S·E / Sem III / EXTC / CBSGS / A·E - I / 23/11/17

**Q. P. Code: 24888**

**Duration: 3hours** **Maximum 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 5 questions [20]

a) Write down current equation of diode and explain significance of each parameter.

b) Calculate $I_B$, $I_C$ and $V_{CE}$ for the common emitter circuit shown in Fig. 1b

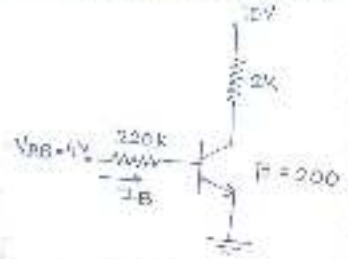


**Fig. 1b**

c) Explain effect of temperature on JFET and derive equation for zero temperature drift.

d) Compare CE, CB and CC configuration.

e) Draw small signal hybrid pi model of BJT including early effect.

f) Why LC oscillators are preferred for high frequency applications?

Q.2 a) Draw the output waveform for the clipper and clamper circuit shown in Fig 2a and 2b. [10]

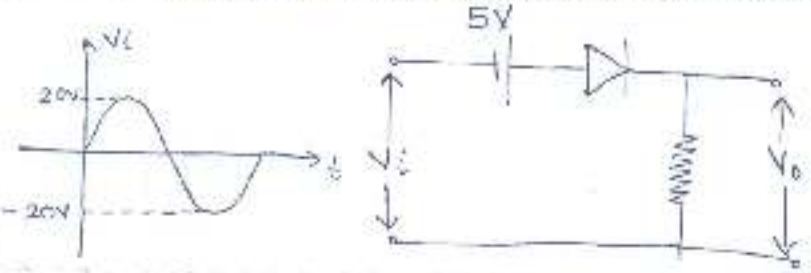


**Fig. 2a**

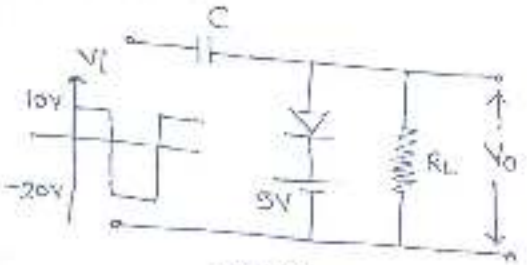


**Fig. 2b**

b) Derive the expression for frequency of oscillation for a transistorized (BJT) RC phase shift oscillator. [10]

Q.3 a) Find $I_{CQ}$ and $V_{CEQ}$ for the circuit shown in Fig 3a if $\beta$ = 100.

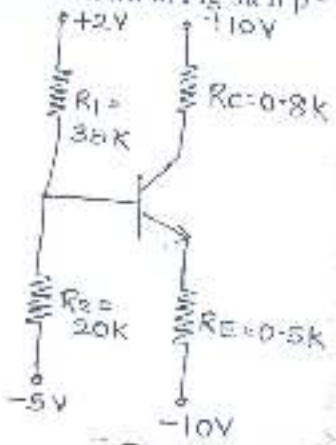


Fig. 3a

b) Explain the construction and characteristics of N-channel Enhancement MOSFET. Draw transfer and drain characteristics. [

Q.4 a) For the circuit shown in Fig. 4a, determine $V_{GSQ}$ and $V_{DSQ}$. Also calculate voltage gain, input impedance and output impedance. [
$V_{TN}$ = 1V, $K_N$ = 0.5 mA/V$^2$, $\lambda$=0.01V$^{-1}$

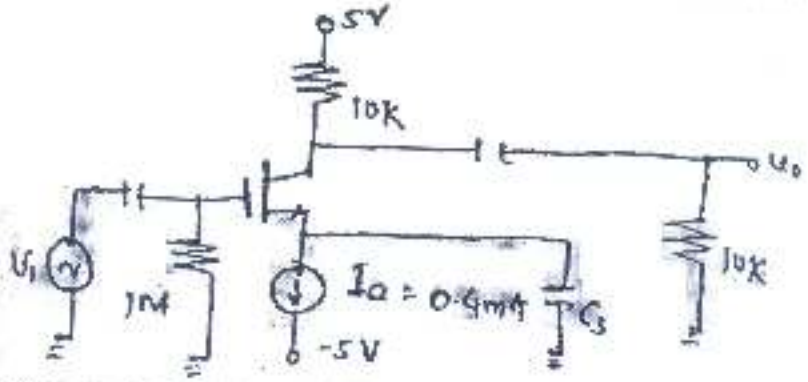


Fig.4a

b) Find $I_{DQ}$, $V_{GSQ}$, $V_{DSQ}$, $V_D$ and $V_S$ for the circuit shown in Fig 4b. [10

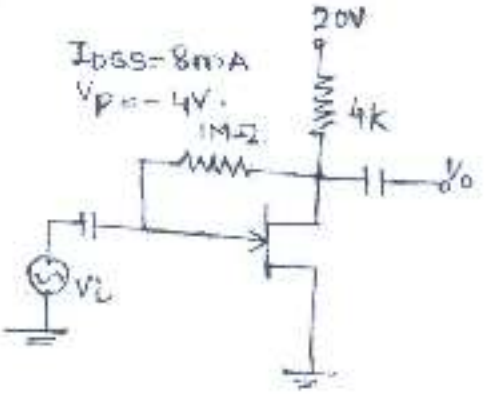


Fig. 4b

Q.5 a) For the circuit shown below in Fig.5b, the transistor parameters are $V_{BE(on)} = 0.7$ V, [10]
$\beta = 100$ and $V_A = \infty$. Determine $Z_i$, $Z_o$ and $A_V$

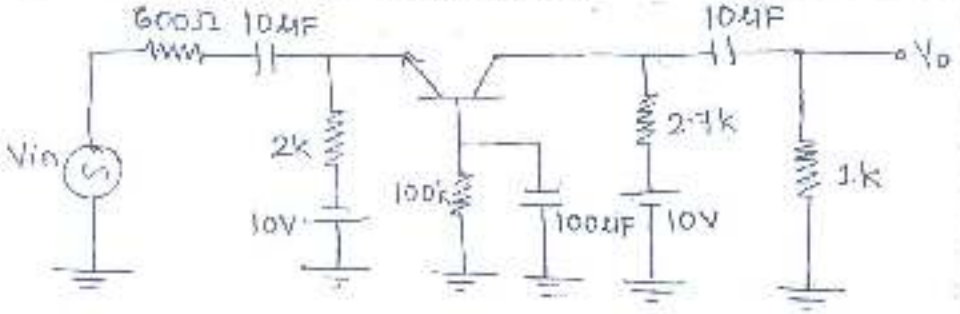


Fig. 5a

b) Draw and explain energy band diagram of MOS capacitor in accumulation, depletion and inversion region. [10]

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

a) Construction and operation of varactor diode
b) Crystal oscillator
c) Transistor as a switch
d) Emitter follower
e) Regions of operation of FET

S·E / EXTC / Sem III / CBCGS / Nov-Dec / 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 $f(x)=9-x^2, \quad -3\le x\le 3$ [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 $\bar{F}=ye^{xy}\cos z\,\hat{i}+xe^{xy}\cos z\,\hat{j}-e^{xy}\sin z\,\hat{k}$ is irrotational vector field. Find $\phi$ if $\bar{F}=\nabla\phi$ and also evaluate $\int_P^Q \bar{F}.d\bar{r}$ along a curve joining the points P(0,0,0) and Q(-1,2, $\pi$). [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 [5]

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

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 $\iint_S \bar{F}.d\bar{s}$ where $\bar{F}=4x\hat{i}-2y^2\hat{j}+z^2\hat{k}$ 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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SEM III / Nov - Dec 2017 / EXTC / EDC - I / CBCGS

29/11/2017

**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 ± 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]**

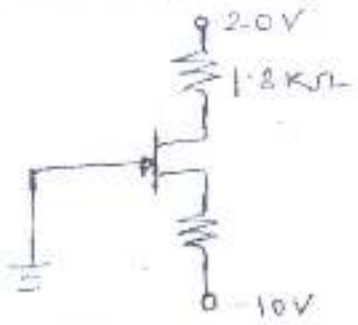


Fig. 3(b)

**Q.4** (a) Design the resistors of a single stage CS amplifier for audio frequency with BFW11 with $I_{DS}$ = (5.3 ± 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, β = 200 and $V_A$ = ∞. **[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**

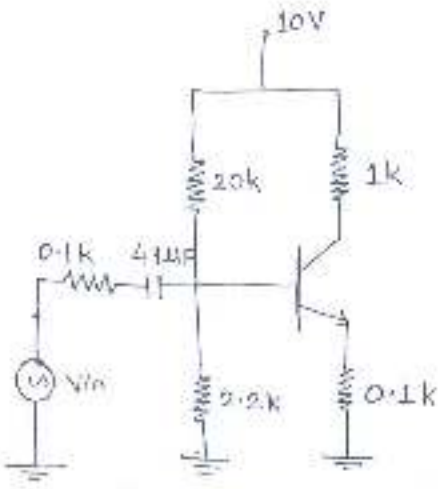


Fig. 4(b)

Q.5 (a) For the circuit using JFET as shown in Fig. 5(a), if $I_{DSS}$ = 6 mA, $V_p$ = -6 V, $r_d$ = ∞, $C_{gd}$ = 4 pF, $C_{gs}$ = 6 pF, $C_d$ = 1 pF, Determine i) $V_{GSQ}$, ii) $I_{DQ}$, iii) $g_{mo}$, and iv) $g_m$. [1

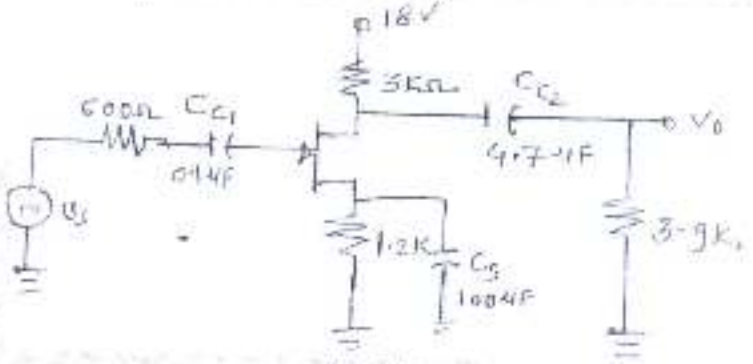


Fig. 5(a)

(b) For the circuit shown below in Fig. 5(b), the transistor parameters are $V_{BE}$ = 0.7 V, $\beta$ = 100 and $V_A$ = ∞. Determine $Z_i$, $Z_o$ and $A_V$. [1

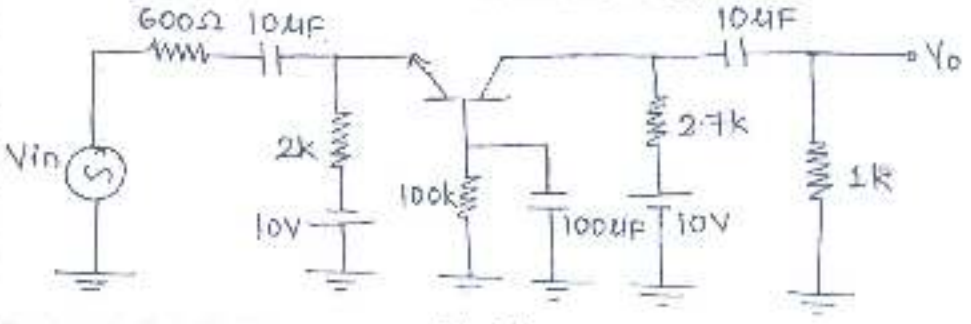


Fig. 5(b)

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.

| Transistor type | $P_{tot}$ max @ 25°C Watts | $I_{C(max)}$ @ 25°C Amps | $V_{CE}$ (sat) volts d.c. | $V_{CEO}$ volts d.c. | $V_{CER}$ (5Ω) volts d.c. | $V_{CES}$ (5Ω) volts d.c. | $V_{CBO}$ volts d.c. | $V_{EBO}$ volts d.c. | $T_j$ max °C | D.C. current gain min. | typ. | max. | Small signal gain min. | Typical $f_T$ | $f_T$ max. | $V_{BE}$ max. | $C_{ob}$ pF | 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 169 | 30-0 | 4-0 | 1-0 | 50 | 40 | — | — | 5 | 150 | 90 | 50 | 110 | 23 | 60 | 115 | 1-2 | 4-0 | 0-1 |
| ECN 100 | 5-0 | 0-7 | 0-6 | 70 | 60 | 65 | — | 6 | 200 | 50 | 90 | 280 | 50 | 90 | 220 | 0-9 | 15 | 0-05 |
| BC347A | 0-25 | 0-1 | 0-25 | 50 | 45 | 50 | — | 6 | 125 | 110 | 180 | 220 | 125 | 270 | 280 | 0-9 | — | — |
| 2N 525(PNP) | 0-225 | 0-5 | 0-25 | 85 | 30 | — | — | — | 100 | 25 | — | 65 | — | 45 | — | — | — | — |
| BC147B | 0-25 | 0-1 | 0-25 | 50 | 45 | 50 | — | 6 | 125 | 200 | 290 | 450 | 240 | 330 | 500 | 0-7 | — | — |

| Transistor type | $h_{ie}$ | $h_{oe}$ | $h_{re}$ | $\theta_{ja}$ |
|---|---|---|---|---|
| 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 169 | 250 Ω | — | — | — |
| ECN 055 | 100 Ω | — | — | — |
| 2N 3055 | 25 Ω | — | — | — |

BFW 11—JFET NOTIONAL CHARACTERISTICS

| $V_{GS}$ volts | 0·0 | 0·2 | 0·4 | 0·6 | 0·8 | 1·0 | 1·2 | 1·4 | 2·0 | 2·5 | 3·0 | 3·5 | 4·0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $I_{DS}$ max. mA | 10 | 9·8 | 8·5 | 7·6 | 6·8 | 6·1 | 5·4 | 4·2 | 3·1 | 2·2 | 1·4 | 0·8 | 0·5 |
| $I_{DS}$ typ. mA | 7·0 | 6·8 | 5·4 | 4·6 | 4·0 | 3·3 | 2·3 | 1·7 | 0·8 | 0·2 | 0·0 | 0·0 | 0·0 |
| $I_{DS}$ min. mA | 4·0 | 3·8 | 2·3 | 1·6 | 1·0 | 0·5 | 0·0 | 0·0 | 0·0 | 0·0 | 0·0 | 0·0 | 0·0 |

N-Channel JFET

| Type | $V_{DS}$ max. Volts | $V_{GS}$ max. Volts | $V_{DG}$ max. Volts | $P_T$ max. @25°C | $T_j$ max. | $I_{DSS}$ | $g_{fs}$ (typical) | $V_p$ Volts | $r_{ds}$ | Derate above 25°C | $\theta_{ja}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2N5622 | 30 | 30 | 35 | 300 mW | 175°C | 2 mA | 3000 μ ℧ | 6 | 50 KΩ | 2 mW/°C | 0·5°C/mW |
| BFW 11 (Optional) | 30 | 30 | 35 | 500 mW | 200°C | 7 mA | 5600 μ ℧ | 2·5 | 50 KΩ | — | 0·2°C/mW |

SEM-III / CBSGS / Nov-Dec 17/ ~~Mech-A~~ EXTC / Am-III

**Q.P. Code : 13606**

**( 3 Hours)** **[ Total marks : 80**

Note :- 1) Question number 1 is **compulsory.**
2) Attempt any **three** questions from the remaining **five** questions.
3) **Figures** to the **right** indicate **full** marks.

Q.1 a) Find the angle between the surfaces 05
$x \log z + 1 - y^2 = 0, \quad x^2y + z = 2$ at $(1, 1, 1)$.

b) 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. 05

c) Find the Laplace transform of $\int_0^t u^{-1} e^{-u} \sin u \, du$ 05

d) Prove that $f(z) = (x^3 - 3xy^2 + 2xy) + i(3x^2y - x^2 + y^2 - y^3)$ is analytic and find $f'(z)$ and $f(z)$ in terms of $z$. 05

Q.2 a) Obtain half- range sine series of $f(x) = x(\pi - x)$ in $(0, \pi)$ and hence, find the value of $\sum \frac{(-1)^n}{(2n-1)^3}$ 06

b) Prove that 06
$\bar{F} = (y^2 \cos x + z^3)\,\hat{i} + (2y \sin x - 4)\,\hat{j} + (3xz^2 + 2)\,\hat{k}$
is a conservative field. Find the scalar potential for $\bar{F}$.

c) Find the inverse Laplace transform of 08

(i) $\dfrac{s+2}{s^2 - 4s + 13}$

(ii) $\dfrac{1}{(s-a)(s-b)}$

Q.3 a) Prove that $J_{5/2}(x) = \sqrt{\frac{2}{\pi x}} \left(\frac{3 - x^2}{x^2} \sin x - \frac{3}{x} \cos x\right)$. 06

b) Find the analytic function $f(z) = u + iv$ if 06
$3u + 2v = y^2 - x^2 + 16xy$.

**TURN OVER**

c) Expand $f(x) = \begin{cases} \pi x, & 0 < x < 1 \\ 0, & 1 < x < 2 \end{cases}$ period 2 into a Fourier Series. 08

Q. 4 a) Prove that 06
$\int x^3 \cdot J_0(x)\, dx = x^3 \cdot J_1(x) - 2x^2 \cdot J_2(x)$.

b) Use Stoke's Theorem to evaluate $\int_C \bar{F} \cdot d\bar{r}$ 06
where $\bar{F} = yz\, i + zx\, j + xy\, k$
and $C$ is the boundary of the circle $x^2 + y^2 + z^2 = 1,\ z = 0$.

c) Solve using Laplace transform $(D^2 - 3D + 2)\, y = 4e^{2t}$ with 08
$y(0) = -3$ and $y'(0) = 5$.

Q. 5 a) Prove that $2J_0''(x) = J_2(x) - J_0(x)$. 06

b) Use Laplace transform to evaluate 06
$\int_0^\infty e^{-t} \left( \int_0^t u^2 \sin hu \cos hu\, du \right) dt$.

c) Obtain complex form of Fourier Series for $f(x) = e^{ax}$ in $(-\pi, \pi)$ 08
where $a$ is not an integer. Hence deduce that when $\alpha$ is a constant other than an integer

$$\cos \alpha x = \frac{\sin \pi\alpha}{\pi} \sum \frac{(-1)^n \alpha}{(\alpha^2 - n^2)}\, e^{in\alpha x}$$

Q. 6 a) Express the function 06

$$f(x) = \begin{cases} -e^{kx} & for\ x < 0 \\ e^{-kx} & for\ x > 0 \end{cases}$$

as Fourier Integral and hence, prove that

$$\int_0^\infty \frac{\omega \sin \omega x}{\omega^2 + k^2}\, d\omega = \frac{\pi}{2} e^{-kx} \quad if \quad x > 0, k > 0.$$

b) Using Green's theorem evaluate 06

$$\oint_C \left(e^{x^2} - xy\right) dx - \left(y^2 - ax\right) dy$$

where $C$ is the circle $x^2 + y^2 = a^2$.

c) Under the transformation $w = \frac{z-1}{z+1}$, show that the map of the straight line $y = x$ is a circle and find its center and radius. 08

xxx xxx

SE/ EXTC / SEM-III / CBSGS / DSP / 07/12/19.

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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ETE/SE/DE/SEM-III/CBSGS/7-12-17.

**Q. P. Code : 20753**

Time : 3 Hours | Total Marks: 80



N.B. 1. Question No. 1 is **Compulsory**
2. Out of remaining questions, attempt any **three**
3. **Assume** suitable data if required
4. Figures to the right indicate **full marks**

1. (a) Compare SRAM and DRAM [5]
(b) Compare Mealy and Moore machine [5]
(c) Compare TTL and CMOS Logic [5]
(d) Compare PLA with PAL [5]

2. (a) Prove that NAND and NOR Gates are universal Gates [10]
(b) Design a full subtractor and implement using logic Gates [10]

3. (a) Design a 4 bit Binary to Grey code converter [10]
(b) Implement the given function using 8:1 Multiplexer [10]
$F(A, B, C, D) = \sum m(0, 1, 2, 4, 5, 6, 7, 8, 9, 10, 12, 13)$

4. (a) Explain 4-bit asynchronous up counter with proper timing diagram [10]
(b) Write a VHDL program to design a 4:1 Mux [10]

5. (a) Minimize the following expression using Quine McClusky Technique [10]
$F(A,B,C,D) = \sum m(0, 1, 2, 3, 5, 7, 9, 11, 15)$
(b) Convert JK FF to T FF and SR FF to D FF [10]

6. (a) Design synchronous mod 5 counter using T FF [10]
(b) Write a note on CPLDs [10]

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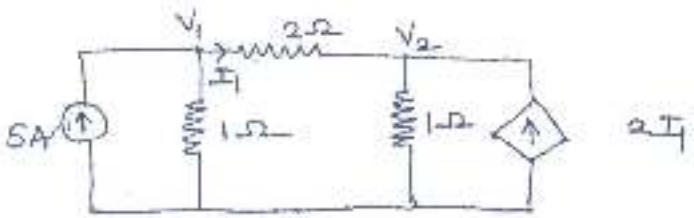
SE EXTC | II | 063085 | CTN | 13-12-17

Q.P. Code : 24950

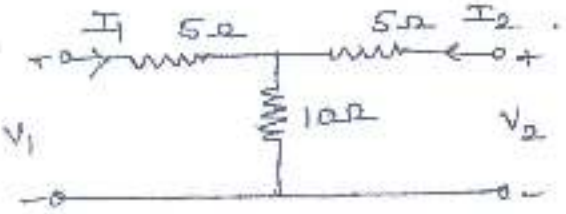
[Time: 3 Hours] [ Marks: 80]

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



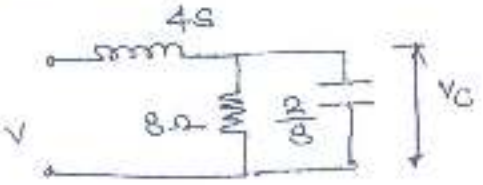

b) Find Z parameter of the following two port network. 5



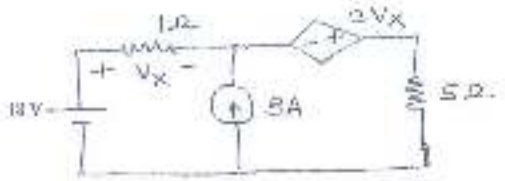

c) Synthesize in cauer I, cauer II, Foster I and Foster II forms. 5

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

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

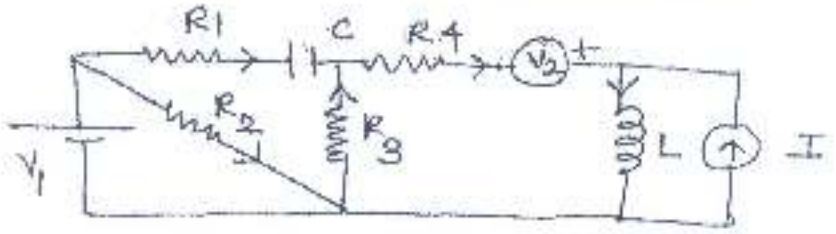



2. a) Find the current through 5Ω Resistor using superposition theorem. 10




Turn Over

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

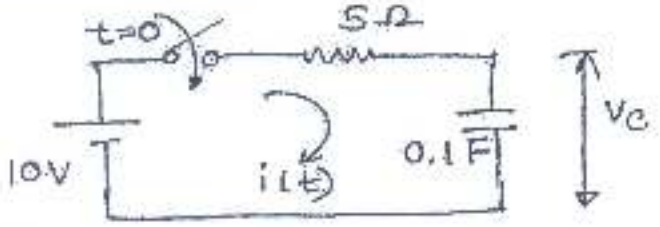



c) Find the condition for symmetry and Reciprocity in terms of Z parameter. 5

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

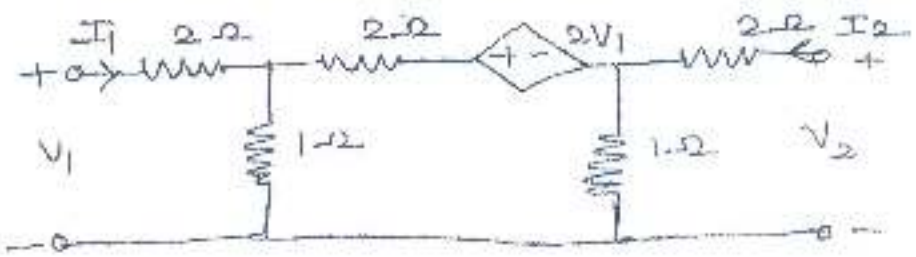
$$Z(s) = \frac{S(S^2+4)}{(S^2+1)(S^2+9)}$$

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) $S^5 + S^3 + S$

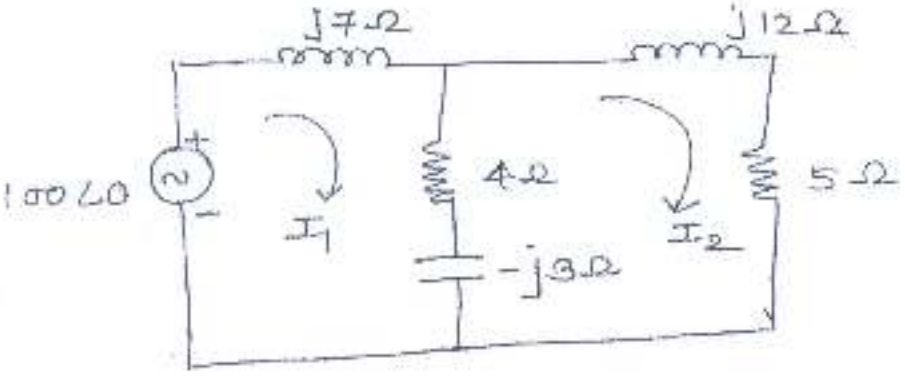
4. a) Find ABCD parameters of the following Network. 10



b) Test for positive Real function 5

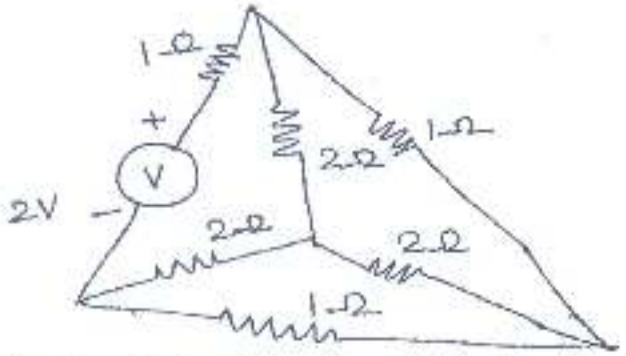
$$F(S)=\frac{S^2+4}{\left(S^3+3S^2+3S+1\right)}$$

c) Find $I_2$ using Mesh Analysis 5

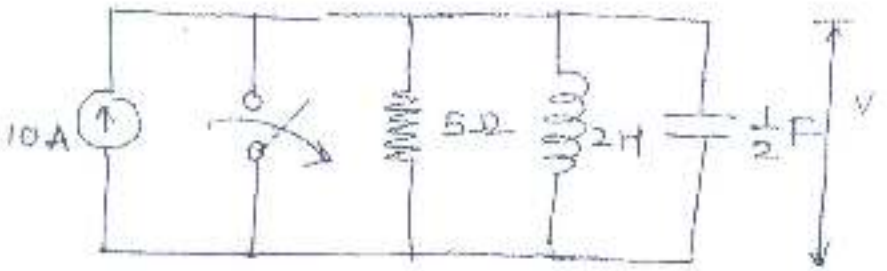




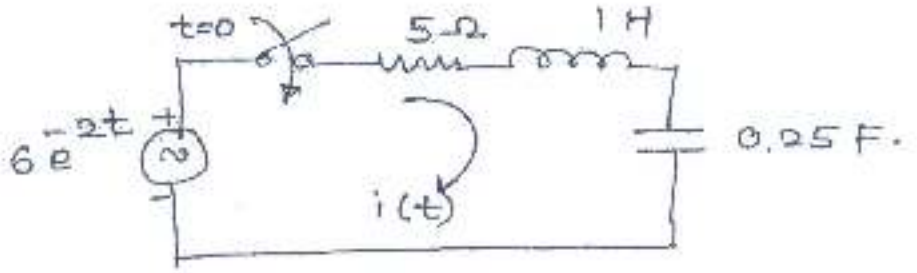

5. a) Obtain equilibrium equation using KVL in matrix form. Hence find link currents. 10



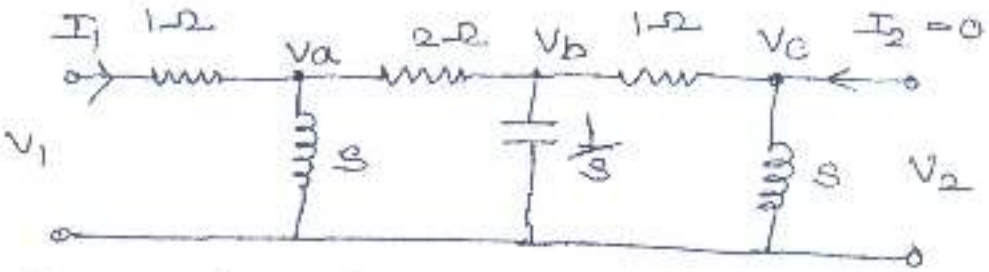

b) In the network given below the switch is closed for a long time and opened at t = 0 5
Find $v(0^-)$, $\frac{dv}{dt}(0^+)$ and $\frac{dv^2}{dt^2}(0^+)$



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




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




b) Find Z parameters in terms of Y parameters.

c) Obtain Tieset and f-cutset matrix for the following graph.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III / SE EXTC / 63505 / EMC) 13-12-17

**Q. P. Code: 26311**

**(3Hours)**

**Total Marks: 80**

**Instructions** – i) Questions 1 is Compulsory
ii) Out of remaining questions attempt any three questions
iii) Figures in the bracket to the right hand side indicate full marks.

| | | | |
|---|---|---|---|
| Q.1 | a) | Explain alternate and chopped mode in dual trace CRO. | (05) |
| | b) | Define precision, accuracy and sensitivity with suitable example. | (05) |
| | c) | Explain selection criteria for transducers. | (05) |
| | d) | Write a note on piezoelectric transducer. | (05) |
| Q.2 | a) | Explain working of strain gauge and derive expression for gauge factor. | (10) |
| Q.2 | b) | Explain Kelvins'double bridge and its application in low resistance measurement. | (10) |
| Q.3 | a) | Write a note on applications of Q meter. | (10) |
| Q.3 | b) | Define power and energy and explain working of a single phase energy meter. | (10) |
| Q.4 | a) | Explain heterodyne type wave analyser and its application. | (10) |
| Q.4 | b) | Draw and explain Schering bridge and drive expression for measurement of capacitance. | (10) |
| Q.5 | a) | Draw and explain R_2Rladder network DAC for 3 bit input taking suitable example. | (10) |
| Q.5 | b) | Discuss DSO with the help of block diagram along with various modes of operation also explain its applications. | (10) |
| Q.6 | a) | Draw and explain capacitive transducer for level measurement | (10) |
| Q.6 | b) | Explain SAR type ADC with neat block diagram and comment on its speed. | (10) |

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SE/EXTC/III/CBSGS/CTL/19-1247

Q.P. Code: 27027

[Time:3 Hours] [ Marks:80]

N.B

1. Question **No.1** is compulsory.
2. Attempt **any three** questions from remaining five questions.
3. Assume **suitable data** if required.
4. Use **Smith chart** for the transmission line problem if asked.

Q.1)(a) Find the Norton's equivalent circuit across the terminal a-b for the circuit shown in Figure No.1. (5-M)

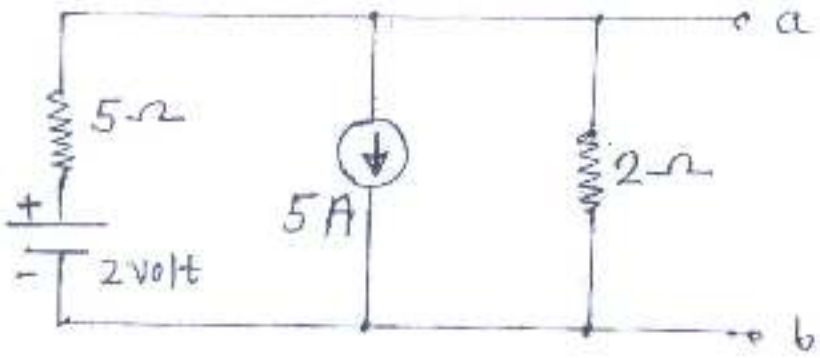


Figure No.1

(b) Obtain the instantaneous value of currents through R and L and obtain the total current in terms of RMS value for the circuit shown in Figure No.2. This circuit is energized by a sinusoidal a.c. voltage of v= 100sin (1000t+36) volt. (5-M).

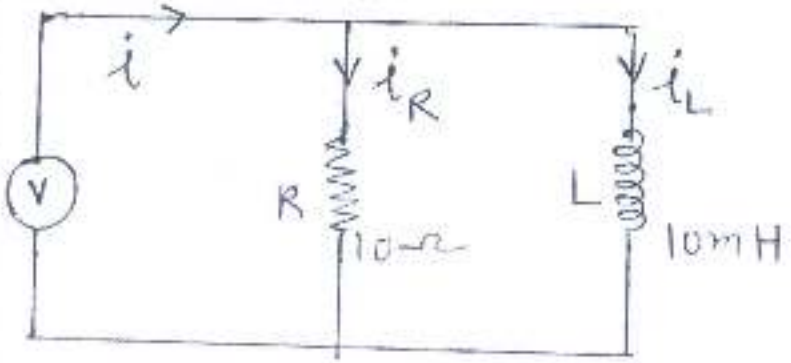


Figure No.2

(c) Determine the Z- parameters for the circuit shown in Figure No.3. (5-M)

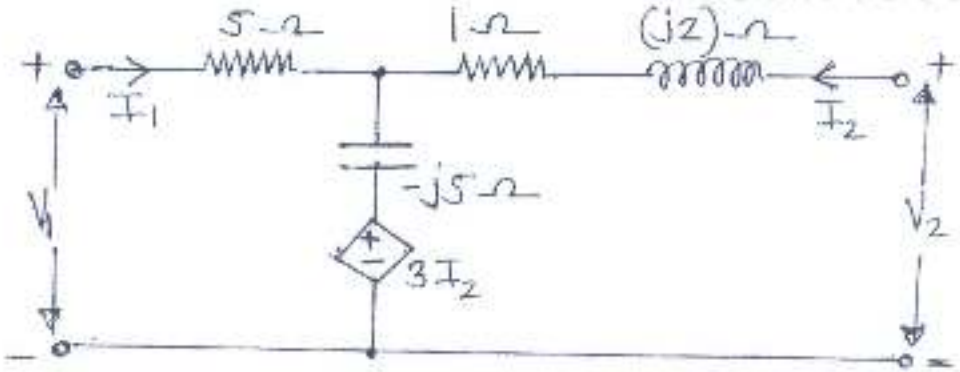


Figure No 3

(d) Differentiate between lossy transmission line and lossless transmission line with respect to (i) Equivalent circuit (ii) Propagation constant (iii) Attenuation constant (iv) Characteristic impedance (v) Input impedance. (5-M)

Q.2) (a) Find the transmission parameters for the circuit shown in Figure No.4 (10-M)

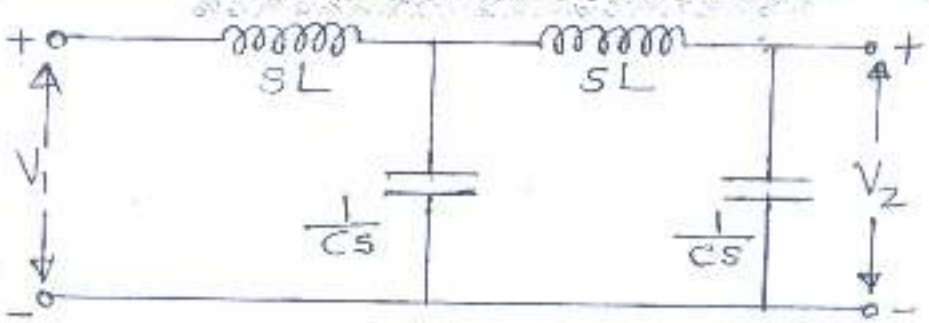


Figure No 4

(b) For network shown in Figure No.5, the switch is opened at t = 0, find v(t) for t > 0. (10-M)

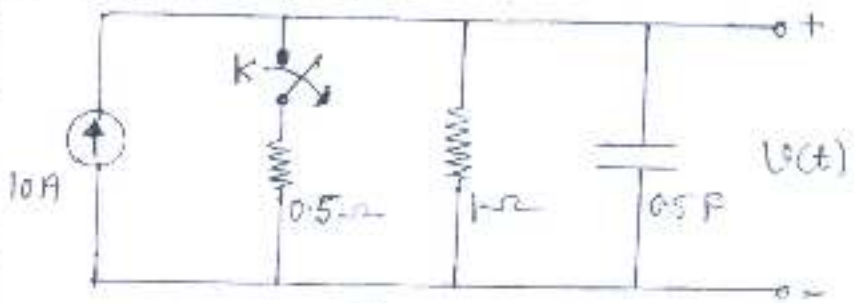


Figure No 5

Q.3) (a) Find the Thevenin's equivalent circuit for the network shown in Figure No.6 at the right of the terminal a-b. (10-M)

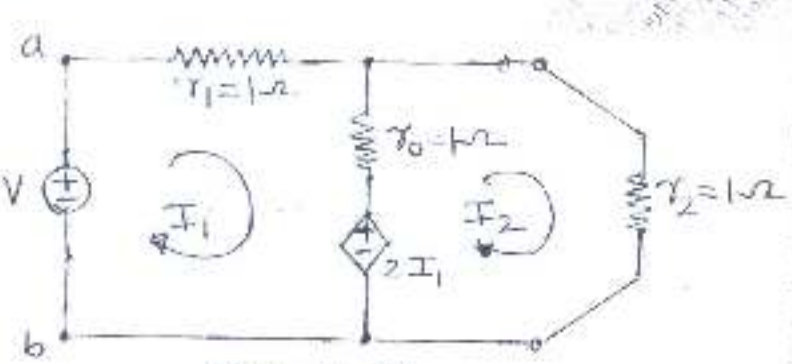


Figure No. 6

(b) A series RC combination, having an impedance of $Z_0 = (450\text{-}j600)\,\Omega$ at 100 MHz, is connected to a 300 Ω transmission line. Calculate in meters the position and length of short circuited shunt stub designed to match this load to the line. Give any one solution and solve using **Smith chart** only. (10-M)

Q.4) (a) A driving point impedance is given by $Z_{in}(s) = \frac{s(s^2+4)(s^2+6)}{(s^2+1)(s^2+5)}$. Obtain the first form of Cauer network. (10-M)

(b) Find the voltage drop across the capacitor and the resistor for the circuit shown in Figure No.7. (10-M)

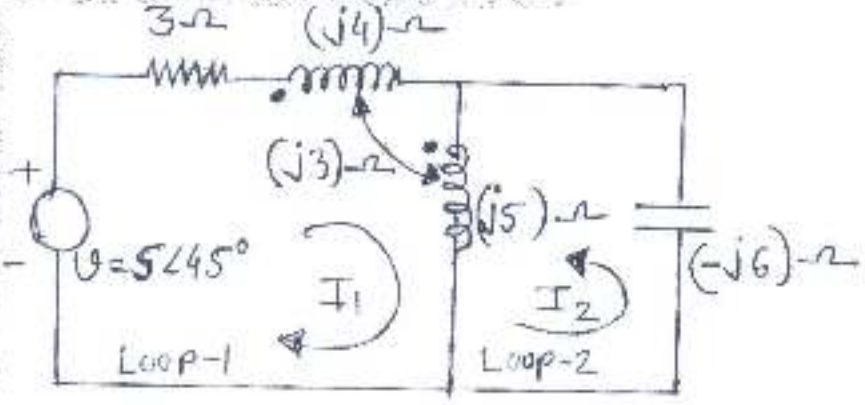


Figure No. 7

Q.5) (a) Find the Z parameters for the network shown in Figure No.8 (10-M)

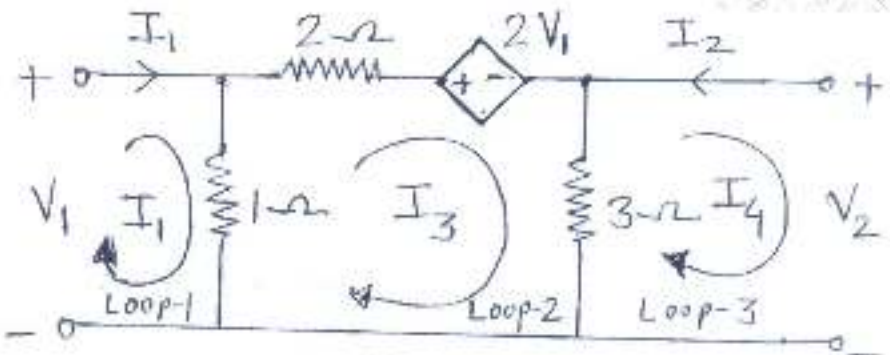


Figure No·8

(b) (I) State properties of the positive real function (PRF). (5-M)

(II) Check positive realness of the function $Y(s) = \frac{s^2+25s+20}{s+10}$ with proper reason. (5-M)

Q.6) (a) Find $V_c(t)$ and $I_L(t)$ in the circuit shown in Figure No.9 assuming zero initial conditions (10-M)

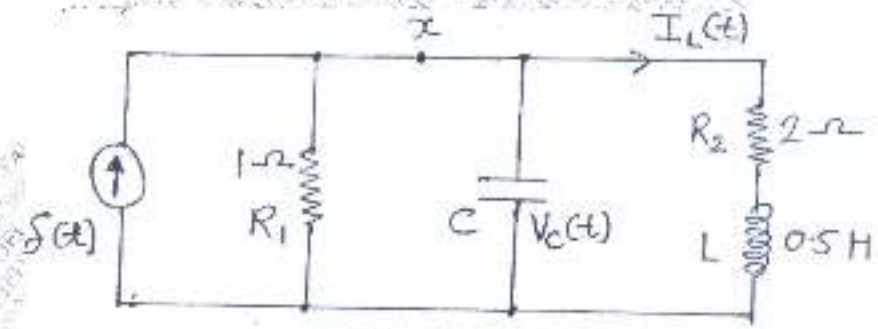


Figure No·9

(b) A load impedance of $Z_L = (40+j70)\ \Omega$ terminates 100 Ω transmission line of length $0.3\lambda$ long. Use formulas and determine following parameters. (10-M)

(i) Find load admittance at the load end of transmission line. (2-M)
(ii) Find input impedance at the input port of transmission line. (4-M)
(iii) Find reflection coefficient at the load end of transmission line. (2-M)
(iv) Find voltage wave standing ratio (VSWR) along the transmission line. (2-M)

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SE / EXTC / SII / CBSGS / EIC / 19-12-17

**Q. P. Code: 22931**

(3 Hours) [Total Marks : 80]

N. B. : (1) Question **No. 1** is **compulsory.**
(2) Attempt 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

$$\frac{C(s)}{R(s)} = \frac{35}{s^2+5s+25}$$

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.

**TURN OVER**

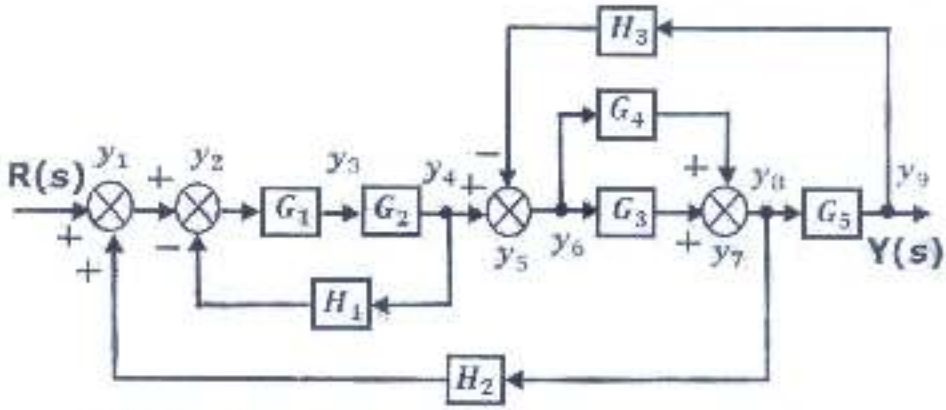
4 (a) I) Explain basic telemetry system

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

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

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

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




(b) Define power and energy. Explain the working of Electrodynamometer wattmeter. 1

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

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

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