[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1381 **I**

Unique Paper Code : 2512041102

Name of the Paper : Basic Circuit Theory

Name of the Course : **B.Sc. (H) Instrumentation (Core)**

Semester : I

Duration : 3 Hours Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are **seven** questions in all, out of which you have to attempt any **five** questions.
3. **All** questions carry equal marks.
4. **First** Question is Compulsory.

1. (a) What is the cut off frequency of High Pass RC filter if R = 5K and C = 0.01uF? (3)

   (b) Find the total current and voltages across all the resistors shown in Fig. 1. (3)

P.T.O.

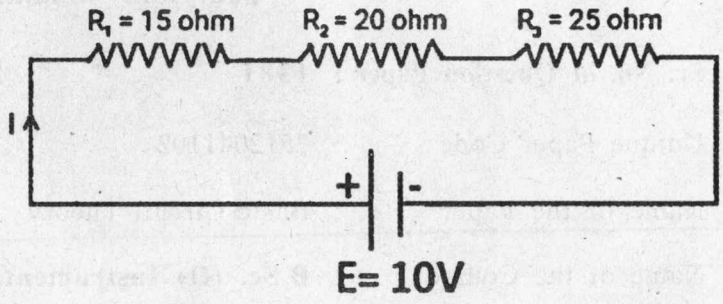

Fig. 1

(c) Define time constant for an RC circuit. Draw its transient voltage characteristics. (3)

(d) What is Kirchhoffs current law? Find the current I in the circuit shown in Fig. 2 (3)

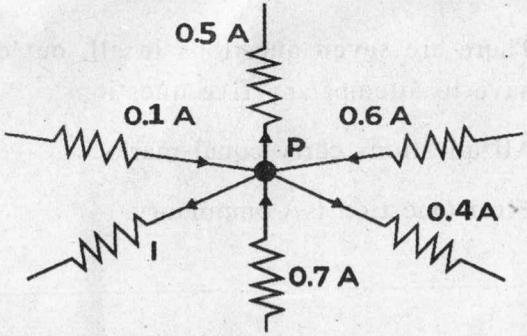

Fig. 2

(e) Define resonance and give the condition for resonance in series RLC circuit. (3)

(f) Define Peak to Peak and Root Mean Square voltage. (3)

2. (a) What will be resistance of a bulb if voltage across it is 150V and current flowing through it is 3A. What will be the value of the resistor shown below in Fig. 3? (First band- Green, Second band-blue, Third band-orange and fourth band-golden). (5)

Fig. 3

(b) Derive the condition for star to delta conversion of a network. (6)

(c) Find the current flowing through 10Ω resistor using mesh analysis in the circuit shown in Fig. 4. (7)

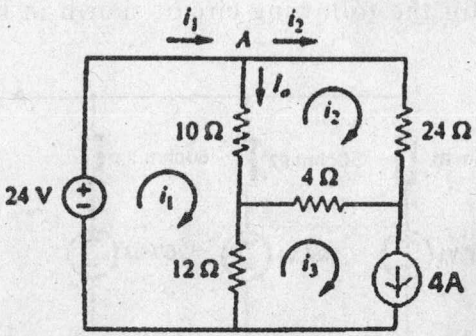

Fig. 4

3. (a) Find the maximum power that can be delivered to the resistor R in the circuit of Fig. 5. (7)

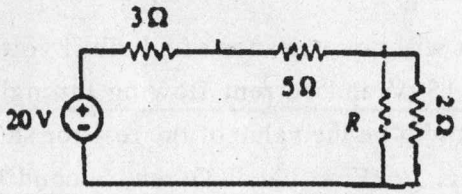

Fig. 5

(b) For the circuit shown in Fig. 6, find power factor, apparent power, and reactive power. (8)

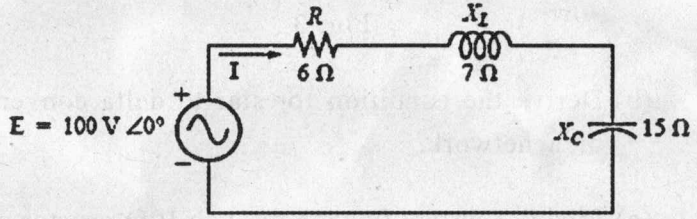

Fig. 6

(c) Find the Millman's equivalent across the terminals AB for the following circuit shown in Fig. 7:

(3)

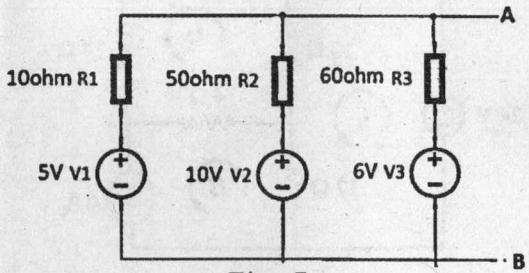

Fig. 7

4. (a) Find the node voltages V_1 and V_2 for the circuit shown in Fig. 8. (7)

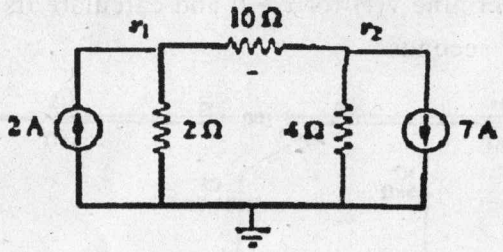

Fig. 8

(b) Using the superposition theorem, find the current flowing in resistor 5 Ω in the circuit shown in Fig. 9. (7)

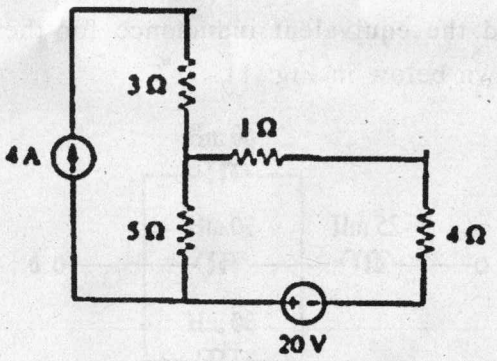

Fig. 9

(c) Explain quality factor (Q) in parallel RLC circuits. (4)

5. (a) The switch in Fig. 10 has been in position A for a long time. At time t=0, the switch moves to B. Determine v(t) for t > 0 and calculate its value at t=4 seconds. (8)

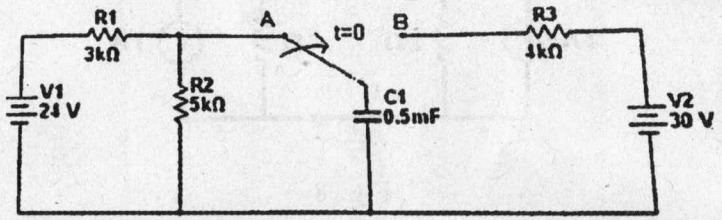

Fig. 10

(b) Explain the working of band pass filter with the diagram. Draw its frequency response. (6)

(c) Find the equivalent inductance for the network shown below in Fig. 11. (4)

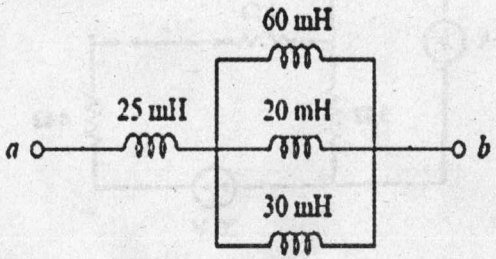

Fig. 11

6. (a) Given $Z_{11}=30\Omega$, $Z_{12}=15\Omega$, $Z_{21}=45\Omega$ and $Z_{22}=35\Omega$. Find Y and ABCD parameters for a two-port network. (6)

(b) Explain step response of an RC circuit. (8)

(c) Find the Z parameters for the following circuit shown in Fig. 12. (4)

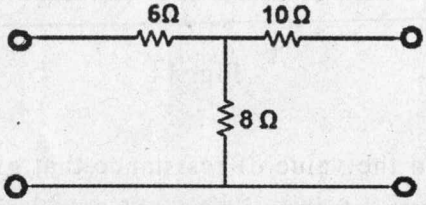

Fig. 12

7. (a) Verify the reciprocity theorem for the following circuit shown in Fig. 13 for the current flowing in resistor 3Ω. (7)

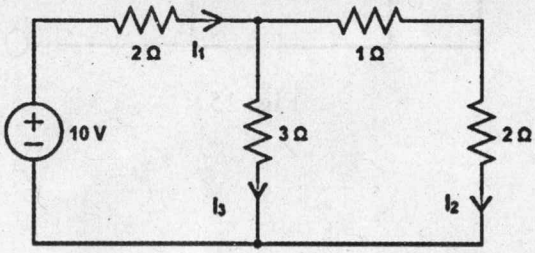

Fig. 13

(b) Find Thevenin's equivalent for circuit shown in Fig. 14 across terminals A-B. (7)

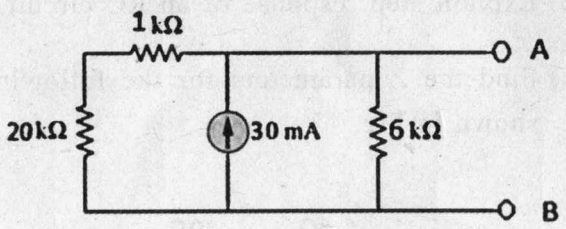

Fig. 14

(c) Find the value of resistance that gives Maximum power of the circuit shown in Fig. 15 across terminals A-B. (4)

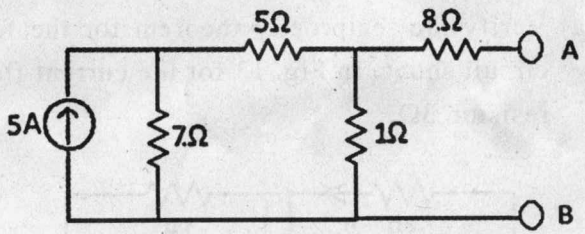

Fig. 15