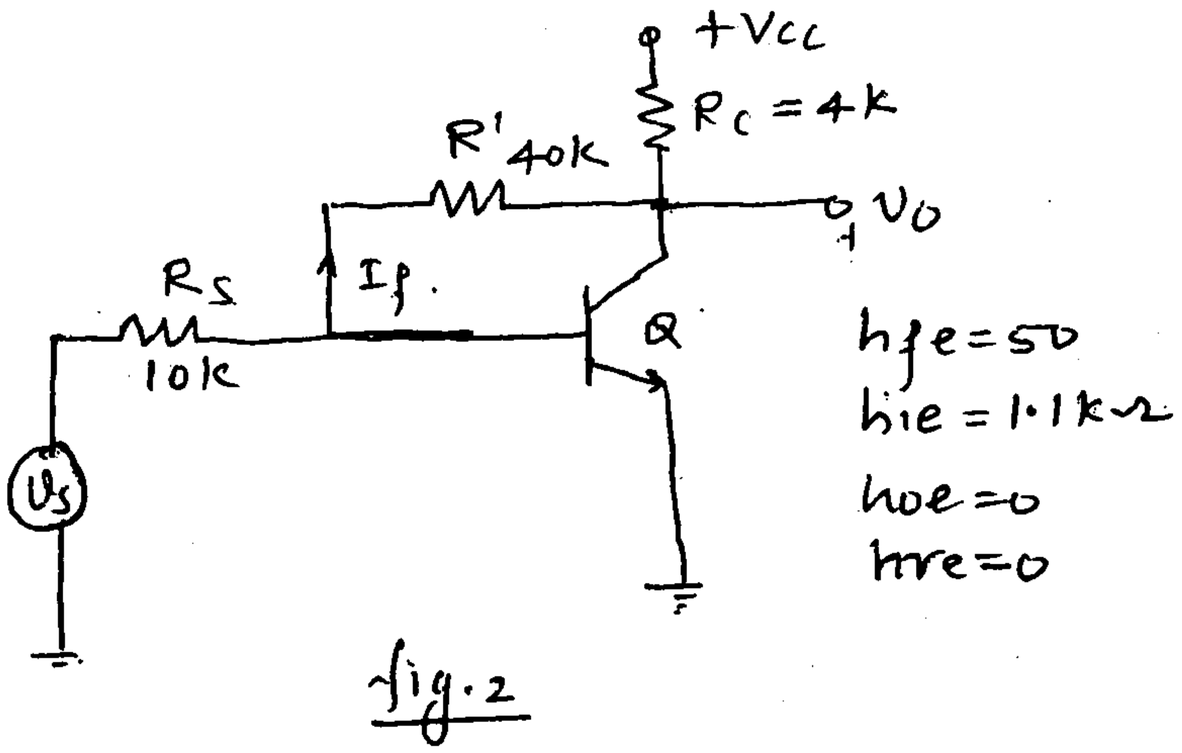

fig.2

b Explain the working principle of a Wein bridge oscillator. Derive the expression for the frequency of oscillation and the value of gain required for sustained oscillation. 08

Q5 a Enumerates the effects of negative feedback on i) gain, ii) frequency response,iii) Distortion,iv) Noise and v) Input and output impedance. 08

Q5 b For the amplifier shown in fig.3 determine V_{B1} ,V_{B2}, I_{CQ} ,Av, Ri and Ro. 12

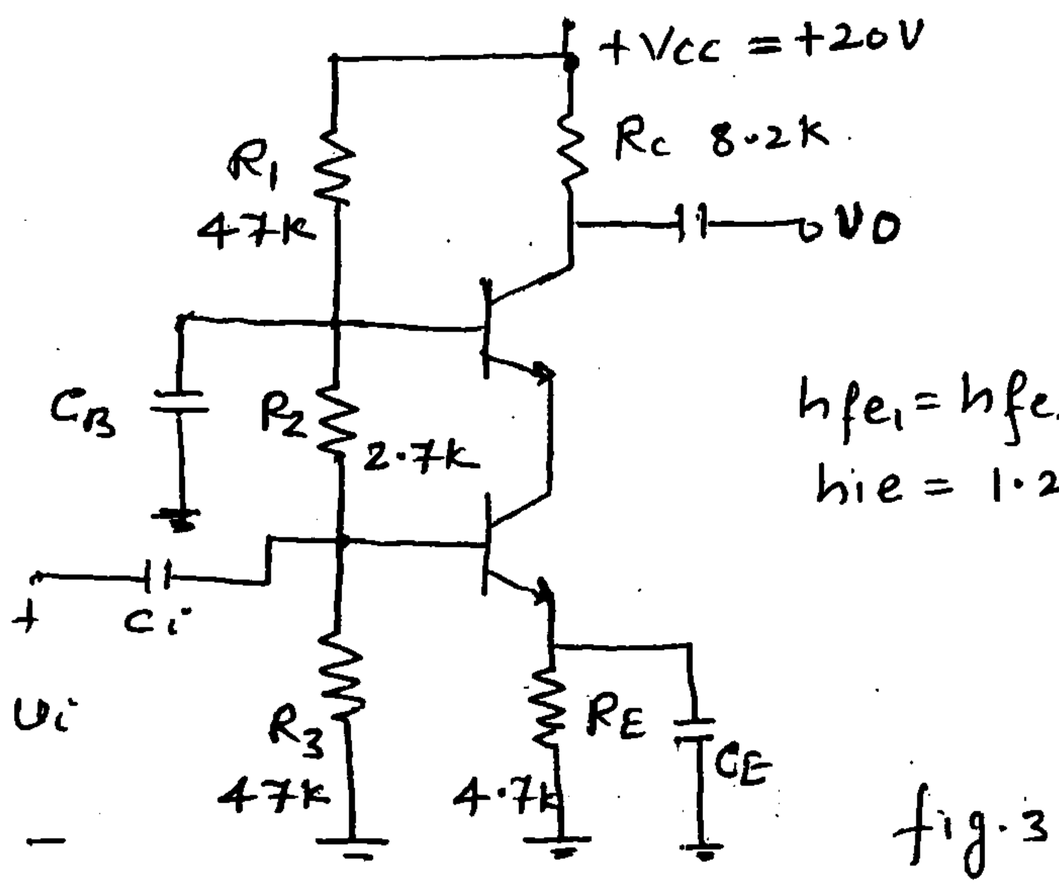

fig.3

Q6 a Draw the circuit diagram for class B push-pull power amplifier and derive the expression for conversion efficiency. 10

b With neat sketch, explain the working of an emitter coupled astable multivibrator. State the advantages of emitter coupled astable multivibrator. 10

Q7 Write a short note on following. 20

a Colpitt's oscilator.

b Frequency response of R-C, Direct coupled and transformer coupled amplifier

c Crossover Distortion in power amplifier.

d Class C power amplifier.

Transistor type	Pdmax @ 25°C Watts	Icmax @ 25°C Amps	$V_{CE}^{(sat)}$ volts d.c.	V_{CBO} volts d.c.	V_{CEO} (Sus) volts d.c.	V_{CEX} (Sus) volts d.c.	V_{CBX} volts d.c.	V_{EBO} volts d.c.	T_j max °C	D.C. current gain min	typ.	max.	Small · Signal min.	typ.	h_{fe} max.	V_{BE} max.	θ_{j-a} °C/W	Derate above 25°C W/°C
2N 3055	115·5	15·0	1·1	100	60	70	90	7	200	20	50	70	15	50	120	1·8	1·5	0·7
ECN 055	50·0	5·0	1·0	60	50	55	60	5	200	25	50	100	25	75	125	1·5	3·5	0·4
ECN 149	30·0	4·0	1·0	50	40	—	—	8	150	30	50	110	33	60	115	1·2	4·0	0·3
ECN 100	5·0	0·7	0·6	70	60	65	—	6	200	50	90	280	50	90	280	0·9	35	0·05
BC147A	0·25	0·1	0·25	50	45	50	—	6	125	115	180	220	125	220	260	0·9	—	—
2N 525(PNP)	0·225	0·5	0·25	85	30	—	—	—	100	35	—	65	—	45	—	—	—	—
BC147B	0·25	0·1	0·25	50	45	50	—	6	125	200	290	450	240	330	500	0·9	—	—

Transistor type	hie	hoe	hre	θja
BC 147A	2·7 K Ω	18μ ℧	1·5 × 10^{-4}	0·4°C/mw
2N 525 (PNP)	1·4 K Ω	25μ ℧	3·2 × 10^{-4}	—
BC 147B	4·5 K Ω	30μ ℧	2 × 10^{-4}	0·4°C/mw
ECN 100	500 Ω	—	—	—
ECN 149	250 Ω	—	—	—
ECN 055	100 Ω	—	—	—
2N 3055	25 Ω	—	—	—

BFW 11—JFET MUTUAL CHARACTERISTICS

−Vds volts	0·0	0·2	0·4	0·6	0·8	1·0	1·2	1·6	2·0	2·4	2·5	3·0	3·5	4·0
Ids max. mA	10	9·0	8·3	7·6	6·8	6·1	5·4	4·2	3·1	2·2	2·0	1·1	0·5	0·0
Ids typ. mA	7·0	6·0	5·4	4·6	4·0	3·3	2·7	1·7	0·8	0·2	0·0	0·0	0·0	0·0
Ids min. mA	4·0	3·0	2·2	1·6	1·0	0·5	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0

N-Channel *JFET*

Type	V_{os} max. Volts	V_{DG} max. Volts	V_{GS} max. Volts	P_d max. @25°C	T_j max.	I_{DSS}	g_{os} (typical)	$-V_p$ Volts	r_d	Derate above 25°C	θ_{j-a}
2N3822	50	50	50	300 mW	175°C	2 mA	3000 μ ℧	6	50 KΩ	2 mW/°C	0·59°C/mW
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	5600 μ ℧	2·5	50 KΩ	—	0·59° C/mW

S.E (EXTC) SEM IV 11/12/13
Principle of Communication Engg.

29-10-2013-DTP-P-8-KG-1

Con. 5764 -13. **LJ-10577**

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory.**
(2) Attempt any **four** questions from Q. **2** & Q. 7.
(3) Make suitable assumption wherever necessary and clarly justify the same.

1. Answer **any four** of the following :- **20**
   (a) Explain why FM is immune to noise.
   (b) Explain how PPM is generated from PWM.
   (c) Explain tracking in AM receiver.
   (d) Why AGC (Control) is needed in receivers. Explain its working in brief.
   (e) What is aliasing error and how can it be eliminated ?

2. (a) With neat block diagram and wareforms explain working of adaptive delta mudulation. Explain its advantages. **10**
   (b) Explain with a neat block diagram and phasor diagram, working of phase discriminator. **10**

3. (a) Explain high power AM - DSBFC modulator with schematic diagram. **10**
   (b) Derive expression for mathametical representation of FM and its modulation index. **10**

4. (a) Draw block diagram and pulse code modulation technique and explain every block. **10**
   (b) Derive expression for total trasmitted power, total side band power and signal side band power for AM wave and draw frequency spectrum for DSBFC. **10**

5. (a) Draw block diagram of superhet receiver. Write frequency component present at the output of each block if modulating frequency is 1KHz, carrier frequency 535 KHz & IF 455 KHz also sketch waveforms of output & IF and detector stage. **10**
   (b) State and prove sampling theorum for low pass band limited signal. **10**

6. (a) Draw following data wave forms for bit stream 110101101 **8**
      (i) Bipolar RZ (ii) Bipolar RZ AMI
      (iii) Unipolar NRZ (iv) Bipolar NRZ
   (b) Draw and explain delta modulation transmitter and receiver. What is meant by slope overload distortion ? **12**

7. Write short notes on any **four** :- **20**
   (a) Preemphasis and deemphasis
   (b) Ratio detector
   (c) μ Law and A law of companding.
   (d) FM noise triangle.
   (e) Compare AM with FM.

S.E. EXTC sem IV Nov-13 26/11/13

Sub:- AM IV

12-11-13-DTP7-RM-10

Con. 8032-13. **LJ-10463**

(3 Hours) **[Total Marks : 100**

N.B. 1) Question No. 1 is compulsory
2) Solve any four questions from remaining.

Attempt any **five** questions :-

1. (a) Show that there does not exist any analytic function. $f(z) = u+iv$ such that **5**

$$u+v = \frac{x-y}{x+y}$$

(b) Find the poles of $f(z) = \frac{\sec z}{z^2}$ which lie inside the circle C: $|z|=2$. **5**

Also find the residues of f(z) at these poles.

(c) Show that $\frac{d}{dx}\left[x^{\frac{n}{2}} J_n(\sqrt{x})\right] = \frac{1}{2} x^{\frac{n-1}{2}} J_{n-1}(\sqrt{x})$ **5**

(d) A is a 3 x 3 matrix whose characteristic polymial is $\lambda^3 + 2\lambda^2 + 3\lambda + 4$. Find the sum of the eigen values of A^{-1}. **5**

2. (a) Show that the bilinear transformation **6**

$w = \frac{9z+3i}{3-iz}$ maps $|z| \leq 1$ onto $|w| \leq 3$

(b) Show that the matrix is not digonalisable. **6**

$$A = \begin{bmatrix} -17 & 18 & -6 \\ -18 & 19 & -6 \\ -9 & 9 & 2 \end{bmatrix}$$

(c) Show that $\vec{F} = \frac{\vec{r}}{r^3}$ is irrotational i also find the corresponding potential function. **8**

3. (a) Evaluate $\int_0^{2\pi} \frac{d\theta}{2+\cos\theta}$ using the residue theorem. **6**

(b) If $A = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$ show that $e^{At} = \begin{bmatrix} \cos t & -\sin t \\ \sin t & \cos t \end{bmatrix}$ **6**

(c) Verify Green's therem for **6**

$\int_C (x2-y^2)\,dx + (x^3+y^3)\,dy$

over the region bounded by $1 \leq x \leq 2$ and $1 \leq y \leq 3$

4. (a) Show that $J_2(X) = J_0''(X) - \frac{1}{X} J_0'(X)$ **6**

(b) Evaluate $\int_C (x^2+2y)dx + (4x+y^2)\,dy$ over the region bounded by $y = 0, y = 2x, x+y = 3$ **6**

(c) $A=\begin{bmatrix}2 & a & b\\ 0 & 2 & c\\ 0 & 0 & 3\end{bmatrix}$ show that A is diagonalisabel if any only if A is derogatory. **8**

5. (a) $A=\frac{1}{5}\begin{bmatrix}3 & -4\\ 4 & 3\end{bmatrix}$ **6**

Show that the eigentralnes are of unit modulus and the eigenvectors are orthogonal.

(b) Find a and b such that $u = (5x + 3y)(2x^2 + axy + by^2)$ is a harmanic function. **6**

(c) Find the analytic function f(z) whose real part is $u = \frac{2\sin x.\cosh y}{\cosh 2y - = \cos 2x}$ **8**

6. (a) Evaluate $\int_C \overline{Z}\, dz$ over the upper half of C : $|z|=2$, traversed in the anti-clockwise direction. **6**

(b) Verify the Gauss divergence theorem for $\vec{F}=(x^2-yz)+(y^2-zx)\uparrow+(z^2-xy)\uparrow$ over the surface S : $0\le x\le a,\ 0\le y\le b, 0\le z\le c$ **6**

(c) Find the laurent series expansion of $f(z) = \frac{1}{(Z+1)(Z+3)}$ in **8**

(i) $|z|<|$,

(ii) $|z|>3$,

(iii) $0<|z+1|<2$

7. (a) Verify Stocks theorem for $\vec{F}=y\,\hat{i}+z\,\hat{f}+x\,\hat{K}$ where S is the upper hemisphere $x^2+y^2+z^2 = 1$, ~~$z\ge 0$~~ $z>0$. **6**

(b) Diagonalise the quadratic form $Q=2xy+2xz-2yz$ using an arthogonal transformation. **6**

(c) Show that **8**

$$\frac{d}{dx}\left[J_n^2(x)+J_{n+1}^2(x)\right]=2\left[\frac{n}{x}J_n^2(x)-\frac{(n+1)}{x}J_{n+1}^2(x)\right]$$

S.E(EXTC) Sem IV Rev 30/11/13
Analog & Digital IC Design & App.

30-10-2013-DTP-P-8-KG-17

Con. 6290 - 13. **LJ-10503**

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory**.
(2) Answer any **four** questions for **remaining**.
(3) Assume suitable data wherever necessary.
(4) Draw neat circuit **diagram** wherever **necessary**.

1. (a) Explain current amplifier. **5**
   (b) Explain switched capacitor filters. **5**
   (c) Explain the log amplifier. **5**
   (d) Find the output voltage expression for the averaging amplifier. **5**

2. (a) Draw the block diagram of internal architecture of Xc 9500 family CPLD and explain. **10**
   (b) Explain basic requirement of instrumention amplifier and find output voltage expression for instrument amplifier using three op-amp. **10**

3. (a) Design astable multivibrator using 555 with output frequency 10 KHz and duty cycle 70%. **10**
   (b) Explain inverting schmitt trigger and find the expression for the hystersis width for it also mention transfer characteristics. **10**

4. (a) Design IC 566 for frequency 10 KHz. Find change in modulation voltage if frequency is varied from 9 KHz - 10 KHz. **10**
   (b) Write the VHDL code for synchronous decade counter with rising clock edge and asynohronous clear input. **10**

5. (a) Design a second order KRC highpass filter with cut-off frequency FO = 1KHz and Q = 5 and draw circuit diagram. **10**
   (b) Explain the servo tracking tupe ADC. **5**
   (c) Explain the filter approximations. **5**

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6. (a) Explain IC 8038 with internal block. Find the expression for duty cycle of 8038 IC. **10**

   (b) Design a melay machine for overlap sequence detector for the string 1101. The output must be ⊥ when the input matches this string. **10**

   (i) Draw the state diagram

   (ii) Write its transition and output table.

   (iii) Draw its logic diagram.

7. (a) Explain antilog amplifier. **5**

   (b) Explain sample and hold CKT. **5**

   (c) Explain generalised impedance convertor. **5**

   (d) Differentiate between static RAM and Dynamic RAM. **5**
