Sem III OTR
EXTC

QP CODE : 542800

(OLD COURSE)

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

N.B. (1) Question No. **1** is **compulsory.**
(2) Attempt any **four** out of remaining **six** questions.
(3) Make **suitable** assumptions if **required** and **justify** the **same.**

1. **(a)** Volume of a certain solid V is calculated using formula $V = 64\frac{xy^4}{z^2}$ where x, y & z denote three dimensions. If maximum possible errors in the x, y & z is limited to plus minus 0.001.Estimate the maximum probable error in the calculation of volume if the normal dimension x, y & z are equal to unity. **5**

(b) Define the operators $\Delta, \nabla, \delta, \mu$ & E. Prove that **5**

i) $2\mu\delta = \Delta + \nabla$ ii) $E = 1 + \Delta$

(c) Using Picard's method solve **5**

$\frac{dy}{dx} = 1 + xy$ such that $y = 0$ when $x = 0$.

(d) Derive the equation for Regula – falsi method using geometrical interpretation. **5**

2. **(a)** List the bracketing methods and open methods and find the real root of the equation $xe^x - \cos x = 0$ using Newton-Raphson method correct to three decimal places. **10**

(b) Solve the following equations by Gauss - Seidel method. **10**
$27x + 6y - z = 85$, $6x + 15y + 2z = 72$, $x + y + 54z = 110$.

3. **(a)** From the following table find the number of students who obtained marks less than 45. **10**

Marks	30-40	40-50	50-60	60-70
No. of students	31	42	51	35

(b) Using Newton's divided difference formula, find the value of **f(9)** from the following table. **10**

x	5	7	11	13	17
$f(x)$	150	392	1452	2366	5202

[TURN OVER

4. (a) Write a program for Lagrange's interpolation method and using this formula, find the value of y when $x = 10$ from the following table. **10**

x	5	6	9	11
y	12	13	14	16

(b) Fit a second degree parabola to the following data: **10**

x	2	4	5	6	8	11
y	18	12	10	8	7	5

5. (a) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using Trapezoidal, Simpson's $\frac{1}{3}^{rd}$ and Simpson's $\frac{3}{8}^{th}$ rule. **10**

(b) Solve $\frac{dy}{dx} = x^2 + y$ with $x_0 = 0$, $y_0 = 1$ by Euler's modified formula find the value of y when $x = 0.5$ taking $h = 0.25$. **10**

6. (a) Solve $\frac{dy}{dx} = x + y^2$ with initial conditions $y(1) = 1.5$ and find y at $x = 1.2$, $x = 1.4$ by Runge - Kutta Method of Fourth Order taking $h = 0.2$. **10**

(b) Solve the following set of equations using Gauss Elimination method. **10**

$2x + y + z = 10$, $3x + 2y + 3z = 18$, $x + 4y + 9z = 16$.

7. (a) Explain the propagation of errors. **5**

(b) Using Adams – Bashforth method, obtain the solution of $\frac{dy}{dx} = x - y^2$ at $y(0.8)$, given values **10**

x	0	0.2	0.4	0.6
y	0	0.0200	0.0795	0.1762

(c) Write a short note on Golden section search. **5**

8E- Sem-III EXTC CBSGS/OTR) dt 12/6/17

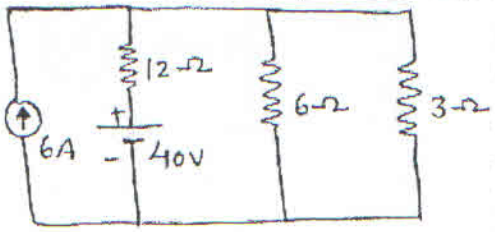
Q.P. Code : 544602

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

NB: 1) Question No.1 is **compulsory**.
2) Attempt any **four** from the **remaining** questions.
3) **Assume** suitable **data**, if **required**.

1. **Attempt any four :** **20**

(a) Using source transformation, replace the network with a single current source and a resistors.



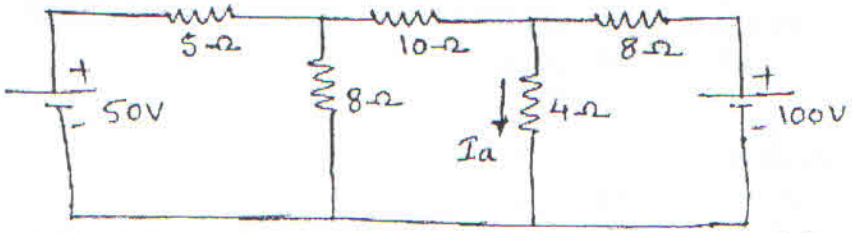
(b) Define Unilateral and Bilateral element. **05**

(c) Obtain condition for reciprocity for Z parameters. **05**

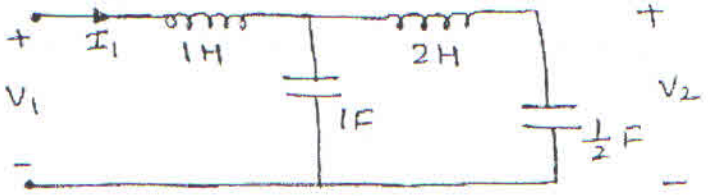
(d) Define final steady state condition for resistor and capacitor. **05**

(e) Draw pole zero plot for $-S(S+1)/(S+3)(S+2)^2$

2. (a) Using nodal analysis calculate current I_a in the given network. **10**



(b) Find the network functions V_1 / I_1, V_2 / I_1, and V_2 / V_1. **10**



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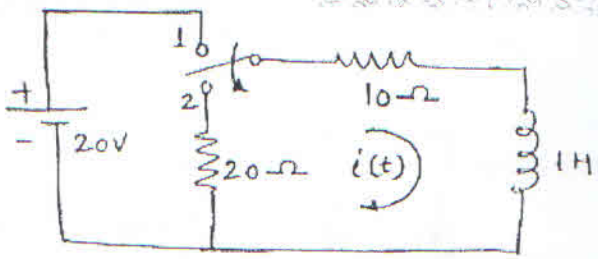
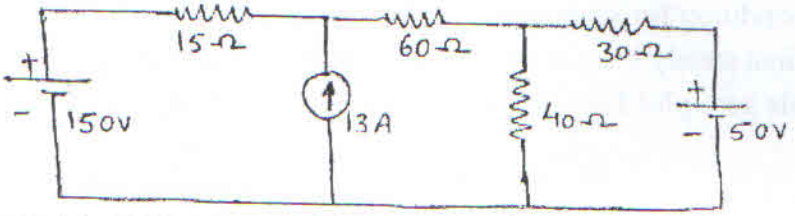
3. (a) Realise the function using Cauer 1 and Cauer II **10**

$$Z(s) = (10S^4 + 12S^2 + 1) / (2S^3 + 2S)$$

(b) In the given network switch initially is at position 1, and attains steady state condition. At t=0, it is moved from position 1 to position 2, find the value of (i, di/dt and d^2i / dt^2) at $t > 0^+$. **10**



4. (a) Find the current through 30Ω resistor. **10**



(b) Test the function is PRF or not **05**

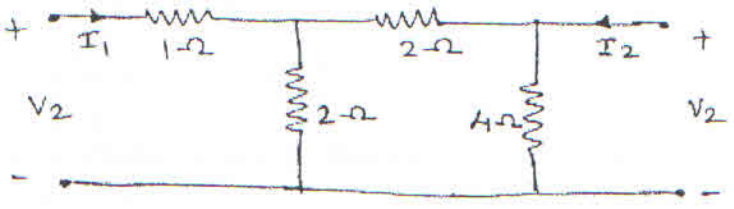
$$F(s) = (S^3 + 6S^2 + 7S + 3) / (S^2 + 2S + 1)$$

(c) Test whether the polynomials are Hurwitz or not **10**

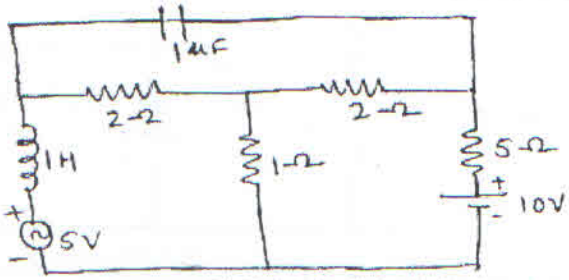
(1) $P(s) = 2S^4 + 5S^3 + 5S^2 + 4S + 10$

(2) $P(s) = S^5 + S^3 + S$

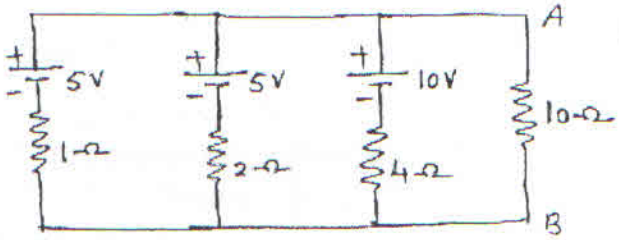
5. (a) Find h parameters for the given network **10**



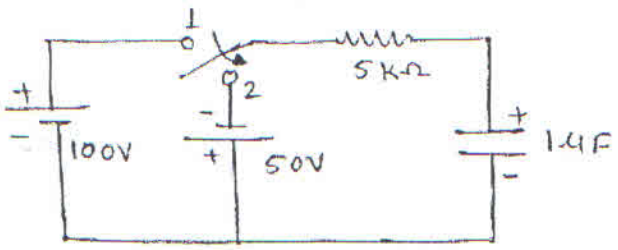
(b) For the given network draw graph and write down incidence matrix, cut-set matrix and tie-set matrix. **10**



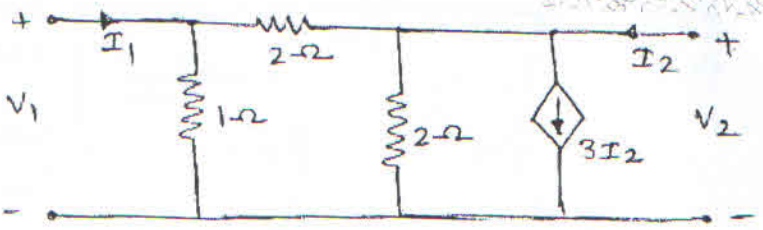
6. (a) Determine voltage across AB branch for the given network. **10**



(b) The switch in the circuit is moved from position 1 to 2 at t=0, calculate voltage across capacitor. **10**



7. (a) For the given network find Z and ABCD parameters. 10



(b) Draw the Bode plot for the given T.F. 10

$$G(S)H(S) = \frac{10(S+1)}{S(1+0.02S)(1+0.002S)}$$

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S.E - Sem-III (OLD) EXTC

Dt: 24.05.18

QP Code:544400

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

N.B. : (1) Question No.**1** is **compulsory**.
(2) Solve any **four** questions out of remaining **six**.
(3) Each questions carries **20 marks**. Equal marks for the subquestions.
(4) **Assume** suitable **data** if required.

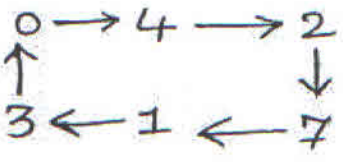
1. (a) Perform $(28)_{10}$- $(54)_{10}$ using 2's complement method.
   (b) Convert T-FF to D-FF
   (c) Differentiate between Demultiplexer and Decoder.
   (d) Compare PAL and PLA

2. (a) Describe various Binary codes giving examples.
   (b) Minimize following logical function using k-map
   $f(A, B,C,D) = \Sigma m(1,3,5,8,9,11,15)+d(2,13)$

3. (a) Design the logic ckt for following logical operations using single decoder and few logic gates.
   (i) 2-I/P EX-OR (ii) 2-I/P EX-NOR
   (b) Explain the term Race Around condition and methods to avoid it.

4. (a) Minimize following logical function using Quine Mc Cluskey method
   $f(A,B,C,D) = \Sigma m(1,3,7,11,15) + d(0,2,5)$
   (b) (i) Implement $Y=(A+B).(A+C)$ using NOR gates.
   (ii) Using boolean algebraic theroems, prove that,
   $AB+ABC+AB=A$

5. (a) Explain ECL Logic family
   (b) Design synchronous counter for the following counting sequence using MS-JKFFs



6. (a) Describe various characteristics of logic families.
   (b) Draw and explain 3-bit Right shift Register with output waveforms.

7. Write short notes on
   (i) Multiplexer (ii) Universal gates
   (iii) CPLD (iv) TTL Logic family

S.E. Sem III (old) EXTC

App. Maths - III

Q.P. Code : 544202

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

N.B. : (1) Question No.1 is compulsory.
(2) **Answer** any **Four** questions out of the remaining six questions.
(3) Figures to the right indicate **full** marks.

1. a) Find Laplace transform of t sin3t cost **5**
   b) Obtain complex form of Fourier series for $f(x) = sinh(ax)$ in $(-l, l)$ **5**
   c) Show that every square matrix can be uniquely expressed as the scm of a Hermitian and skew- Hermitian matrix. **5**
   d) Find the inverse Laplace transformation of $\frac{s^2+1}{s^3+3s^2+2s}$ **5**

2. a) Find Laplace transform of $(\int_0^t e^{-3u}\cos^2(u)du)$ **6**
   b) If $A = \begin{bmatrix} 0 & 2b & c \\ a & b & -c \\ a & -b & c \end{bmatrix}$ is orthogonal, Find a, b, c, also Find A^{-1}. **6**
   c) Find the Fourier expansion for $f(x) = x^2$ in $(0, 2\pi)$ Hence deduce **8**
   $\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \text{---}$

3. a) Test for consistency and solve **6**
   $2x - 3y + 5z = 1$, $3x + y - z = 2$, $x + 4y - 6z = 1$
   b) Find the Fourier expansion for $f(x) = 4 - x^2$ *in* $(0, 2)$ **6**
   c) Find inverse z-transform of $\frac{3z^2 - 18z + 26}{(z-2)(z-3)(z-4)}$, $3 < z < 4$ **8**

4. a) Solve Using Laplace transform $[D^2 + 4D + 8]\, y = 1$ *where* **6**
   $y(0) = 0$, $y'(0) = 1$.
   b) Find th e Fourier expansion for $f(x) = \left(\frac{3x^2 - 6x + 2\pi^2}{12}\right)$ in$(0, 0\pi)$ **6**
   c) Find z- transform of $c^k \sinh(\alpha k)$, $k \geq 0$ **8**

[TURN OVER]

5. a) Find fourier integral representation for 6

$$f(x) = f(x) = \begin{cases} 1-x^2 & \text{for} \quad |x| \le 1 \\ 0 & \text{for} \quad |x| > 1 \end{cases}$$

b) Find the two non -singular matrices P and Q such that 6

PAQ is in normal form *where* $A=\begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$ hence find Rank and A^{-1}

c) Obtain Half range sine series $f(x) = x\sin x$ in $(0, \pi)$. Hence deduce 8

$$\frac{\pi^2}{8\sqrt{2}} = \frac{1}{1^2} - \frac{1}{3^2} + \frac{1}{5^2} - \frac{1}{7^2} + \text{---}$$

6 a) Using Laplace transform evaluate 6

$$\int_0^\infty e^{-t}(1+2t-t^2+t^3)H(t-1)dt$$

b) Find inverse Laplace transform of $\tan^{-1}\left(\frac{2}{s^2}\right)$ 6

c) Find inverse Laplace transform of the following 8

(i) $\frac{1}{s}\tan^{-1}\left(\frac{a}{s}\right)$ (ii) $\frac{(s+1)e^{-s}}{s^2+2s+2}$

7. a) Find inverse Laplace transform of $\frac{1}{(s^2+4s+13)^2}$ by convolution theorem 6

b) Show that the matrix is a unitary matrix $A = \frac{1}{2}\begin{bmatrix} \sqrt{2} & -i\sqrt{2} & 0 \\ i\sqrt{2} & -\sqrt{2} & 0 \\ 0 & 0 & 2 \end{bmatrix}$ 6

c) Show that the functions $f_1(x) = 1$; $f_2(x) = x$ are orthogonal on [-1, 1]. Determine the constants a and b such that the function $f_3(x) = -1 + ax + bx^2$ is orthogonal to both f_1 and f_2 on that interval. 8

SE Sem III EXTC (old) 18/5/17 (2)

Electronics Devices & circuits-I

Q.P. Code :13327

Duration: 3hrs Maximum Marks: 100

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 single stage RC coupled CE amplifier for the following specifications: 15
$A_v \geq 150$, V_O= 3.6V, $F_L \leq 20$ Hz , $V_{CC} = 16V$,Use transistor BC147A from data sheet.

b For the above designed amplifier determine; voltage gain, input impedance, output impedance and maximum undistorted output voltage. 05

Q2. a Design single stage CS amplifier with self-biasing employing JFET type BFW11for the following specifications; $A_v \geq 15$, $V_{GS} = 4.0V$,$I_{DSS} = 1.5mA$,V_{DD}= 21V and $F_L \leq$ 20Hz. 15

b For the designed amplifier, determine voltage gain, input impedance, output impedance and coupling capacitor if two such similar stages are used. 05

Q3. a Draw a small signal hybrid parameter equivalent circuit for transistor amplifier and define the same from characteristics. What are the advantages of h-parameters.? 10

b Design fixed bias with emitter resistance circuit for $I_E = 1.2mA$ $V_{CE} = 4.0V$ $V_{BE} = 1.5V$ and $\beta = 100$. Assume $V_{CC} = 10V$. 10

Q4. a For the amplifier shown in figure.1 analyze and determine 10
i) Operating point
ii) Small-signal mid band voltage gain.
iii) Input and out put impedance.
The circuit parameters are: R_1=40KΩ, R_2=10kΩ, R_E=620Ω, R_C=2.2kΩ, V_{CC}=12V. The transistor parameters are $\beta = 110$, $V_{BE} = 0.7V$

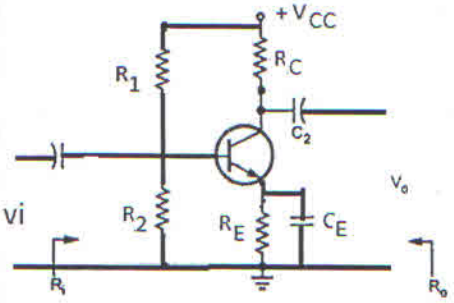


Fig.1

b Draw JFET small signal common drain amplifier with self-bias and derive the expression for, small signal mid-band voltage gain, input impedance and output impedance. Also write the advantages and disadvantages of this configurations. 10

Q5 a Draw and explain the construction and working principle for an E-MOSFET. 10

b Design a JFET voltage divider biasing circuit for CS amplifier. JFET has the following parameters: $I_{DSS} = 3.2\,mA$, $V_P = -2.5V$ 10

The circuit parameters: $R_D = 1.2k\Omega$, $R_1 = 10\,M\Omega$, $I_{DQ} = 3\,mA$ and $V_{DS} = 10\,V$, $V_{DD} = 21\,V$ .Determine the values of R_2 and R_S.

Q6 a Design L section LC filter with full wave rectifier to meet following specifications: The DC output voltage V_{DC}= 200V, deliver I_L=80 $mA \pm 10\,mA$ to the resistive load, and required ripple factor is 0.027. Determine output voltage ripple factor for the designed filter circuit.Also find bleeder resistance if required. 12

b Design a simple Zener voltage regulator to meet the following specifications: Output voltage $V_o = 5.1V$, Load current $I_{L\,max} = 40\,mA$, $I_{Z\,min} = 1mA$, $I_{Z\,max} = 80\,mA$, $I_{Z\,min} = 2mA$, P_Z=408mW and Input voltage $V_i = 15\,V$ to $25\,V$. 8

Q7 Write a short note on following(any two) 20

a SCR (Construction and Characteristics).

b D C load line for BJT amplifier

c MOSFET biasing

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_{EBO} 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_{j-c} °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 ℧	$1·5 \times 10^{-4}$	0·4°C/mw
2N 525 (PNP)	1·4 K Ω	25μ ℧	$3·2 \times 10^{-4}$	—
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_{fs} (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