CBCS SCHEME

USN [| | | | | | | | |]

21EE33

Third Semester B.E. Degree Examination, June/July 2024
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. Define the following networks with example :
i) Linear and Nonlinear Network
ii) Bilateral and Unilateral Network
iii) Active and Passive network. **(06 Marks)**

b. Using source transformation, determine the power delivered by 50 V source in given network Fig.Q1(b) below.

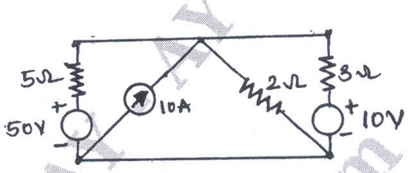

Fig.Q1(b) **(07 Marks)**

c. Determine I_x and V_x for the circuit shown in Fig.Q1(c) below, using mesh analysis.

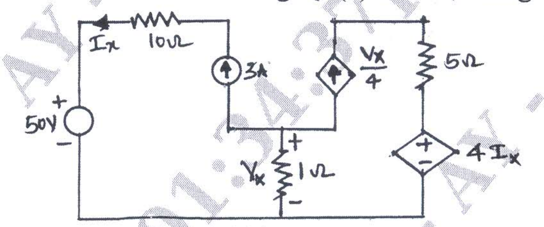

Fig.Q1(c) **(07 Marks)**

OR

2 a. Obtain expressions to convert star connected impedances into equivalent delta connected impedances. **(06 Marks)**

b. Explain the concept of supermesh using network and also mention steps to apply Mesh analysis. **(07 Marks)**

c. Determine the power dissipation in 10 ohm resistor using nodal analysis, shown in Fig.Q2(c).

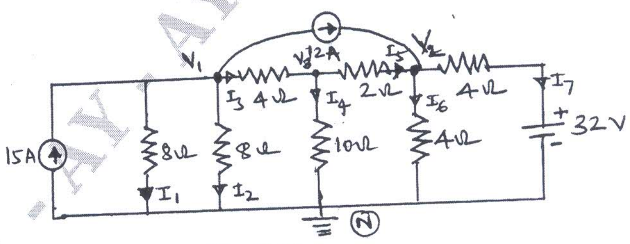

Fig.Q2(c) **(07 Marks)**

Module-2

3 a. State Thevenin's theorem. Explain it with the help of networks. Mention the steps to apply Thevenin's theorem and also limitations of Thevenin's theorem. **(10 Marks)**

b. State Norton's theorem and determine the Norton's equivalent circuit across AB terminals in Network shown in Fig.Q3(b). Also draw Thevenin's equivalent across AB.

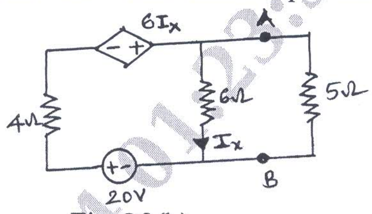

Fig.Q3(b) **(10 Marks)**

OR

4 a. State and explain maximum power transfer theorem using suitable networks and also prove the maximum power transfer theorem. **(10 Marks)**

b. By using superposition theorem, determine the current through the (4 + j3) impedance shown in Fig.Q4(b) Network.

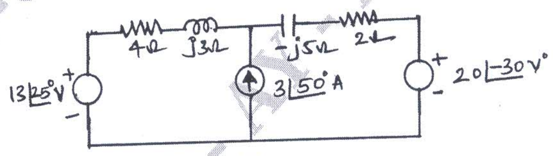

Fig.Q4(b) **(10 Marks)**

<u>Module-3</u>

5 a. Define the following :
i) Resonance ii) Q-factor iii) Selectivity iv) Bandwidth **(04 Marks)**

b. Explain the behaviour of R, L, C elements for transients. Mention their representation at the time of switching. **(06 Marks)**

c. The network shown in Fig.Q5(c) below is under steady state condition with switch K is at position 1. Determine expression for i(t) if switch K is moved to position 2. Draw variation of i(t).

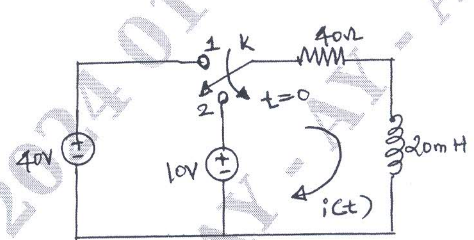

Fig.Q5(c) **(10 Marks)**

OR

6 a. Show that Resonant frequency is geometric mean of two half power frequencies. **(04 Marks)**

b. It is required that a series RLC circuit should resonate at 1 MHz. Determine values of R, L and C if bandwidth of circuit is 5 kHz and its impedance is 50 Ω at resonance. **(06 Marks)**

c. In circuit shown in Fig.Q6(c), determine complete solution for current, when switch K is closed at t = 0. Applied voltage is V(t) which is given, $100\cos(10^3 t + \pi/2)$.

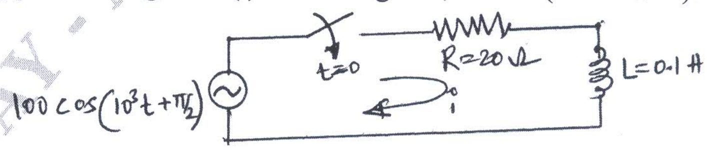

Fig.Q6(c) **(10 Marks)**

Module-4

7 a. Mention advantages and disadvantages of Laplace transform. **(04 Marks)**

b. State and prove Final Value theorem as applied to Laplace transform. **(06 Marks)**

c. Synthesis the waveform shown in Fig.Q7(c). Determine Laplace transform of periodic waveform.

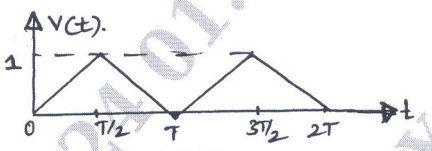

Fig.Q7(c) **(10 Marks)**

OR

8 a. Obtain Laplace transform of a Ramp function. **(04 Marks)**

b. Determine Laplace transform of a following :

i) $\sin^2 t$ ii) $\cos^2 t$ **(06 Marks)**

c. Calculate the voltage $V_c(t)$ for $t \geq 0$ for the circuit shown below using Laplace transform method. In the circuit shown Fig.Q8(c) switch is opened at t = 0.

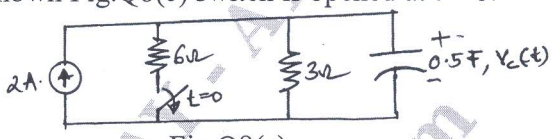

Fig.Q8(c) **(10 Marks)**

Module-5

9 a. Define port of network and write assumptions to be made to find network and also obtain Z-parameters. **(10 Marks)**

b. An unbalanced 3-phase load is supplied by symmetrical 3 phase, 440V, 3 wire system. The star connected load branch are $Z_R = 5\angle 30°$, $Z_y = 10\angle 45°$, $Z_B = 10\angle 60°$. Determine line currents. **(10 Marks)**

OR

10 a. Discuss the method of analyzing 3-phase star connected unbalanced load using mesh method. **(10 Marks)**

b. Determine h-parameter of network shown in Fig.Q10(b) and give its equivalent circuit.

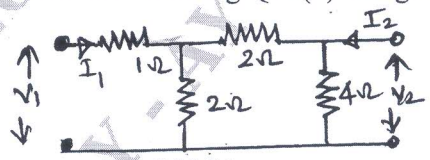

Fig.Q10(b) **(10 Marks)**

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