CBCS SCHEME

USN

17EE32

Third Semester B.E. Degree Examination, Jan./Feb. 2023
Electric Circuit Analysis

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Differentiate between:
- i) Active and passive elements
- ii) Unilateral and bilateral elements
- iii) Linear and non-linear elements
- iv) Lumped and distributed elements
- v) Independent and dependent sources. **(10 Marks)**

b. Find the current flowing through the 10Ω resistor using source transformation technique for the circuit given in Fig.Q.1(b). **(10 Marks)**

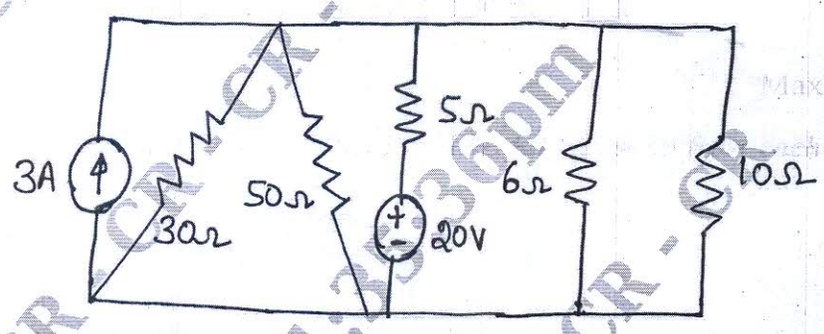

Fig.Q.1(b)

OR

2 a. Define and explain supernode. **(04 Marks)**

b. Find the equivalent resistance between the terminals A and B using star-delta transformation technique for the circuit given in Fig.Q.2(b). **(08 Marks)**

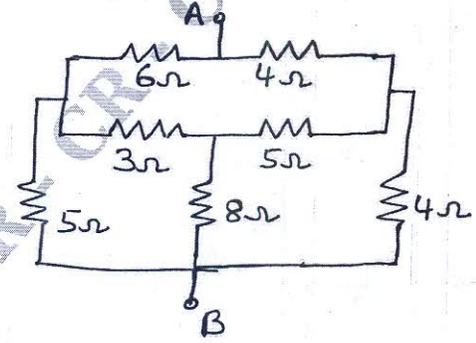

Fig.Q.2(b)

c. For the circuit shown in the Fig.Q.2(c), find the current through the 5Ω resistor using mesh analysis. **(08 Marks)**

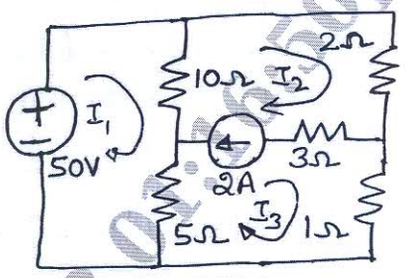

Fig.Q.2(c)

Module-2

3 a. State and explain superposition theorem. **(05 Marks)**

b. Find the current through the 10Ω resistor using Thevenin's theorem for the circuit shown in Fig.Q.3(b). **(08 Marks)**

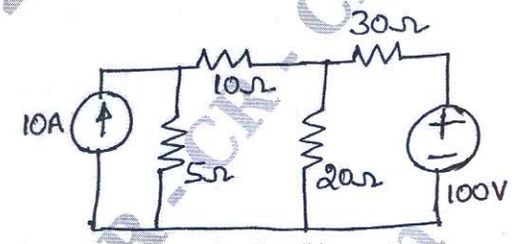

Fig.Q.3(b)

c. For the circuit given in Fig.Q.3(c), find the value of load impedance Z_L for which power transferred is maximum. **(07 Marks)**

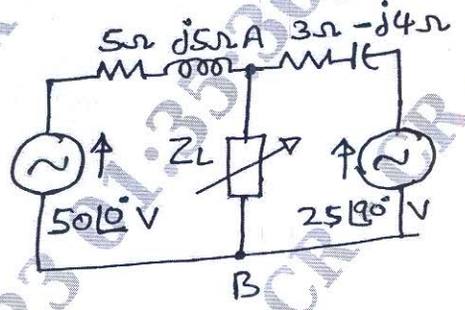

Fig.Q.3(c)

OR

4 a. Use Norton's theorem for the circuit of Fig.Q.4(a) to determine the power absorbed by the 9Ω resistor. **(10 Marks)**

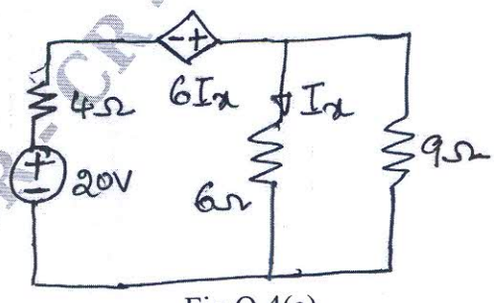

Fig.Q.4(a)

b. In the circuit shown in Fig.Q.4(b), verify reciprocity theorem. **(10 Marks)**

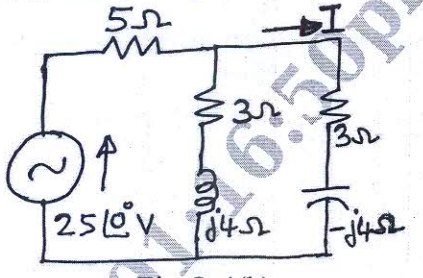

Fig.Q.4(b)

Module-3

5 a. An R-L-C series circuit with a resistance of 10Ω inductance of 0.2H and a capacitance of 40μF is supplied with a 100-V supply at variable frequency. Find: i) Resonant frequency ii) Current at resonance iii) Quality factor iv) Half power frequencies v) Voltage at resonance across R-L-C. Draw the resonance curve. **(10 Marks)**

b. Derive an expression for the band width of series R-L-C circuit. **(10 Marks)**

OR

6 a. In the circuit shown in Fig.Q.6(a), the switch is changed from the position a to the position be at t = 0, steady state condition having reached before switching. Find the value of i(t), $\frac{di(t)}{dt}$ and $\frac{d^2i(t)}{dt^2}$ at $t = 0^+$. **(10 Marks)**

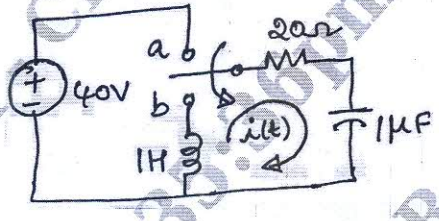

Fig.Q.6(a)

b. Explain the behavior of R, L and C elements for transients. Write the procedure for evaluating initial conditions. **(10 Marks)**

Module-4

7 a. State and explain initial value theorem. **(06 Marks)**

b. Find the Laplace transform of i) e^{at} ii) sinwt. **(06 Marks)**

c. Find the Laplace transform of the function given in Fig.Q.7(c). **(08 Marks)**

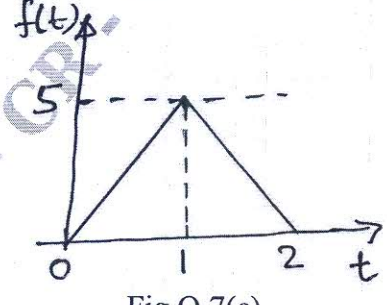

Fig.Q.7(c)

OR

8 a. Synthesize the waveform given in Fig.Q.8(a) and obtain its Laplace transform. **(10 Marks)**

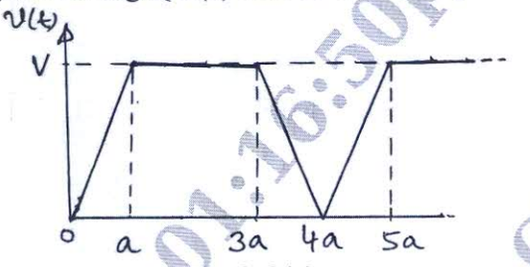

Fig.Q.8(a)

b. Verify initial and final value theorem to i) $10e^{5t}$ ii) 5 sin 3t. **(10 Marks)**

Module-5

9 a. A 400V, 3 phase supply feeds an unbalanced 3 wire star connected load consisting of impedances $Z_R = 7\angle 10^\circ\ \Omega$, $Z_Y = 8\angle 30^\circ\ \Omega$ and $Z_B = 8\angle 50^\circ\ \Omega$. The phase sequence is RYB. Determine the line currents and power taken by the load. **(10 Marks)**

b. Define Z-parameters. Express Y-parameters in terms of Z-parameters. **(10 Marks)**

OR

10 a. Find the Y and Z parameters for the network shown in the Fig.Q.10(a). **(10 Marks)**

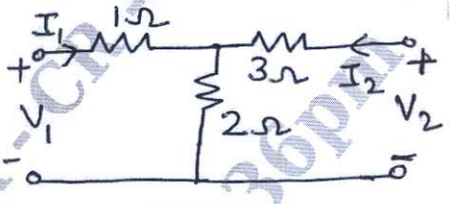

Fig.Q.10(a)

b. Determine the transmission parameters for the circuit shown in the Fig.Q.10(b). Verify for reciprocity. **(10 Marks)**

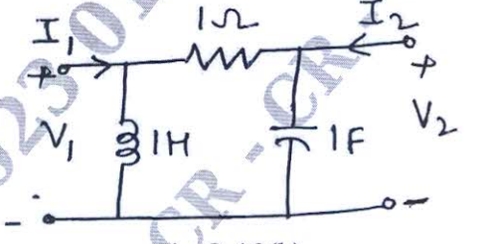

Fig.Q.10(b)

* * * * *