D 70377 (Pages : 4) Name.....

Reg. No.....

THIRD SEMESTER B.TECH. (ENGINEERING) [09 SCHEME] DEGREE EXAMINATION, NOVEMBER 2014

EE 09 303/PTEE 09 302—ELECTRIC CIRCUIT THEORY

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *the questions.*
Each question carries 2 marks.

1. 3 resistors 10 Ω, 15 Ω, and 12 Ω are connected in delta to form a closed triangle. Sketch the equivalent star network.
2. State Maximum power transfer theorem.
3. What is a Gate function ? Write its Laplace transform.
4. Explain the terms cutset and fundamental cutset with a simple example.
5. What is meant by image impedance ? Explain.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 marks.

6. Sketch a parallel RLC resonant circuit and obtain the conditions for resonance.
7. State and prove the final value theorem.
8. With an example explain how a two port network can be transformed from π section to T section representation.
9. Sketch the network graph if the incidence matrix is represented in Table form shown in Table 1

	Branches				
Nodes	1	2	3	4	5
1	1	0	0	0	1
2	−1	1	0	1	0
3	0	−1	1	0	0
4	0	0	−1	−1	−1

Table 1

Turn over

10. Find the current flowing through the 5 Ω resistor in the circuit shown in Figure 1, if all active elements are ideal.

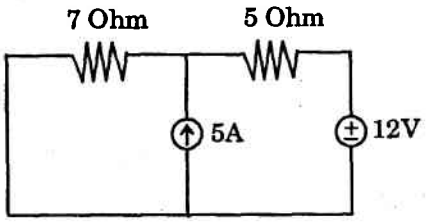

Figure 1

11. Use initial value theorem and verify the initial value of (i) $3e^{-4t}$ (ii) $2 - e^{3t}\cos 5t$

(4 × 5 = 20 marks)

Part C

Answer **four** *full questions. Each question carries* 10 *marks.*
Missing data may suitably be assumed.

12. (a) For the network shown in Figure 2, find the current flowing through the 8Ω resistor using nodal analysis and prove that the same result can be obtained using Super position theorem.

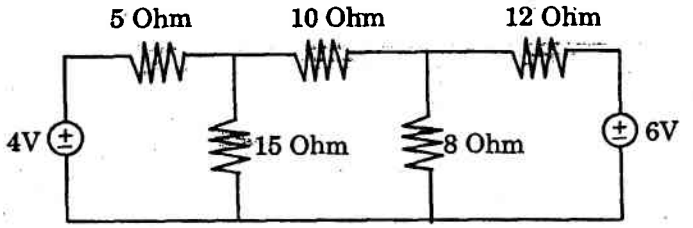

Figure 2

(10 marks)

Or

(b) A 440 V balanced 3ϕ system with phase sequence RYB is connected to supply a Y connected load with branch impedance in respective phases as $Z_R = 100\Omega$, $Z_Y = j50\Omega$ and $Z_B = -j\,50\Omega$. Calculate the voltage drop across each branch and potential of neutral point to earth. What will be the reading of the 2 Watt meters whose current coil is connected in R and B phases and potential coil connected between R-Y and B-Y phases respectively. Also calculate the phase currents.

(10 marks)

13. (a) For a square wave of amplitude 1 and period $2p$, show that the Laplace transform is, $\frac{1}{s}\tanh\left(\frac{ps}{2}\right)$. If this square wave is applied to an RL series circuit, obtain the response.

(10 marks)

Or

(b) A series RC circuit with $R = 10\,\Omega$ and $C = 4\mu$ F has an initial charge $Q_o = 800\mu C$ on the capacitor. At $t = 0$, the switch is closed to apply a constant d.c. voltage source of 100 V. sketch the transformed circuit. Find and sketch the resulting current transient if the charge on the capacitor has the same polarity as deposited by the source. If the capacitor is connected with the opposite polarity, what will be the resulting current.

(10 marks)

14. (a) Obtain the Z,Y and ABCD parameters of the circuit shown in Figure 3. Also deduce the values of other parameters from the Z parameter values using the relations connecting them.

(10 marks)

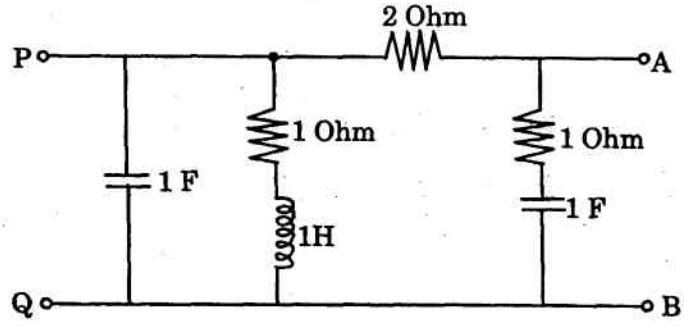

Figure 3

Or

(b) Derive the expressions for characteristic impedance and propagation constant of symmetrical T and π networks under sinusoidal steady state.

(c) Derive the design equations for a constant k low pass filter.

(6 + 4 = 10 marks)

15 (a) An impedance function is given by $Z(s)=\frac{8\left(s^2+25\right)}{\left(s^2+2\right)\left(s^2+4\right)}$. Realize the network in Foster I and Causer II form. Comment about the realization.

(10 marks)

Or

(b) For the circuit shown in Figure 4, draw the oriented graph. Write the tie set matrix and cut set matrix of the network and explain how the circuit can be solved to obtain various currents and voltages using the tie set matrix.

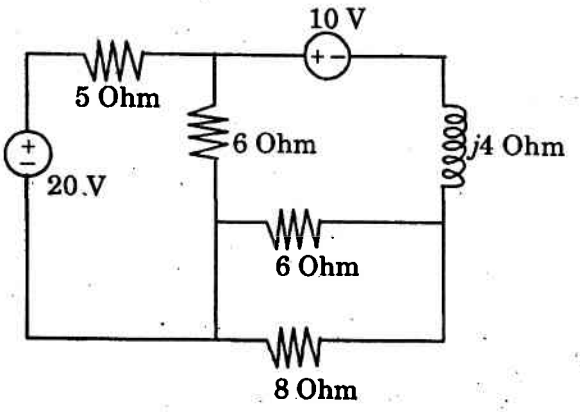

Figure 4

(10 marks)

[4 × 10 = 40 marks]