SE - sem - III - [redacted] Choice Based — EXTC — AM-III 23/11/17

Q. P. Code: 24392

(3 Hours) [Total Marks: 80]

N.B. : 1) Question No. 1 is Compulsory.

2) Answer any THREE questions from Q.2 to Q.6.

3) Figures to the right indicate full marks.

Q 1. a) Evaluate the Laplace transform of $\sinh(\frac{t}{2})\sin(\frac{\sqrt{3}}{2}t)$ [5]

b) Determine the constants a,b,c,d so that the function $f(z) = x^2 + axy + by^2 + i(cx^2 + dxy + y^2)$ is analytic. [5]

c) Find a unit normal to the surface $xy^3z^2 = 4$ at the point (-1,-1, 2). [5]

d) Obtain half range sine series for $f(x) = x, \quad 0 < x < 2$. [5]

Q 2. a) If $u = e^{2x}(x\cos 2y - y\sin 2y)$ then find analytic function $f(z)$ by Milne Thomson Method [6]

b) Find the Fourier series for $f(x) = 9 - x^2$, $-3 \le x \le 3$ [6]

c) Find the Laplace transform of the following

i) $L[t\sqrt{1+\sin t}]$ ii) $L\left[\frac{\sinh 2t}{t}\right]$ [8]

Q 3. a) Prove that $J_{1/2}(x) = \sqrt{\frac{2}{\pi x}}\sin x$ [6]

b) Evaluate inverse Laplace transform using Convolution Theorem $L^{-1}\left[\frac{(s+2)^2}{(s^2+4s+8)^2}\right]$ [6]

c) Show that $\overline{F} = ye^{xy}\cos z\,\hat{i} + xe^{xy}\cos z\,\hat{j} - e^{xy}\sin z\,\hat{k}$ is irrotational vector field. Find ϕ if $\overline{F} = \nabla\phi$ and also evaluate $\int_P^Q \overline{F}.d\overline{r}$ along a curve joining the points P(0,0,0) and Q(-1,2, π). [8]

Q 4 a) Find the Fourier transform of $f(t) = e^{-|t|}$ [6]

b) Show that the function $f_1(x) = 1$, $f_2(x) = x$ are orthogonal on $(-1,1)$ and determine the constant A & B so that functions $f_3(x) = 1 + Ax + Bx^2$ is orthogonal to both $f_1(x)$ and $f_2(x)$ on that interval. [6]

c) Find bilinear transformation which maps the points z=1, i,-1 onto the points w=i, 0,-i hence find the image of $|z|<1$ on to w plane find invariant points of this transformation [8]

Q 5 a) solve Using the Laplace transform the following system of equations [6]

$$\frac{dX}{dt}=2X-3Y, \frac{dY}{dt}=Y-2X \quad where\ X(0)=8, Y(0)=3.$$

b) Find Complex form of the Fourier series for $f(x)=e^{ax}$ in $-\pi<x<\pi$ where 'a' is a real constant. Hence deduce that $\frac{\pi}{a\sinh a\pi}=\sum_{n=-\infty}^{\infty}\frac{(-1)^n}{n^2+a^2}$ [6]

c) Verify Green's Theorem in the plane for $\oint_C (3x^2-8y^2)dx+(4y-6xy)dy$ where C is the boundary of the region defined by $y = x^2$ and $y = \sqrt{x}$. [8]

Q 6. a) Prove that $J_n''(x)=J_{n-2}(x)-2J_n(x)+J_{n+2}(x)$ [6]

b) Find the map of the line x-y=1 by transformation $w=\frac{1}{z}$ [6]

c) Evaluate $\iint_S \overline{F}.d\overline{s}$ where $\overline{F}=4x\hat{i}-2y^2\hat{j}+z^2\hat{k}$ where S is the region bounded by $x^2+y^2=4$, $z=0$, $z=3$ using Gauss divergence theorem. [8]

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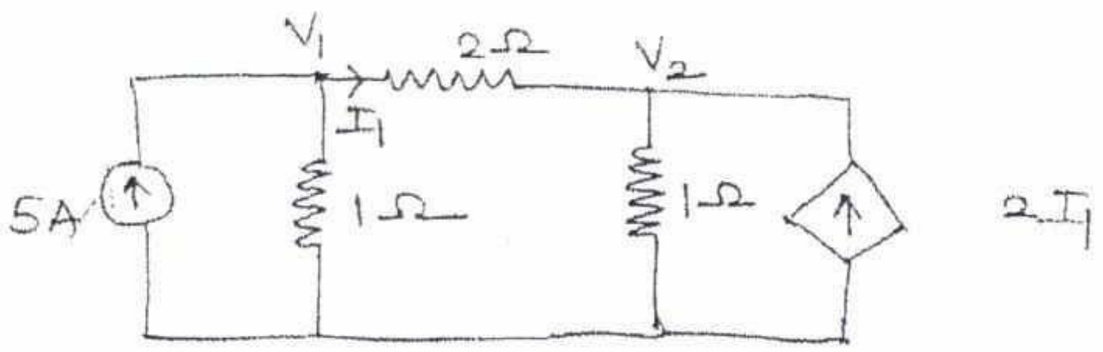
Q.P. Code : 24950

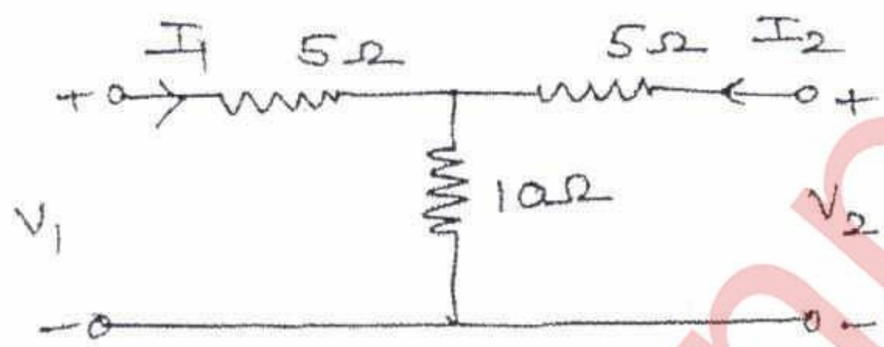
[Time: 3 Hours] [Marks: 80]

N.B: 1. Question No. 1 is compulsory.
2. Attempt any three from remaining questions.

1. a) Find voltages V_1 and V_2 by nodal Analysis for the circuit given below. 5



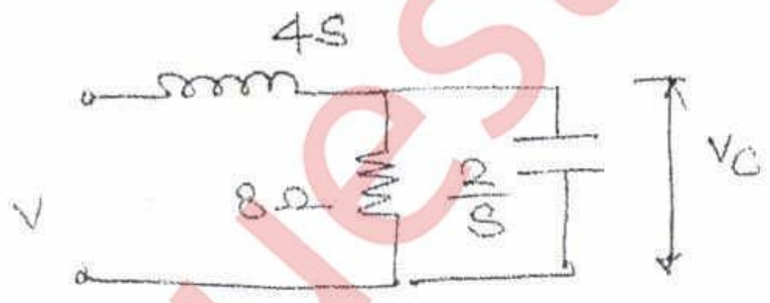
b) Find Z parameter of the following two port network. 5



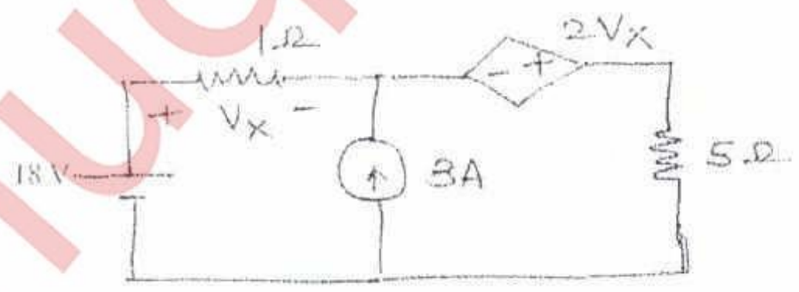
c) Synthesize in cauer I, cauer II, Foster I and Foster II forms. 5

$$Z(s) = \frac{S}{(S+2)}$$

d) For the Network shown find v_c/v. Also draw pole-zero plot. 5



2. a) Find the current through 5 Ω Resistor using superposition theorem. 10



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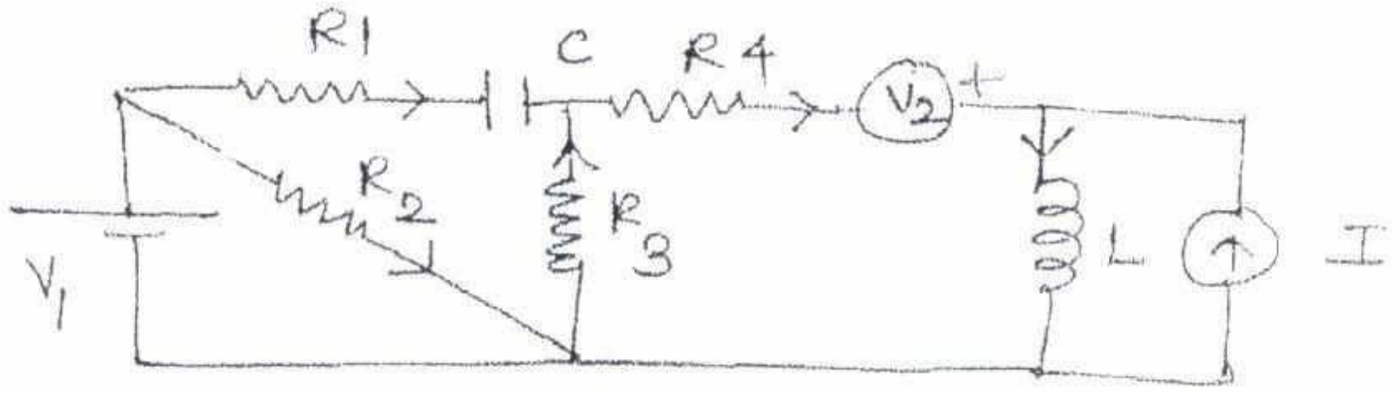
b) Draw the oriented graph for the following circuit and obtain its incidence matrix. 5

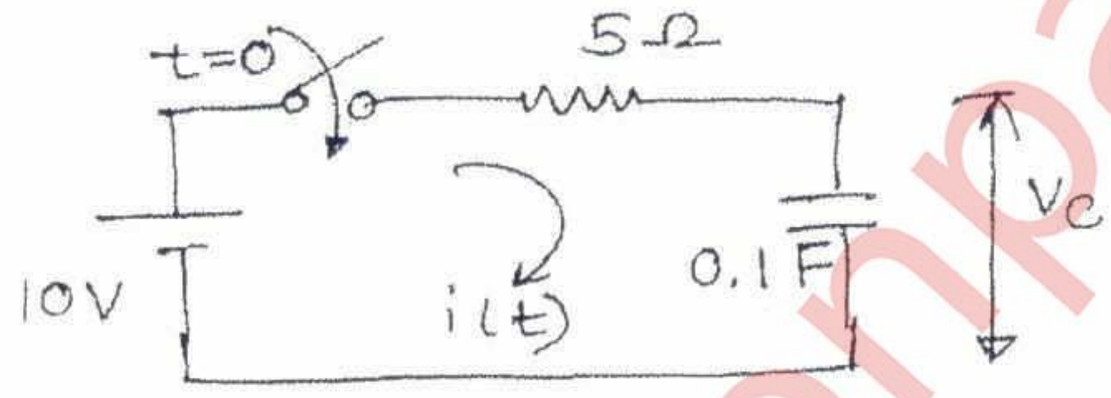


c) Find the condition for symmetry and Reciprocity in terms of Z parameter. 5

3. a) Realise Z(s) in foster I and foster II form. 10

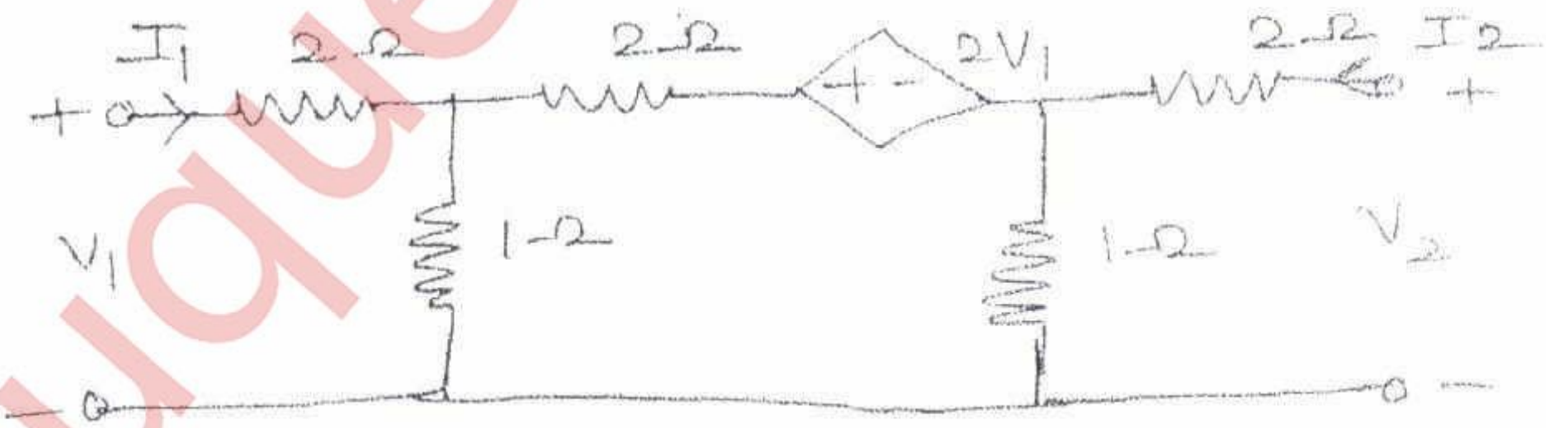
$$Z(s) = \frac{S\left(S^2+4\right)}{\left(S^2+1\right)\left(S^2+9\right)}$$

b) In the following series RC circuit switch is closed at t = 0. 5
Find i(t) and $v_c(t)$ for t > 0.



c) Test whether the given polynomial is Hurwitz 5
i) $S^4 + 7S^3 + 6S^2 + 21S + 8$
ii) $S^5 + S^3 + S$

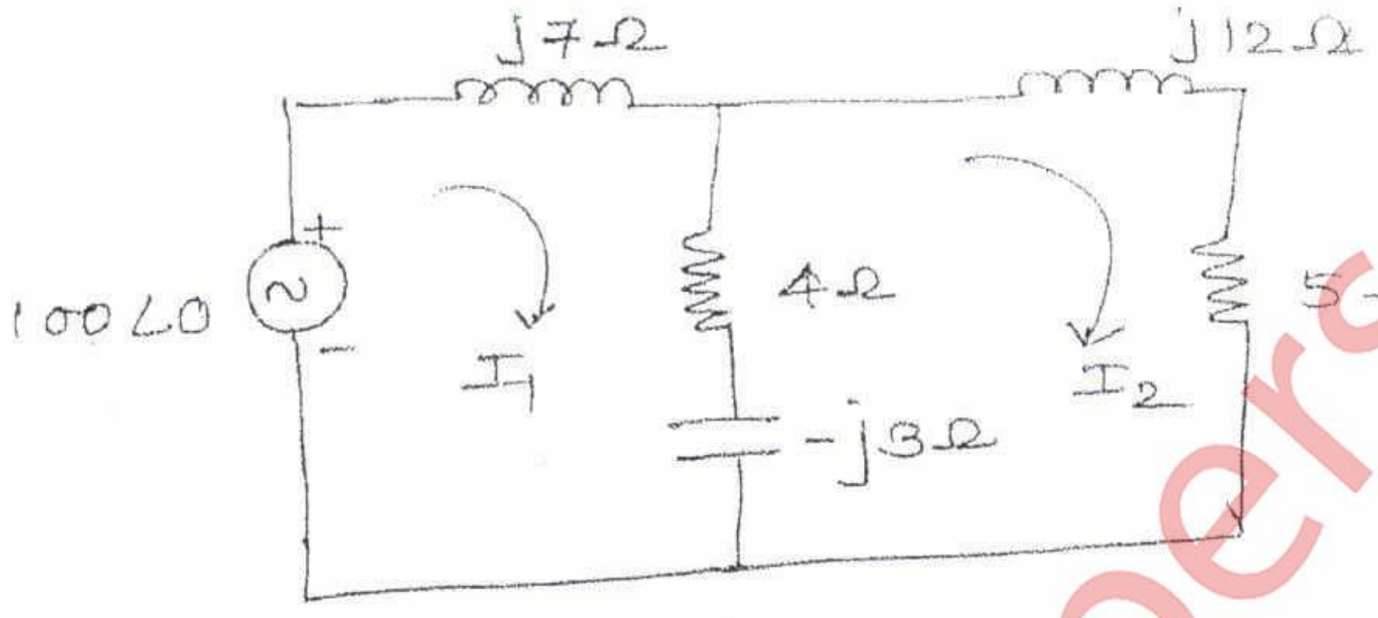
4. a) Find ABCD parameters of the following Network. 10



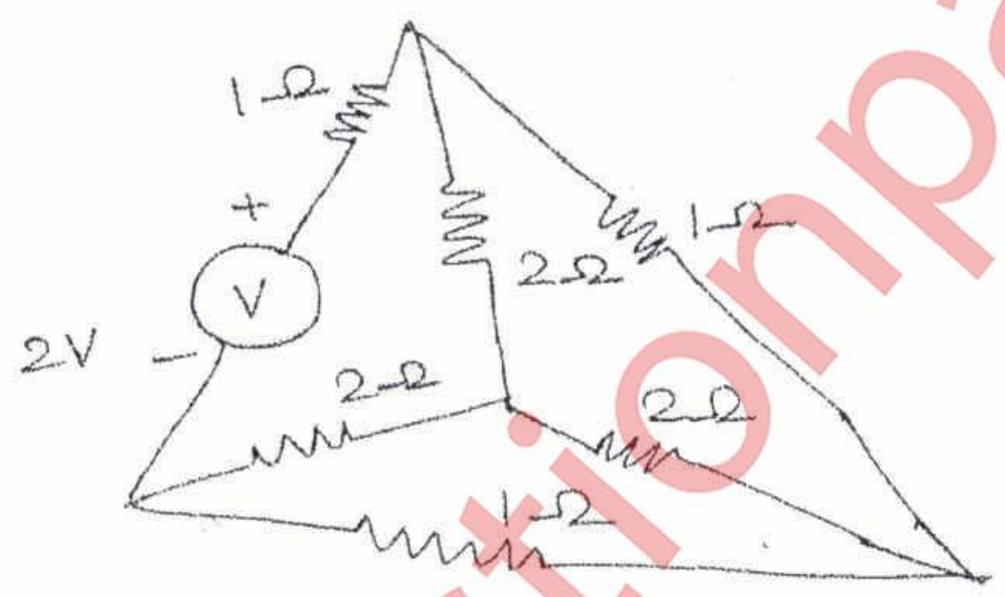
b) Test for positive Real function 5

$$F(S) = \frac{S^2 + 4}{\left(S^3 + 3S^2 + 3S + 1\right)}$$

c) Find I_2 using Mesh Analysis 5

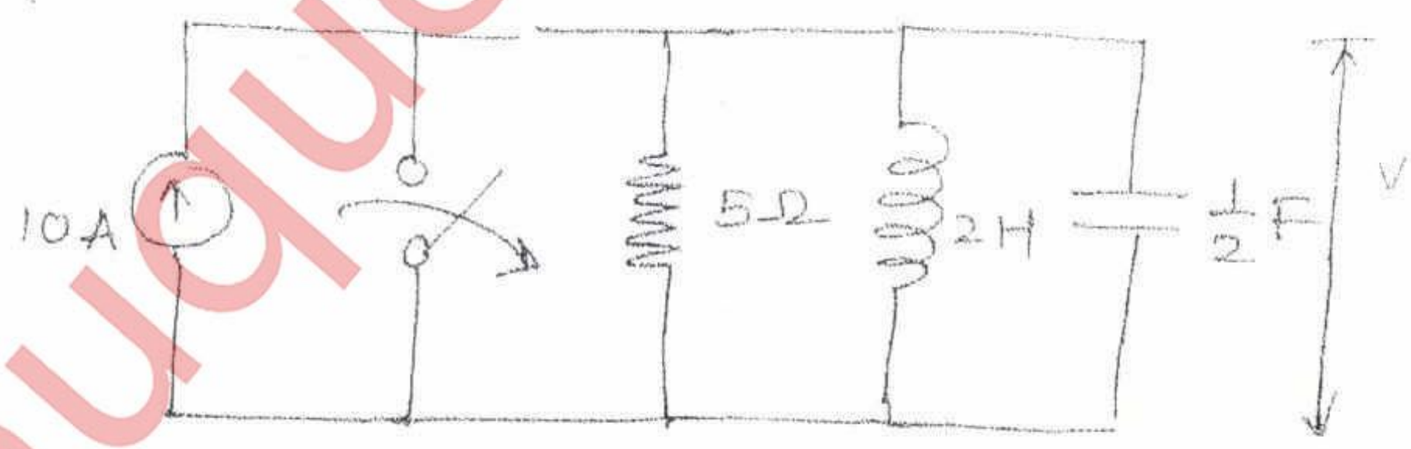


5. a) Obtain equilibrium equation using KVL in matrix form. Hence find link currents. 10

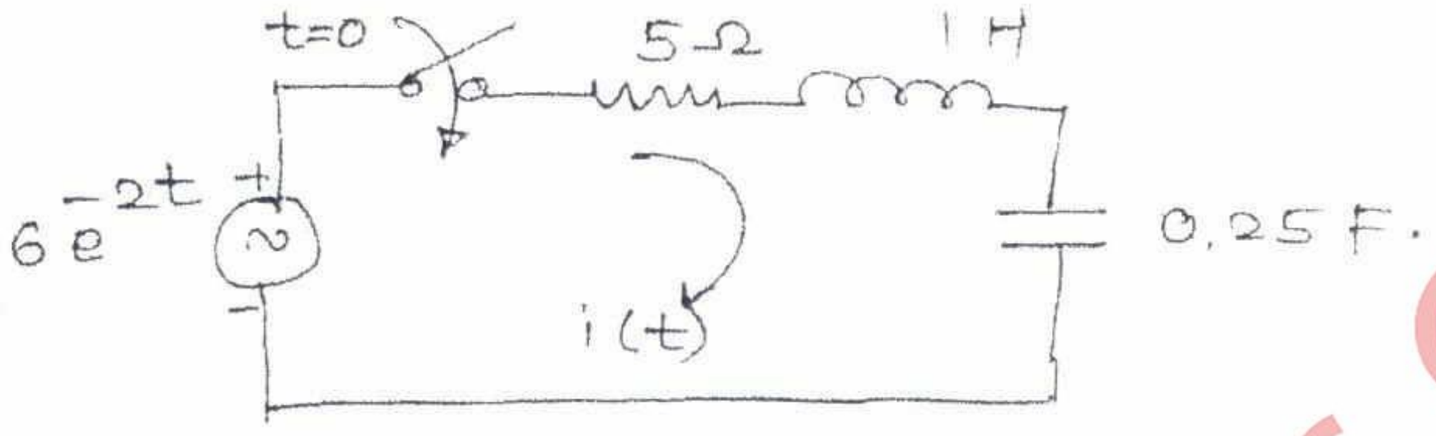


b) In the network given below the switch is closed for a long time and opened at t = 0 5

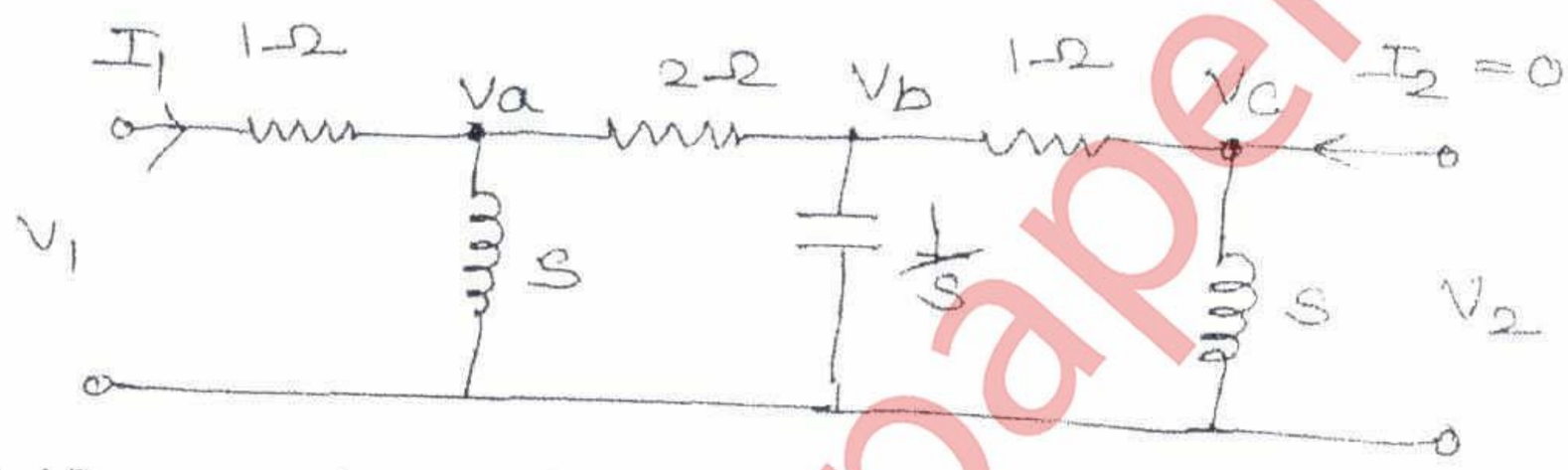
Find $v(0^+)$, $\frac{dv}{dt}(0^+)$ and $\frac{dv^2}{dt^2}(0^+)$



c) The switch is closed at t = 0. Determine current i(t). assuming zero initial condition, using Laplace transform. 5

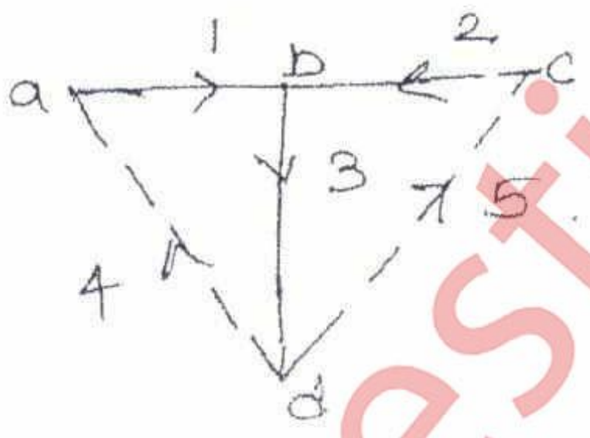


6. a) For the ladder Network shown below obtain V_1/V_2. V_2/I_1. 10



b) Find Z parameters in terms of Y parameters. 5

c) Obtain Tieset and f-cutset matrix for the following graph. 5



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sem III (EXTC)(CBCS) DSD Dec·17

7/12/17

Q.P. Code: 27581

N.B.: 1. Question No. 1 is compulsory.
2. Attempt any three questions out of remaining five questions.
3. Figures to the right indicate full marks.
4. Assume suitable data if required and mention it in answer sheet.

Q1. Solve following **(20 Marks)**

a) Explain the following decimals in gray code form
1. $(42)_{10}$ 2. $(17)_{10}$

b) Explain Mealy machine and Moore machine

c) Design a full adder using 3:8 Decoder

d) Convert JK flip flop to T flip flop.

Q2. a) Prove that NAND and NOR gates are Universal gates. **(10 Marks)**

b) Implement the following Boolean function using 8:1 multiplexer.
$F(A,B,C,D)=\sum M(0,1,4,5,6,8,10,12,13)$ **(10 Marks)**

Q3. a) Explain the Johnson's Counter. Design for initial state 0110. From initial state explain and draw all possible states. **(10 Marks)**

b) Minimize the following expression using Quine Mc-cluskey technique.
$F(A,B,C,D)=\sum M(0,1,2,3,5,7,9,11)$ **(10 Marks)**

Q4. a) Design a 2 bit comparator and implement using logic gates **(10 Marks)**

b) Using Boolean Algebra Prove the following
1. $AB+BC+\bar{A}C=AB+\bar{A}C$
2. $[(C+\bar{C}D)(C+\bar{C}\bar{D}][AB+\bar{A}\bar{B}+(A \text{ XOR } B)]=C$ **(10 Marks)**

Q5. a) Explain the working of 3 bit asynchronous counter with proper timing diagram **(10 Marks)**

b) What is shift register? Explain any one type of shift register. Give its applications. **(10 Marks)**

Q6. **(20 Marks)**
a) VHDL Code for Full Subtractor
b) Explain CPLD and FPGA
c) Explain SRAM and DRAM.
d) Compare TTL and CMOS logic families

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Sem III (EXTC)(CBCS) EDCT Dec-17 29/11/17

Q.P. Code: 25073

Time: 3 Hours **Marks: 80**

N.B.: (1) Question No. 1 is compulsory.
(2) Solve any three questions from the remaining five questions.
(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 5 questions **[20]**

(a) Explain various types of capacitors.
(b) Why should collector resistor R_C be as large as possible in the design of CE amplifier?
(c) Explain Zener as voltage regulator.
(d) State and explain Miller's Theorem.
(e) Draw and explain small signal model of a diode.
(f) Explain the hybrid pi model of BJT.

Q.2 (a) Explain the fabrication steps of passive elements. **[5]**
(b) Explain concept of zero temperature drift in JFET. **[5]**
(c) Design an L section LC filter with full wave rectifier to meet the following specifications: The DC output voltage $V_{DC} = 220$ V deliver $I_L = (70 \pm 20)$ mA to the resistive load and the required ripple factor is 0.04. **[10]**

Q.3 (a) Draw small signal hybrid parameter equivalent circuit for CE amplifier and define the same. What are the advantages of h parameters? **[10]**
(b) Determine I_{DQ}, V_{GSQ}, V_{DSQ} if $I_{DSS} = 9$ mA and $V_p = -3$ V for the circuit given in Fig. 3(b). **[10]**

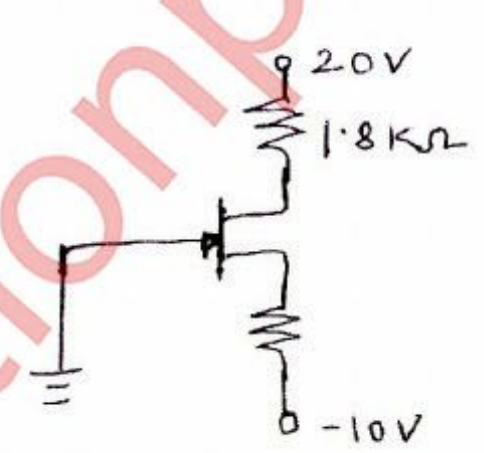

Fig. 3(b)

Q.4 (a) Design the resistors of a single stage CS amplifier for audio frequency with BFW11 with $I_{DS} = (3.3 \pm 0.6)$ mA and $|A_v| = 12$. **[10]**
(b) For the circuit shown below in Fig.4(b), the transistor parameters are $V_{BE(on)} = 0.7$ V, $\beta = 200$ and $V_A = \infty$. **[10]**
i) Derive the expression for lower cut-off frequency (or time constant) due to input coupling capacitor.
ii) Determine lower cut-off frequency and midband voltage gain.

TURN OVER

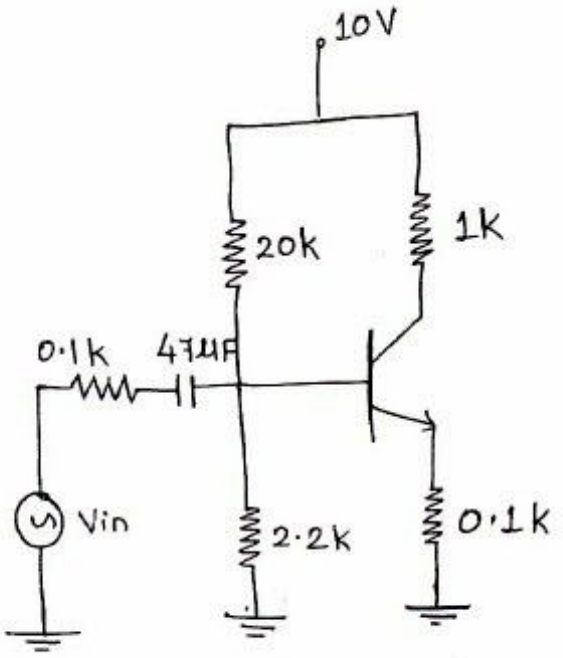

Fig. 4(b)

Q.5 (a) For the circuit using JFET as shown in Fig. 5(a), if I_{DSS} = 6 mA, V_p= -6 V, rd= ∞, C_{gd}= 4 pF, C_{gs}= 6 pF, C_{ds}= 1 pF, Determine i) V_{GSQ}, ii) I_{DQ}, iii) gmo, and iv) gm. **[10]**

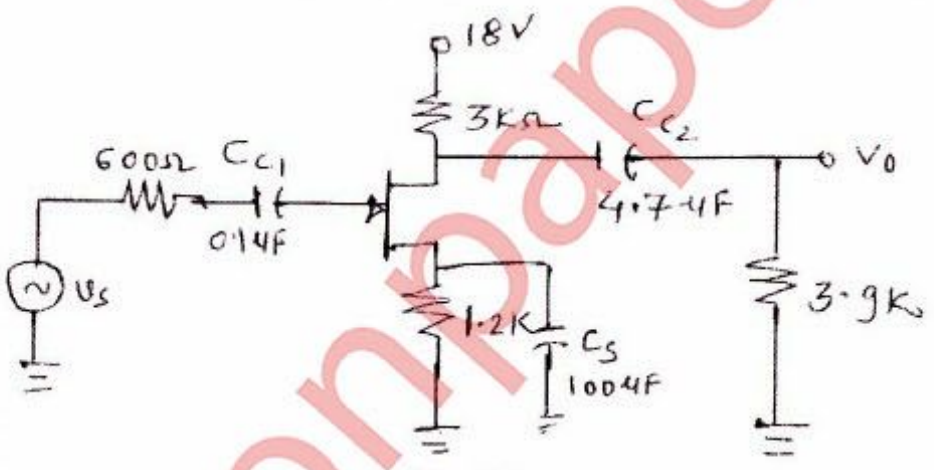

Fig. 5(a)

(b) For the circuit shown below in Fig. 5(b), the transistor parameters are V_{BE} $_{(on)}$ = 0.7 V, β = 100 and V_A = ∞. Determine Z_i, Z_o and A_V. **[10]**

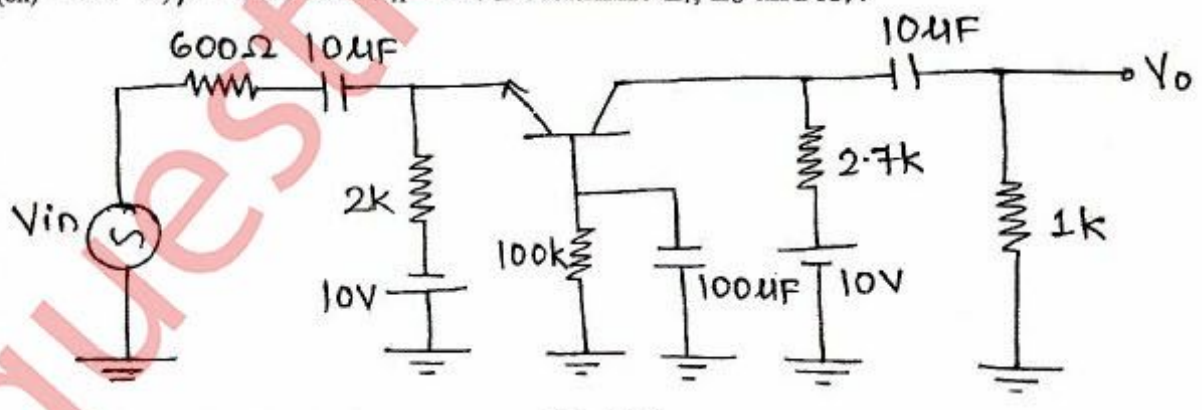

Fig. 5(b)

Q.6 Short notes on: (Attempt any four) **[20]**

(a) High frequency π equivalent model of common emitter BJT.
(b) Stability factors of various biasing techniques of BJT.
(c) Comparison of BJT CE and JFET CS amplifier.
(d) Different types of filters.
(e) JFET parameters.

TURN OVER

Transistor type	P_{tot} max @ 25°C Watts	$I_{C(sat)}$ max @ 25°C Amps	$V_{CE(sat)}$ volts d.c.	V_{CEO} volts d.c.	V_{CBO} (Sus) volts d.c.	V_{CER} (Sus) volts d.c.	V_{CEV} 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	15	0·05
BC147A	0·25	0·1	0·25	50	45	50	—	6	125	115	180	220	125	270	260	0·9	—	—
2N 525(PNP)	0·225	0·5	0·25	25	30	—	—	6	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

$-V_{GS}$ 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
I_{DS} max. mA	10	9·0	8·3	7·5	6·8	6·1	5·4	4·2	3·1	2·2	2·0	1·1	0·5	0·0
I_{DS} 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
I_{DS} 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_{GS} max. Volts	V_{DG} max. Volts	V_{GI} 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	0·50°C/mW
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	5600 μ ℧	2·5	50 KΩ	—	0·59° C/mW

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Q. P. Code: 22931

(3 Hours) [Total Marks : 80]

N. B. : (1) Question **No. 1** is **compulsory.**
(2) Attemt any **three** questions from **remaining** questions.
(3) Assume suitable **data** if **necessary**.

1. (a) Define static characteristics of an instrument. 4
(b) Compare open loop and closed loop control system with block diagram 4
(c) Derive an expression for the resistance using Wheastone bridge for balanced condition. 4
(d) Compare analog and digital data acquisition system. 4
(e) Explain Hurwitz stability criterion. 4

2. (a) Mention the sources of error in Q meter. Explain how Q meter is used to measure the high impedance 10
(b) A second order system is given by 10

$$\frac{C(S)}{R(S)} = \frac{25}{S^2+5S+25}$$

Find delay time, rise time, peak time, peak overshoot, settling time. Also find expression for its output response.

3. (a) The open loop transfer function of a unity feedback system is given by 10

$$G(S) = \frac{K}{S(S+4)(S+6)}$$

Sketch the Root locus of the system.

(b) Draw the bode plot for the given transfer function with unity feedack 10

$$G(S) = \frac{0.75(1+0.2S)}{S(1+0.5S)(1+0.1S)}$$

Calculate gain margin, phase margin and comment on stability.

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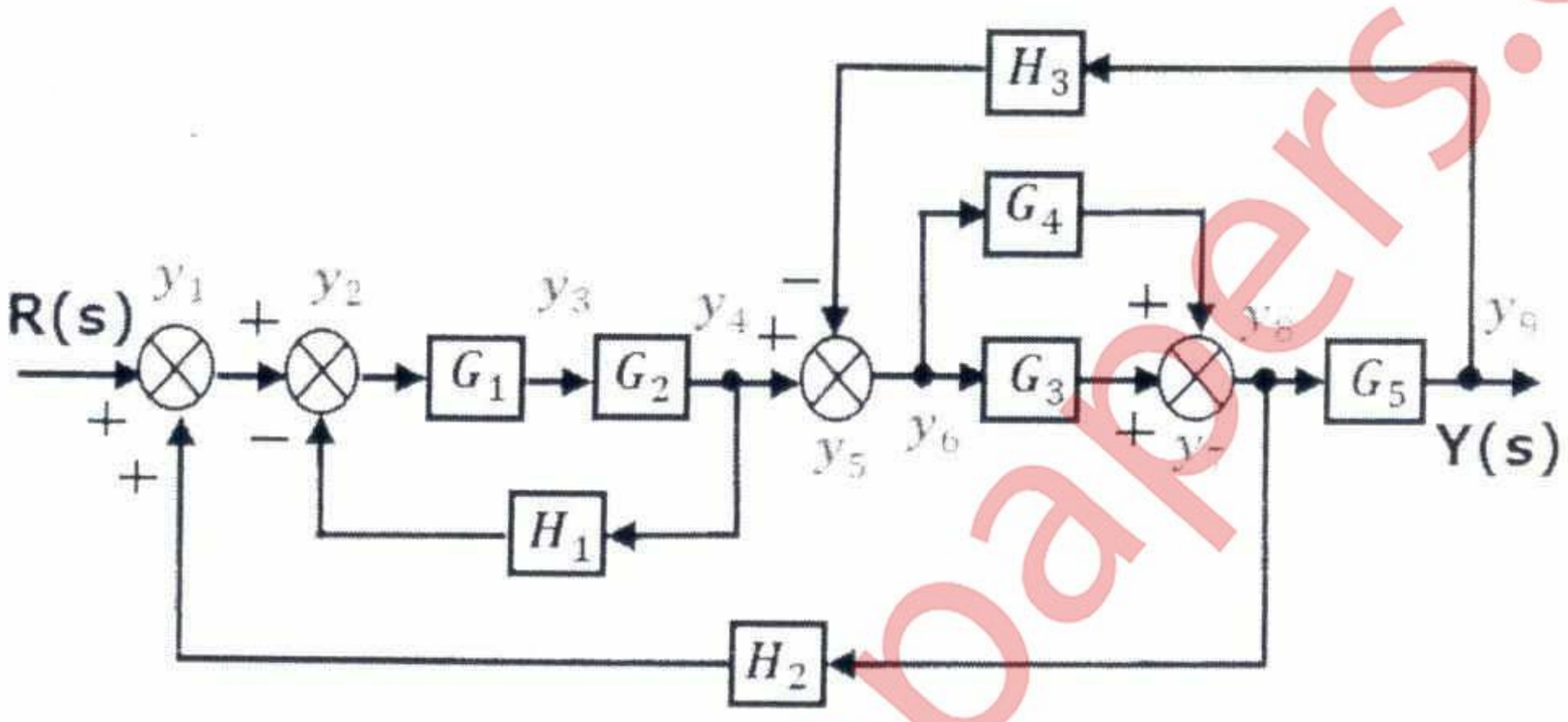
4 (a) I) Explain basic telemetry system 5

II) Using Routh stability criterion determine the stability of the system whose characteristic equation is 5

$$S^6 + 2S^5 + 8S^4 + 12S^3 + 20S^2 + 16S + 16$$

(b) Explain the working principle of LVDT with neat diagram and explain advantages and disadvantages of LVDT 10

5 (a) Draw signal flow graph for the system shown below. Find overall transfer function C(S)/R(S) using Mason's gain formula. 10



(b) Define power and energy. Explain the working of Electrodynamometer wattmeter. 10

6 (a) I) Explain digital data acquisition system. 5

II) Define the following parameters 5

i. Transient response
ii. Steady state response
iii. define Type 0, Type 1, Type 2 system

(b) I) Compare temperature transducer with respect to their characteristics and measurement range. 5

II) What are the advantages of polar plot. Draw the polar plot of the given transfer function 5

$$G(S) = \frac{10}{(s+2)}$$
