BE / EXTC / Sem IV

Con. 6594–10. principles of Commu. Engg

14/12/10

GT–6519

(3 Hours) [Total Marks : 100

N.B. 1) Question No. **1** is **Compulsory**.
2) Attempt any **four** Questions out of remaining **six** Questions.
3) Figures to the right indicate full marks.
4) Assume **suitable data** if **necessary**.

1. Answer the following: 20
   (a) Compare between noise and interference. Explain different types of noise.
   (b) How ratio detector provides Amplitude limiting?
   (c) What is quantization? Explain types of quantization.
   (d) Explain the need of modulation.

2. (a) Derive equation for total transmitted power, total side band power and single sideband power for AM wave and draw frequency spectrum for DSBFC. 10 10

   (b) Explain the following with reference to radio receivers: -
   (i) Sensitivity (iii) Fidelity
   (ii) Selectivity (iv) Dynamic range

3. (a) State and prove sampling theorem for Low pass signal. 10
   (b) An electronic device operating at temperature of 17°C with a bandwidth of 10 KHz. 10
   Calculate: -
   (i) Thermal noise power in volts.
   (ii) RMS noise voltage for 100 Ω internal and 100 Ω load resistance.

4. (a) Explain Indirect method of FM generation. 10
   (b) Explain the block diagram of Adaptive delta modulation with waveforms. 10
   How does it reduce slope overload error?

5. (a) Explain how PPM is generated from PWM. 10
   (b) Explain the working of Foster-Seeley discriminator with neat circuit diagram and phasor diagram. 10

6. (a) Draw the following data waveforms for the bit stream 11010010. 10
   (i) Unipolar NRZ (iv) Bipolar RZ
   (ii) Bipolar NRZ (v) Bipolar RZ-AMI

   (b) Draw the block diagram of Pulse code modulation techniques and explain each block. 10

7. Explain the following:(any **two**) 20
   (a) FM noise triangle.
   (b) Automatic Gain Control.
   (c) Significance of Signal-to-Noise Ratio.

S.E./ExTC/SemIV

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Con. 6011–10.

Electromagnetic wave theory GT–6513

(3 Hours) [Total Marks : 100

N.B.: (1) Question No.1 is compulsory.
(2) Attempt any four questions out of remaining six questions.
(3) Figures to right indicates full marks.

1. Answer the following : (20)
a). State and explain Coulomb's law.
b). Explain Divergence.
c). What do you mean by method of images?
d). Define Poynting Vector.

2. a). Derive an expression for the electric field intensity due to an infinite surface charge(10)
b). Calculate the total charge within the indicated volume $0 \le \rho \le 0.1, 0 \le \Phi \le \pi, 2 \le z \le 4$; given $\rho_v = \rho^2 z^2 \sin 0.6\Phi$. (10)

3. a). State and prove Gauss's law .Using Gauss's law, find an expression for flux density due to an infinite uniform surface charge. (10)
b).Given the electric flux density, $D = 0.3r^2 a_r nc/m^2$ in free space: find the total electric flux leaving the sphere r = 4. (10)

4. a). Given the potential $V = 2x^2y - 5z$ and a point P (-4, 3, 6), find V, E D and ρ_v at P. (10)
b). Find the amount of energy required to move a 4 C charge from B(1,0,0) to A (0,2,0) in the field $E = 5xa_x + 5ya_y$ V/m along the straight line path y = 2-2x, z = 0. (10)

5. a). Find out the capacitance of a spherical capacitor formed of two concentric spherical shells of radius a and b, b>a . (10)
b). Derive an expression for magnetic field intensity due to finite long straight element. (10)

6. a). Two circular coils are located at the z = 0 plane and z = 5 m plane centered about the z axis. The first coil having a radius of 1 m carries a current of 10 Amp. The second coil having a radius of 0.5 m carries a current of 20 Amp. Calculate the magnetic field intensity H at(0,0,2.5m). (10)
b). Derive Maxwell's equation in point form and integral form. (10)

7 . Write short notes on any two : (20)
a) VSWR
b) Laplace & Poisson's equation.
c) scalar and vector magnetic potential.

S.E / Electronic & Telecom / Sem IV

Applied Maths IV

87-p3-upq-Con No. File

Con. 5585–10.

GT–6522

(3 Hours)

[Total Marks : 100

NB: 1.QUESTION NO 1 IS COMPULSORY.

2. ATTEMPT ANY FOUR QUESTIONS OUT OF REMAINING SIX QUESTIONS.

3.FIGURES TO THE RIGHT INDICATE FULL MARKS.

Q.1 a) If $\bar{F} = xy\,\hat{\imath} - z\,\hat{\jmath} + x^2\,\hat{k}$ then evaluate $\int \bar{F} \times d\bar{r}$ over C. (20)

Where C is the curve $x = t^2$, $y = 2t$, $z = t^3$ from t = 0 to 1.

b) Prove that $\int J_3(x)\,dx = -2\,\frac{J_1(x)}{x} - J_2(x)$.

c) Show that one of the Eigen values of the matrix A is zero

Where $A = \begin{bmatrix} 123 & 111 & 222 \\ 201 & -86 & -121 \\ 324 & 25 & 101 \end{bmatrix}$

d) Evaluate $\int \bar{z}\,dz$ over C where C is the upper half of the circle r = 1.

Q.2 a) Evaluate $\int \frac{4z-1}{(z^2+z-2)} dz$ over C where C is $\frac{x^2}{4} + \frac{y^2}{9} = 1$. (6)

b) Find the invariant points of the bilinear transformation $w = -\left(\frac{2z+4i}{iz+1}\right)$ & (7)

prove that these 2 points together with any point z & its image w form a set of points whose cross ratio is constant.

c) Prove that $\int_0^1 x^{\frac{5}{2}} J_{\frac{3}{2}}(ax)\,dx = \frac{1}{a}\,J_{\frac{5}{2}}(a)$. (7)

Q.3a) Find the Eigen values & the Eigen vectors of the matrix A & A^{-1} (6)

Where $A = \begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$

b) Evaluate $\int \frac{ze^z}{(z-1)^3}\,dz$ over C where C is |z| = 2. (7)

c) Apply Stoke's theorem to evaluate $\int y\,dx + z\,dy + x\,dz$ over C where C is the curve of (7)

Intersection of $x^2 + y^2 + z^2 = a^2$ & $x + z = a$.

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Q.4 a) Reduce the following quadratic form to canonical form & find the rank & signature (6)

$2x^2+y^2-3z^2+12xy-4xz-8yz$.

b) Prove that $f(z) = |z|^2$ is not analytic anywhere but satisfies C-R equations at z = 0. (7)

c) Using Green's theorem evaluate $\int(2x^2-y)dx+(y^2+2x)dy$ over C where C is the Boundary of the region bounded by $y = x^2$; $y = 1$; $x = 0$.

Q. 5 a) Expand $f(z) = \frac{1}{(z-2)(z-1)}$ in the regions (6)

(i) $1 < |z-1| < 2$ **(ii)** $1 < |z-3| < 2$

b) Using Cayley- Hamilton theorem find $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I$ (7)

where $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$.

c) Show that $\bar{F} = (ye^{xy}\cos z)\,\hat{\imath} + (xe^{xy}\cos z)\,\hat{\jmath} - (e^{xy}\sin z)\hat{k}$ (7)

is irrotational & also find scalar potential for $\bar{F}$.

Q.6 a) Find the image of the area bounded between $x^2+y^2 = 16$ & $x^2+y^2 = 81$ in the z- plane Into the w - plane under the transformation w = log (z). (6)

b) If $A = \begin{bmatrix} 0.5 & 0.5 \\ 0.5 & 0.5 \end{bmatrix}$ then find $\cos^{-1} A$. (7)

c) Find analytic function f(z) = u +iv such that $U-V = \frac{\cos x+\sin x-e^{-y}}{2\cos x-e^{y}-e^{-y}}$ & $f(\frac{\pi}{2}) = 0$. (7)

Q. 7 a) If $B = \begin{bmatrix} 123 & 231 & 312 \\ 231 & 312 & 123 \\ 312 & 123 & 231 \end{bmatrix}$ then prove that (6)

(i) One of the Eigen values of B is 666.

(ii) One of the Eigen values of B is negative.

b) Using Gauss divergence theorem prove that (7)

$$\iint (y^2z^2\hat{\imath} + z^2x^2\hat{\jmath} + z^2y^2\hat{k})\cdot\hat{N}\,ds = \frac{\pi}{12}.$$

c) Expand $f(x) = 4x - x^3$ In (0,2) in a series

$$4x - x^3 = 8\sum \frac{J_2(2\lambda_n)}{\lambda_n^2\ J_2^2(2\lambda_n)} J_1(\lambda_n x)$$ Where $\lambda_i' s$ are positive roots of $J_1(2\lambda) = 0$.(7)

3. : (1) Question No. **1** is **compulsory**.
(2) Out of remaining questions, attempt any **four** questions.
(3) In **all five** questions to be attempted.
(4) Answer to **each** new question to be stared on a **fresh** page.
(5) Assume **suitable** data if **necessary**.

S.E. / EXTC / Sem-IV / Analog & Digital IC design & Application

) Analyze the current amplifier with grounded load. [20]

) How switched capacitor can simulate resistor?

) With neat circuit diagram explain counter type A-to-D converter

) Explain state machine decomposition.

Differentiate between static RAM and dynamic RAM.

) Draw a neat circuit of an instrumentation amplifier using two Op-amps. [3]

Derive its output voltage equation. [7]

) List the different commercial ROM types? [2]

Differentiate between them. [8]

) What are the universal filters? [2]

Draw a neat circuit diagram of any one universal filter and find out its output voltage equations. [8]

) Write a VHDL program for 4-bit decade counter with enable, reset and synchronous clock input. [10]

) Design an astable multivibrator for an output frequency of 1 KHz but a variable duty cycle of 30% to 70%. Assume V_{cc} =12 v [8]

) Design a logic circuit that asserts its output for one cycle when the input stream changes from 0 to 1 using. [12]
   i. Moore machine
   ii. Meley machine

) Design the Op-amp circuit which can give the output as $v_o = 2v_1+4v_2-v_3$. [5]

) Design second order band pass KRC filter with fo = 10 KHz and BW = 1 KHz. What is its resonant gain? [10]

) Draw and explain the block diagram of CPLD. [5]

) Explain the block diagram of IC 566. [5]

) Draw a logic diagram and timing diagram of 4-bit Johnson counter. [4]

) Give the features of function generator IC 2206. [5]

) Design excess-3 decimal counter using MSI IC 74x163. [6]

) Explain the operation of basic sample and hold circuit. [4]

) Draw the circuit diagram of 4-bit R/2R ladder D-to-A converter and derive its output voltage. [8]

) What is a feedback sequential circuit? Explain the following term with an example [8]
   i. stable state

Con. 5860–10. GT–6516

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. 1 is **compulsory**.
(2) Out of remaining questions, attempt any **four** questions.
(3) In **all five** questions to be attempted.
(4) Answer to **each** new question to be stared on a **fresh** page.
(5) Assume **suitable** data if **necessary**.

S.E. / EXTC / Sem-IV / Analog & Digital IC design & Application

1. [20]
(a) Analyze the current amplifier with grounded load.
(b) How switched capacitor can simulate resistor?
(c) With neat circuit diagram explain counter type A-to-D converter
(d) Explain state machine decomposition.
(e) Differentiate between static RAM and dynamic RAM.

2.(a) Draw a neat circuit of an instrumentation amplifier using two Op-amps. [3]
Derive its output voltage equation. [7]

(b) List the different commercial ROM types? [2]
Differentiate between them. [8]

3.(a) What are the universal filters? [2]
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(b) Write a VHDL program for 4-bit decade counter with enable, reset and synchronous clock input. [10]

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7.(a) Explain the operation of basic sample and hold circuit. [4]

(b) Draw the circuit diagram of 4-bit R/2R ladder D-to-A converter and derive its output voltage. [8]

(c) What is a feedback sequential circuit? Explain the following term with an example [8]
i. stable state
ii. Non-critical state
iii. Critical state

Con. 6200-10. Electronic Dev & Circ – II GT-6510

(3 Hours) [Total Marks : 100

S.E / EXTC - Sem-IV

N.B. (1) Question No. **1** is **compulsory**.
(2) Solve any **four** questions from the remaining.
(3) Assume **suitable** data if **necessary** and mention the **same** in answer-sheet.

Electronic Devices & Circuit - II

1. Solve any **four** :— 20
   (a) Explain how to improve CMRR in differential amplifier.
   (b) Explain principle of operation of oscillator.
   (c) State the importance of frequency response in amplifier circuits. Why at low and at high frequencies gain of CE amplifier is low.
   (d) What are the advantages of negative feedback ?
   (e) Differentiate between Small signal and Large signal amplifiers.

2. Design a two stage RC coupled BJT amplifier to meet the following specifications :— 20
   $A_V \geq 5000$, $S_{ICO} \leq 10$, $f_L \leq 20$ Hz, $V_O = 2{\cdot}5$ V and $V_{CC} = 12$ V.
   For designed circuit calculate A_v, R_i and R_o.

3. For the circuit shown in **figure**.

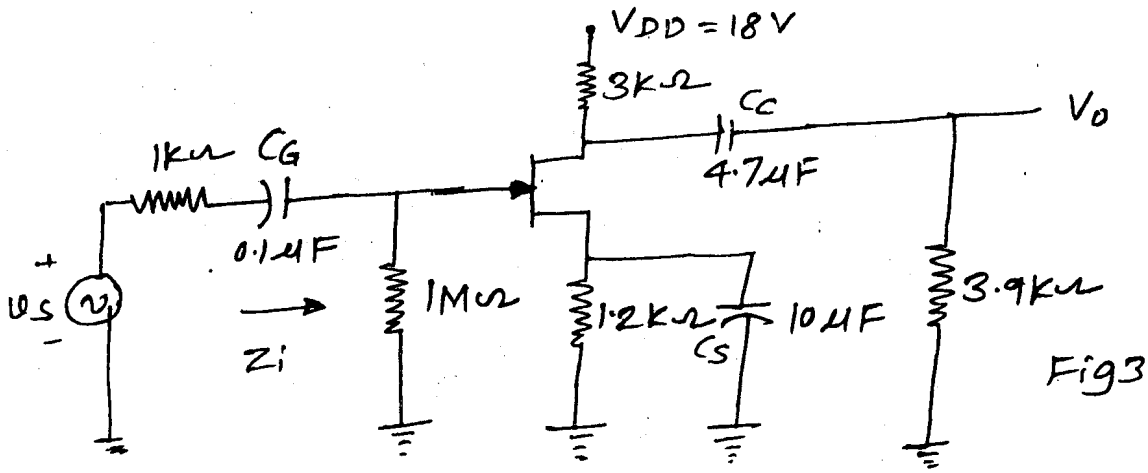

Fig3

For JFET $I_{DSS} = 6$ mA, $V_p = -6$ V, $r_d = \infty$, $C_{gd} = 4$ pF, $C_{gs} = 6$ pF, $C_{ds} = 1$ pF and $C_{wi} = 3$pF, $C_{wo} = 5$ pF.

   (a) Determine V_{GSQ} and I_{DSQ}. 4
   (b) Determine gm_o and gm. 2
   (c) Calculate midband gain $A_v = \frac{V_o}{V_i}$ 2
   (d) Determine Z_i 1
   (e) Calculate $A_{VS} = \frac{V_O}{V_S}$ 2
   (f) Calculate lower cutoff frequency due to C_G, C_S and C_C a shown in **figure.** Also find effective lower cutoff frequency. 4
   (g) Calculate higher cutoff frequency due to input time constant (fH_i) and due to output time constant (fH_o). 5

[TURN OVER

4. (a) For the circuit shown in **figure**, identify type of feedback and determine (i) Avf, (ii) Rif, (iii) R'of using feedback approach. (**Note** Vcc is not required.) **10**

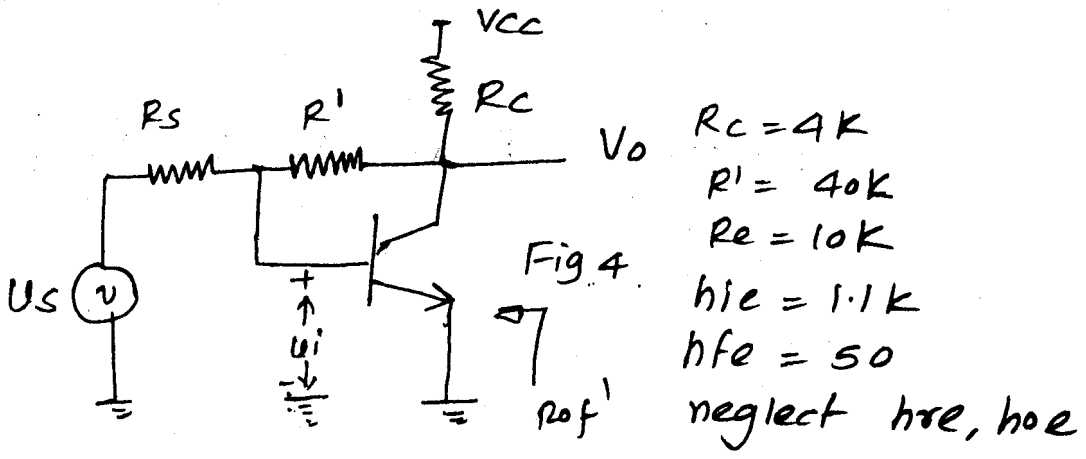

Fig 4.

(b) Explain various types of negative feedback amplifiers with the help of neat block diagrams. For each type give stability ratio, feedback factor (β), Input resistance Rif, output resistance Rof. **10**

5. (a) For the differential amplifier shown in **figure**, determine — **10**

(i) I_{CQ}, V_{CEQ}
(ii) Differential gain A_d
(iii) Common Mode gain A_c and
(iv) CMRR

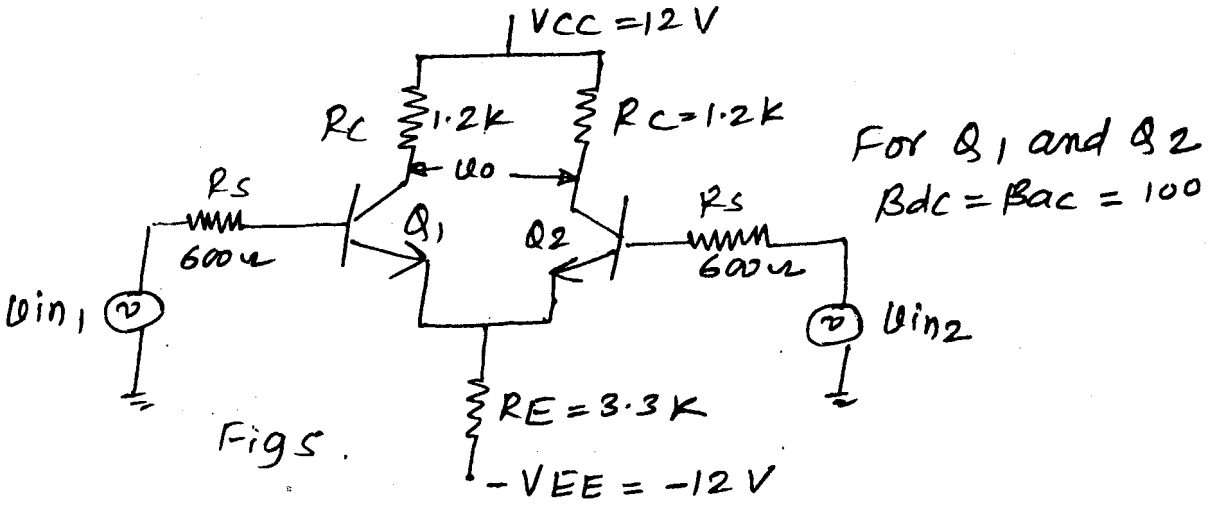

Fig 5.

(b) Draw transistorized Astable Multivibrator and explain its working with waveforms at important nodes. **10**

6. (a) Draw circuit diagram of RC phase shift BJT oscillator and derive expression for frequency of socillation. **10**

(b) Design a large signal transformer coupled class A power amplifier to provide 10 W output to the 4 Ω load. **10**

7. Write short notes on any **four** :— **20**

(a) Cascode Amplifier
(b) High input impedance circuits
(c) High frequency LC oscillator
(d) Class AB push-pull power amplifier
(e) Schmitt trigger.

DBEC DATA SHEET

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_{CER} (Sus) volts d.c.	V_{CEX} volts d.c.	V_{BEO} volts d.c.	T_j max °C	D.C. current gain min	typ.	max.	Small Signal h_{fe} min.	typ.	max.	V_{BE} max.	θ_{jc} °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

–VGS 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_{DS} max. Volts	V_{DG} max. Volts	V_{GS} max. Volts	P_d max. @25°C	T_j max.	I_{DSS}	g_{mo} (typical)	$-V_P$ Volts	r_d	Derate above 25°C	θ_{ja}
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