

Circuits and Networks (313325)

MSBTE Diploma · K-Scheme · Model Question Paper — Set B

Time: 3 Hours**Max. Marks: 70****Instructions:**

1. All questions are compulsory.
2. Answer each next main question on a new page.
3. Illustrate your answers with neat sketches wherever necessary.
4. Figures to the right indicate full marks.
5. Assume suitable data, if necessary.
6. Mobile phone, pager and any other electronic communication devices are not permissible in the examination hall.

Q.1 Attempt any FIVE of the following:**10**

- a) Define the following terms: i) Branch ii) Loop
- b) State maximum power transfer theorem.
- c) Define active network and passive network with one example each.
- d) Draw the symbols of: i) Ideal voltage source ii) Practical current source
- e) Define apparent power and power factor.
- f) Write the equations of short circuit admittance (Y) parameters of a two-port network.
- g) Parallel resonant circuit is called a rejector circuit. Justify.

Q.2 Attempt any THREE of the following:**12**

- a) Draw star and delta networks. Write the equations to convert: i) Delta into equivalent star ii) Star into equivalent delta.
- b) State Thevenin's theorem. Write the stepwise procedure to find current through a load resistance using Thevenin's theorem.
- c) For a series R-L circuit: i) Draw the circuit diagram ii) Draw the phasor diagram iii) Draw waveforms of v and i iv) Draw the voltage triangle.
- d) A series R-C circuit takes a current of 2.5 A from 220 V, 50 Hz supply and consumes 300 W. Calculate: i) Resistance ii) Capacitive reactance iii) Capacitance iv) Power factor.

Q.3 Attempt any THREE of the following:**12**

- a) Using source conversion technique, reduce the network shown in Fig. No. 1 into a single voltage source with a series resistance across A-B.

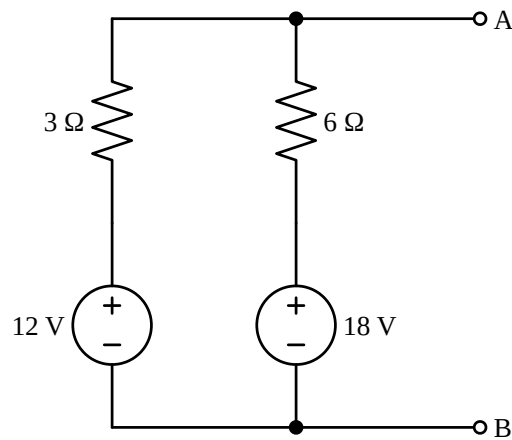


Fig. No. 1

- b) Using nodal analysis, find the current through the $8\ \Omega$ resistor in the network shown in Fig. No. 2.

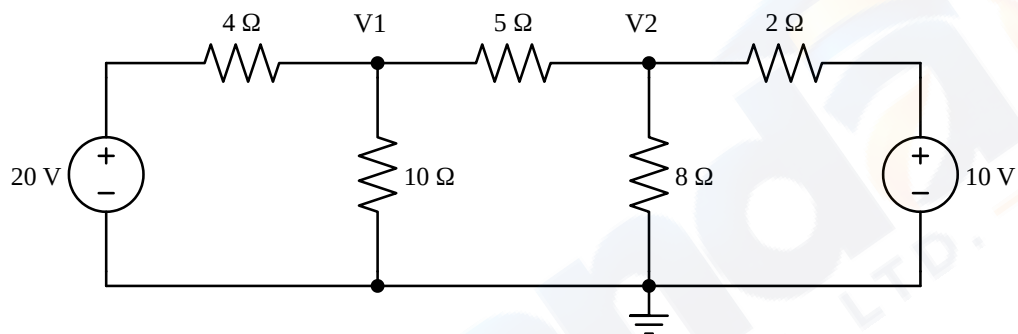


Fig. No. 2

- c) Explain Y-parameters of a two-port network. Draw the equivalent circuit in terms of Y-parameters. State the conditions of reciprocity and symmetry.
- d) Define quality factor and bandwidth of a series resonant circuit. Write their expressions and show the bandwidth on the resonance curve.

Q.4 Attempt any THREE of the following:

12

- a) Find the equivalent resistance between terminals A and B of the network shown in Fig. No. 3 using star-delta transformation.

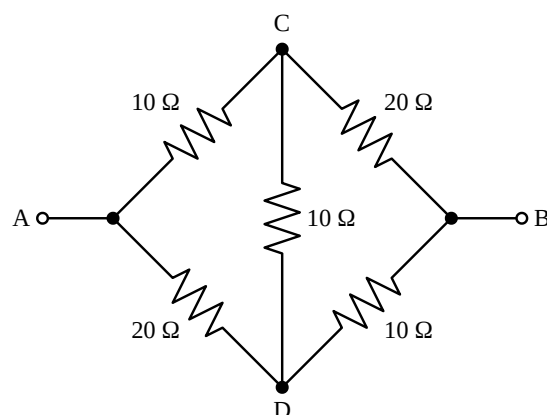


Fig. No. 3

- b) Using Norton's theorem, find the current through $R_L = 4 \Omega$ in the network shown in Fig. No. 4.

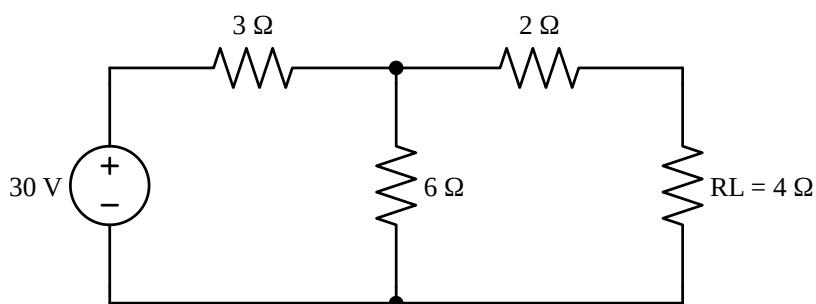


Fig. No. 4

- c) A series R-L-C circuit has $R = 10 \Omega$, $L = 0.2 \text{ H}$ and $C = 50 \mu\text{F}$. It is connected across 100 V variable-frequency supply. Calculate: i) Resonant frequency ii) Current at resonance iii) Q-factor iv) Bandwidth.
- d) Differentiate between low pass filter and high pass filter. (Any four points)
- e) Find the ABCD parameters of the network shown in Fig. No. 5. Check whether the network is reciprocal and symmetrical.

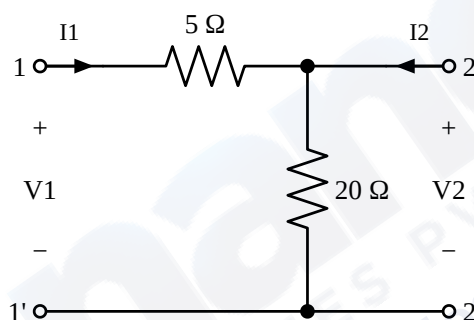


Fig. No. 5

Q.5 Attempt any TWO of the following:

12

- a) Using mesh analysis, find the current through each resistor of the network shown in Fig. No. 6.

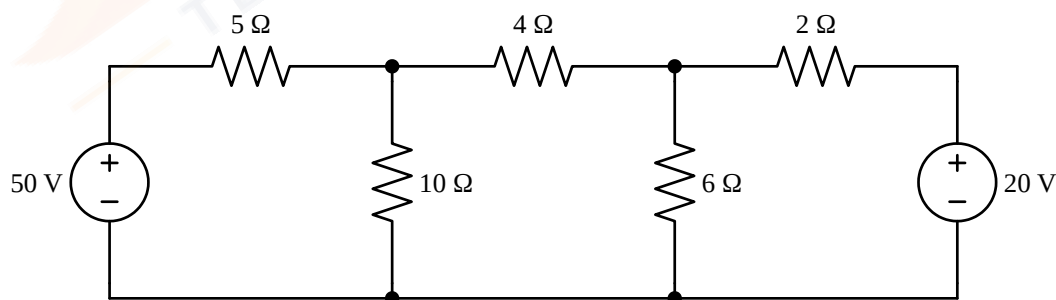


Fig. No. 6

- b) A coil having resistance of 15Ω and inductance of 0.06 H is connected in series with a capacitor of $120 \mu\text{F}$ across 200 V, 50 Hz supply. Calculate: i) Impedance ii) Current iii) Power factor iv) Active, reactive and apparent power. Draw the phasor diagram.

- c) State reciprocity theorem. Verify it for the network shown in Fig. No. 7 by interchanging the 20 V source and the ammeter A (ideal).

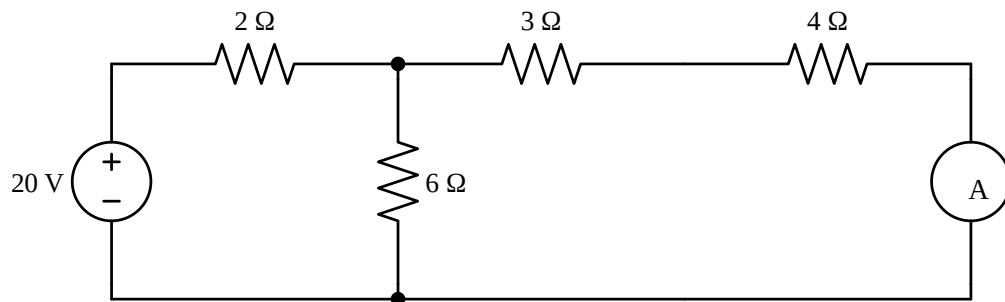


Fig. No. 7

Q.6 Attempt any TWO of the following:

12

- a) Using Thevenin's theorem, find the current through the 5 Ω resistor connected between C and D in the bridge network shown in Fig. No. 8.

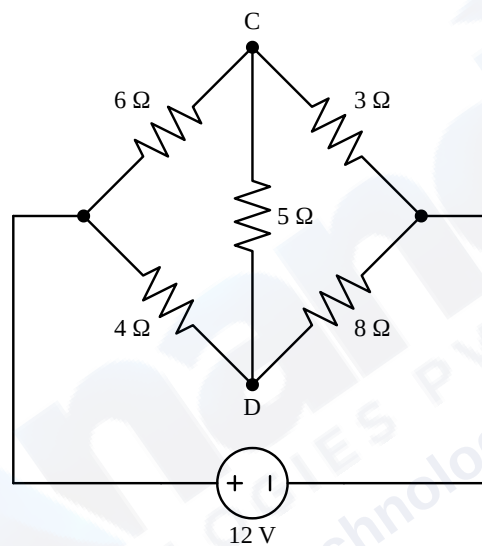


Fig. No. 8

- b) Draw the resonance curve of a series R-L-C circuit. Explain the variation of X_L , X_C , impedance and current with frequency.
- c) Draw the ideal frequency response of low pass, high pass, band pass and band stop filters. Write two applications of each.

Note: This is a **model question paper prepared by Ananda Technologies** only for practice and exam preparation, based on the pattern of previous MSBTE question papers and the K-scheme syllabus. It is **not an official MSBTE paper**, and it does **not** mean that these questions will come in the exam. Answers follow standard textbook points; marks shown are indicative. Free for students — anandatechnologies.in