EXTC - CBGS - AE-I - 12/05/2017

SEM - III

Q.P. Code : 545202

(3 Hours) Total Marks : 80

1. Question No.1 is compulsory.
2. Answer any three from remaining questions.
3. Figures to the right indicate full marks.
4. Assume suitable data if required.

Q1. Attempt any four.

a Explain the effect of temperature of on VI characteristics of a PN junction diode. 05

b What are the important parameters of a JFET? How these parameters are determined graphically? 05

c What is Early effect? Explain how it affects the BJT characteristics in CB configuration. 05

d For the circuit shown in figure.1 draw the output waveform. Assume diode is ideal. 05

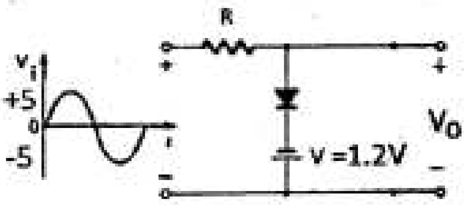

Fig.1

e For the FET shown in figure.2 the drain current equation is 05

$I_{DQ} = 9\left(1+\frac{V_{GSQ}}{3}\right)^2$ mA, Determine I_{DQ}, V_{GSQ}, V_{DSQ}, V_D

, V_{DD}=20V, R_D=2kΩ, R_S=1.5KΩ, $-V_{SS}$=-10V.

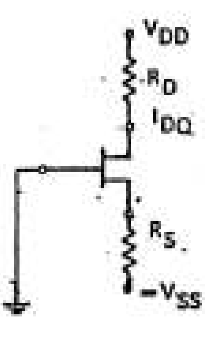

Fig.2

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Q.P. Code : 545202

Q2. a Describe the construction and operation of an N-channel MOSFET in enhancement mode. Draw its characteristics and equivalent circuit of the device. **10**

b Describe the different MOSFET biasing techniques .Determine the drain current, drain to source voltage, and Power dissipated in the transistor of CS circuit with an N-channel E MOSFET shown in figure 3. $R_1 = 30k\Omega$, $R_2 = 20k\Omega$, $R_D = 20k\Omega$, $R_S = 0.5k\Omega$, $V_{DD} = 5V, V_{TN} = 1V, k_N = 0.1mA/V2$ **10**

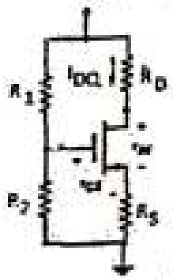

Fig.3

Q3. a Draw input and output characteristics of CE amplifier. Explain graphical analysis to determine parameters.(Zi, Zo, AV, and AI) **10**

b In the Common Emitter configuration with voltage divider bias $I_E = 1mA$ $V_{CE} = 2V$, $R_E = 1k\Omega$ and $\beta = 49$. Determine the values of R_C , R_1 and R_2 such that the stability factor does not exceed 5. Assume $V_{CC} = 5V$ and $V_{BE} = 0.3V$. **10**

Q4. a For the amplifier shown in figure.4 analyze and determine **10**

i) Small-signal hybrid pi parameters of BJT
ii) Small-signal voltage gain
iii) Input and output impedance.

The circuit parameters are: $R_1 = 56k\Omega$, $R_2 = 12.2k\Omega$, $R_E = 0.4k\Omega$, $R_C = 2k\Omega, R_L = 10k\Omega$, $V_{CC} = 10V$ and BJT parameters are $\beta = 100, V_{BE} = 0.7V$

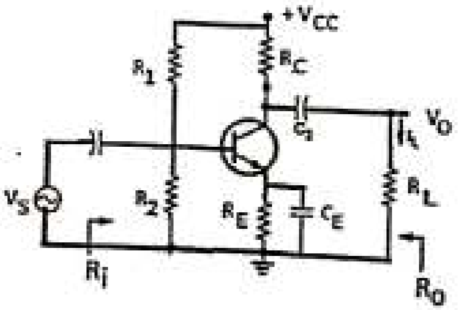

Fig.4

b Draw JFET CS amplifier with voltage divider bias and derive the expressions for the voltage gain, input impedance and output impedance. 10

Q5 a For the amplifier shown in figure.5 derive the expression for voltage gain, input and output impedance. The parameters of the MOSFET in the circuit shown in fig .5 are ; $R_G = 1M\Omega,\ V_{DD} = 5V, -V_{SS} = -5V, V_{TN} = 0.8\,V, k_N = 0.85\ \ mA/V^2$ 10

(i) Determine the values of R_S and R_D such that I_{DQ}=0.1mA and maximum symmetrical 1V peak sinusoidal signal occurs at output.(ii) Find the small signal transistor parameters. (iv) Determine the small-signal voltage gain A_V

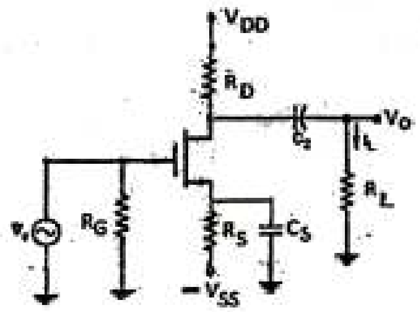

Fig.5

b Draw the circuit diagram of Wein Bridge Oscillator and derive the expression for the frequency of oscillation and minimum gain required for sustained oscillation 10

Q6 Write a short note on following 20

a Twin-T Oscillator.

b Varactor Diode (Construction and operation)

c D C load line concept in BJT. Why Q point should be at the middle of DC load line and fixed?

d MOS capacitor

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ExTC/ III / CBCGS / AM III / 18-5-17 UG

Q.P. Code : 13608

(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) Show that u = $y^3 - 3x^2y$ is a harmonic function. Also find its harmonic conjugate. (5)

B) Find half range Fourier sine series for $f(x) = x^3$, $-\pi < x < \pi$. (5)

C) If $\bar{F} = xye^{2z}i + xy^2\cos zj + x^2\cos xyk$ find div$\bar{F}$ and curl$\bar{F}$ (5)

D) Evaluate $\int_0^\infty e^{-2t}\sin^3 t\,dt$. (5)

Q.2) A) Prove that $J_{-\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}}\cos x$ (6)

B) Find an analytic function f(z) whose imaginary part is $e^{-x}(y\sin y + x\cos y)$ (6)

C) Obtain Fourier series for $f(x) = 1 + \frac{2x}{\pi}$ $\quad -\pi \le x \le 0$

$= 1 - \frac{2x}{\pi}$ $\quad 0 \le x \le \pi$

Hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots$ (8)

Q.3) A) Show that $\bar{F} = (2xyz^2)i + (x^2z^2 + z\cos yz)j + (2x^2yz + y\cos yz)k$, is a conservative field. Find its scalar potential φ such that $\bar{F} = \nabla\varphi$ and hence, find the work done by $\bar{F}$ in displacing a particle from A(0,0,1) to B(1,$\pi/4$,2) along straight line AB (6)

B) Show that the set of functions $f_1(x) = 1, f_2(x) = x$ are orthogonal over (-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 (6)

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C) Find (i) $L^{-1}\left\{log\left[\frac{s^2+a^2}{\sqrt{s+b}}\right]\right\}$

(ii) $L\{(e^{-t}cost.H(t-\pi)\}$ (8)

Q.4) A) Prove that $\int J_5(x)\,dx = -J_4(x) - \frac{4}{x}J_3(x) - \frac{8}{x^2}J_2(x)$ (6)

B) Find inverse Laplace of $\frac{s}{(s^2-a^2)^2}$ using Convolution theorem. (6)

C) Expand $f(x) = \frac{3x^2-6x\pi+2\pi^2}{12}$ in the interval $0 \le x \le 2\pi$ as a Fourier series.

Hence, deduce that $\frac{\pi^2}{6} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \ldots$ (8)

Q.5) A) Using Gauss Divergence theorem, prove that $\iint_S (y^2z^2i + z^2x^2j + z^2y^2k).\bar{N}ds = \frac{\pi}{12}$

where S is the part of the sphere $x^2 + y^2 + z^2 = 1$ and above the xy-plane. (6)

B) Prove that $J_3(x) + 3J_0'(x) + 4J_0'''(x) = 0$ (6)

C) Solve $(D^3-2D^2+5D)y = 0$; with $y(0)= 0$, $y'(0)=0$ and $y''(0)=1$, (8)

Q.6) A) Evaluate by Green's theorem for $\int_C (\frac{1}{y}\,dx + \frac{-1}{x}\,dy)$ where C is the

the boundary of the region define by x = 1, x = 4, y = 1 and $y = \sqrt{x}$ (6)

B) Find the bilinear transformation which maps the points z = 1, i, -1

onto points w = i, 0, –i (6)

C) Find Fourier cosine integral representation for $f(x) = e^{-ax}, x > 0$

Hence, show that $\int_0^\infty \frac{cos\omega x}{1+\omega^2}d\omega = \frac{\pi}{2}e^{-x}$, x≥ 0 (8)

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SE | Sem III | EXTC | DE | CBSGS | 24/5/13

T1423 / T1518 DIGITAL ELECTRONICS

Q.P. Code : 545402

(3 Hours) [Total Marks : 80

N.B. : (1) **Question No. 1** is compulsory.
(2) **Attempt any 3** questions from Q.2 to Q.6.
(3) Figures to the **right** in the bracket indicate **full** marks.
(4) Assume suitable data if necessary.

1. a) Compare Combinational circuits with Sequential circuits. 5
   b) Compare Synchronous counter with Asynchronous counter. 5
   c) Compare Moore machine with Mealy machine. 5
   d) Compare SRAM with DRAM. 5

2. a) Implement the following Boolean equation using single 4:1 MUX and few logic gates : $F(A,B,C,D) = \Sigma m(0, 2, 5, 6, 7, 9, 12, 15)$. 10
   b) State and prove the De Morgan's theorem. 5
   c) Implement $Y = A + \bar{B}C$ using only NOR gates. 5

3. a) Draw a neat circuit of BCD adder using IC 7483 and explain. 10
   b) Using Quine McClusky method, minimize the following: $F(P,Q,R,S) = \Sigma\, m(0,1,2,3,5,7,8,9,11,14)$. 10

4. a) Design synchronous counter using D type flip flops for getting the following sequence: $0 \rightarrow 3 \rightarrow 1 \rightarrow 5 \rightarrow 6 \rightarrow 0$. Take care of lockout condition. 10
   b) Convert JK type flip flop into D type flip flop. 5
   c) Write $(27)_{16}$ into its BCD code and Octal code. 5

5. a) Write the VHDL code for 3-bit up-down counter with negative edge triggered clock and active low Preset and Clear terminals. 10
   b) Compare TTL with CMOS logic families. 5
   c) Draw the internal logic diagram of Programmable Logic Array (PLA). 5

6. a) What is shift register? Explain any one type of shift register. Give its application. 10
   b) Design a Mealy type sequence detector circuit to detect a sequence 1011 using D type flip flops. 10

EXTC / Sem-III / CBGS / 30/05/17 / EI & M

Q.P. Code : 545502

(3 Hours) | Total Marks : 80

N.B. : (1) Attempt **four** questions, question no **1** is **compulsory**.
(2) Assume suitable data where ever required.
(3) Answers to the questions should be grouped together.
(4) Figure to the **right** of question indicates full marks.

1. Attempt any **four** : 20
   (a) Why wave analyzer is known as frequency selective voltmeter?
   (b) Define accuracy, precision and sensitivity with suitable example.
   (c) General specifications of Digital Multi-meter.
   (d) List name of bridges for RLC measurement with proper classification.
   (e) Significance of three and half digit display.

2. (a) What is eddy current sensor? Explain measurement of current using it. **10**
   (b) Draw neat block diagram of CRO and explain its functioning, comment on role of sweep in CRO. **10**

3. (b) Draw and explain Weighted resistor network type DAC for 3 bits input taking suitable example. **10**
   (b) Explain Kelvin's double bridge and its application in very low resistance measurement. **10**

4. (a) Explain dual slop integration type ADC with the help of block diagram and comment on its speed. **10**
   (b) Explain LVDT and define its application in displacement measurement. **10**

5. (a) Explain Hetrodyne type waves analyser and its applications. **10**
   (b) Discuss DSO with the help of block diagram along with various modes of operation also explain its applications. **10**

6. (a) Draw and discuss Maxwell Bridge and its application for measurement of inductance. **10**
   (b) Define Q factor and explain working of a Q meter for Q factor measurement. **10**

SEM III CBGS - EXTC - CBTL 06/06/2017

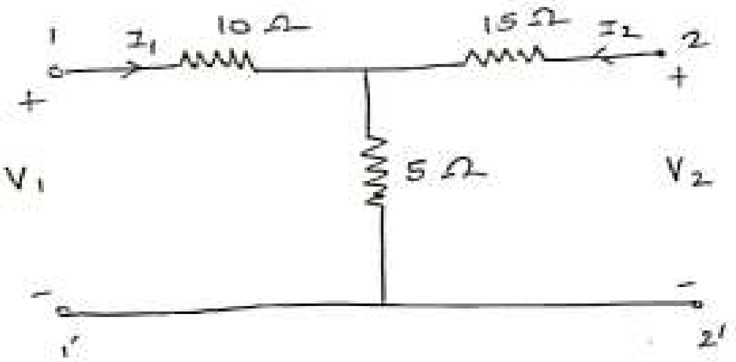
T1423 / T1520 CIRCUITS AND TRANSMISSION LINES

QP Code : 545601

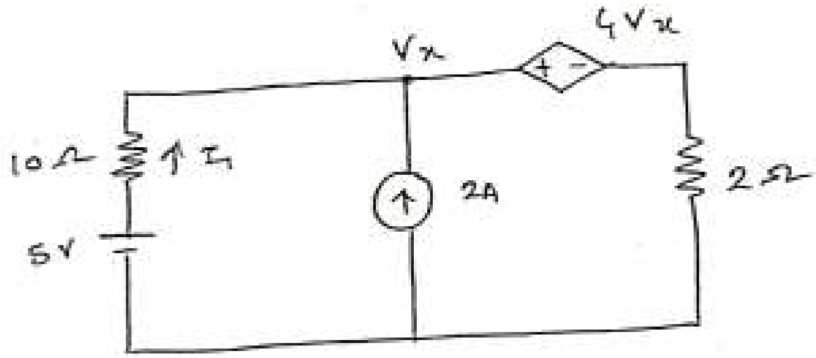
(3 Hours) [Total Marks : 80

N. B. : (1) Question No. 1 is compulsory.
(2) Attempt any three questions from the remaining five.
(3) Assume suitable data with justification if missing.

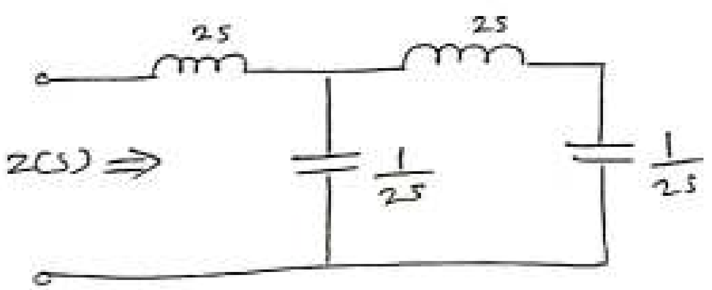
1. (a) Determne the z-parameters for the network shown in the following figure 5



(b) Find current I_1 in the network shown in fig. 5



(c) Determine the driving point impedance function of the one-port network shown 5



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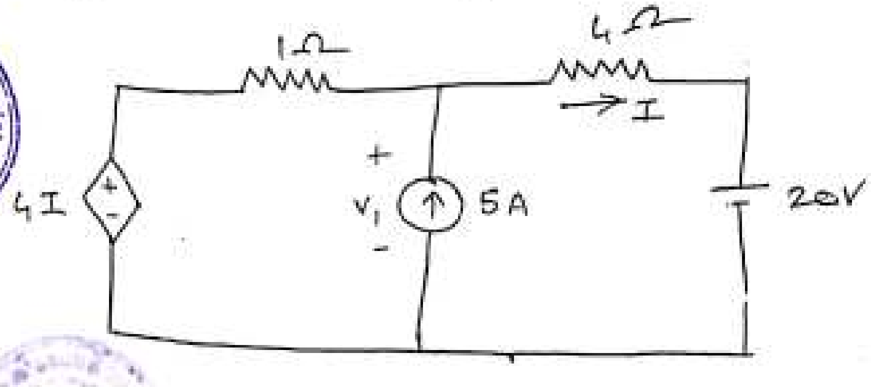
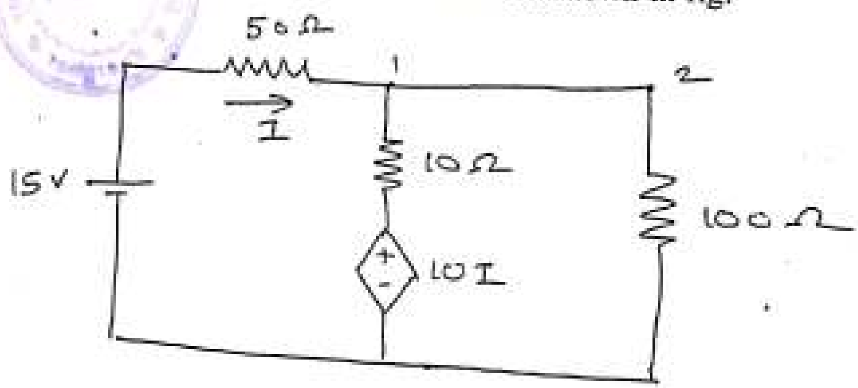
(d) Test whether $(P(s) = s^5 + 12s^4 + 45s^3 + 60s^2 + 44s + 48$ is Hurwitz. 5

2. (a) Find V_1 in the network shown in fig. using superposition theorem. 10



(b) Find the voltage at node 2 in the network shown in fig. 5



(c) State and prove initial value theorem. 5

3. (a) Synthesize the following function in cauer I and cauer II form. 10

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

(b) Check if the following function is a positive real function. 5

$$F(s) = \frac{2s^3 + 2s^2 + 3s + 2}{s^2 + 1}$$

(c) The parameters of a transmission line are R = 6Ω/km, L = 2.2 mH/km, G = 0.25×10^{-6} Ω/km, C = 0.005×10^{-6} F/km. Determine the characteristic impedance and propagation contant at a frequency of 1 GHz. 5

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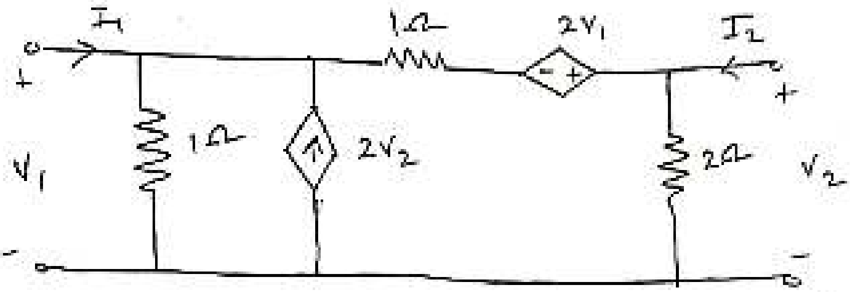
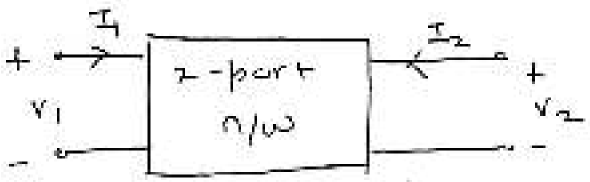
4. (a) Find the Y and Z parameters of the network shown in fig. **10**



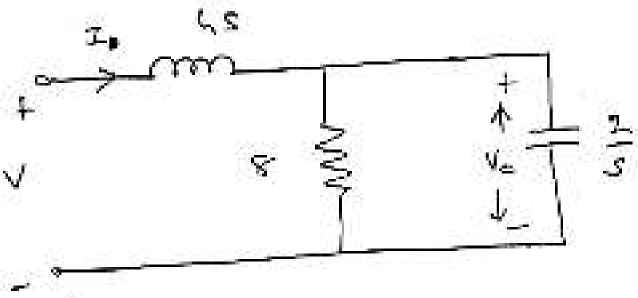
(b) In the two port n/w shown in fig, compute h-perameters from the following data **5**

(i) with the o/p port short circuited, $V_1 = 25V$, $I_1 = 1A$, $I_2 = 2A$

(ii) with the i/p port open circuited, $V_1 = 10V$, $V_2 = 50V$, $I_2 = 2A$



(c) For the circuit given below, determine $\frac{V_o}{V}$ and draw the pole-zero plot. **5**



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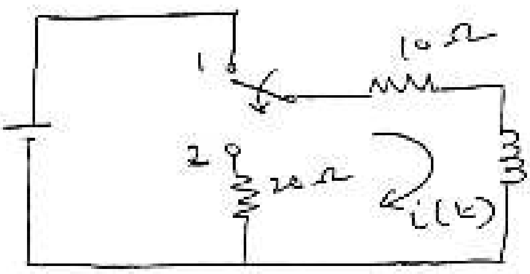
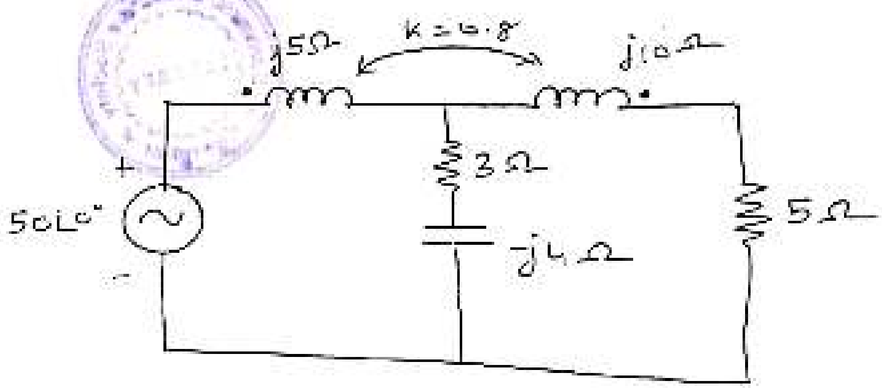
5. (a) In the network shown in fig. switch is changed from position 1 to position 2 at t = 0, steady state condition having reached before switching. Find the values of i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$. **10**

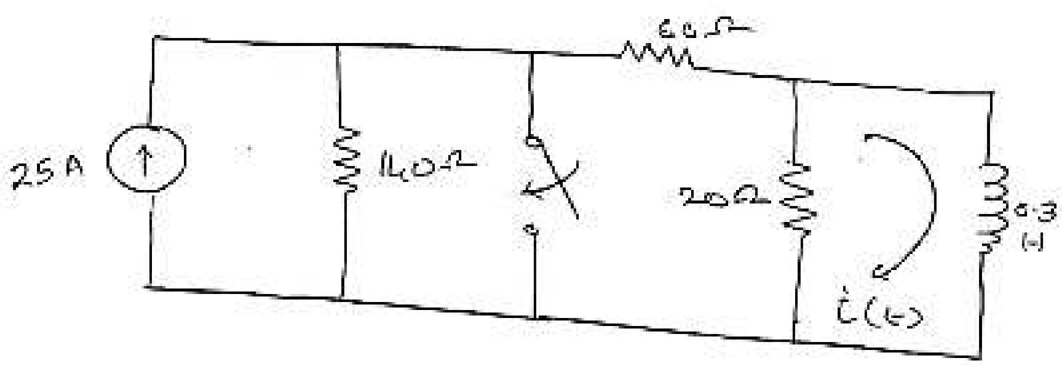


(b) Find the voltage across the 5Ω resistor in the network shown in figure. **5**



(c) Explain the RF bahaviour of transmission line for various conditions. **5**

6. (a) Find the current i(t) for t > 0 **10**



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(b) Synthesize the following using the Foster I realization. **5**

$$F(s) = \frac{(s+1)(s+5)(s+3)}{s(s+2)(s+6)(s+4)}$$

(c) Draw the following normalized quantities on a Smith Chart. **5**

(i) $(3 + j3)\Omega$

(ii) $(1 - j2)\Omega$

(iii) $(2)\Omega$

(iv) $(j1)\Omega$