CBCS SCHEME

USN | | | | | | | | | |

18EE32

Third Semester B.E. Degree Examination, June/July 2024
Electrical 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. Three resistances are connected in delta. Obtain expression for their star connected equivalents. **(06 Marks)**

b. Reduce the network shown in Fig.Q.1(b) to a single voltage source in series with resistance using source shift and source transformation. **(06 Marks)**

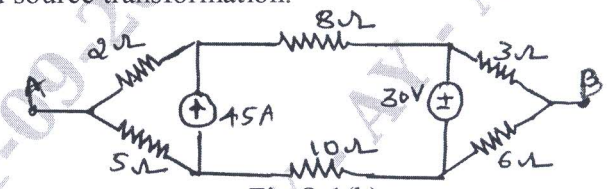

Fig.Q.1(b)

c. In the circuit shown in Fig.Q.1(c), determine V_2 which results in zero current through the 4Ω resister use mesh analysis. **(08 Marks)**

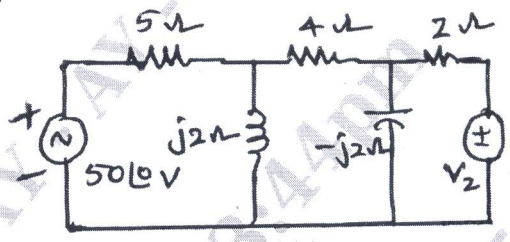

Fig.Q.1(c)

OR

2 a. Write the nodal equation for the circuit shown in Fig.Q.2(a) and then find power supplied by 5V source. **(08 Marks)**

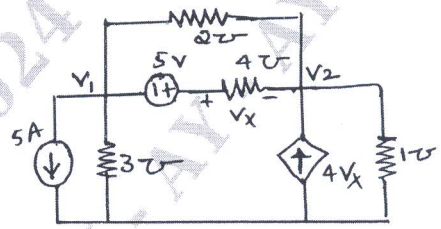

Fig.2.(a)

b. For the network shown in Fig.Q.2(b) write the mesh equations. For the meshes indicated in time domain, draw the dual network and write node equation. **(06 Marks)**

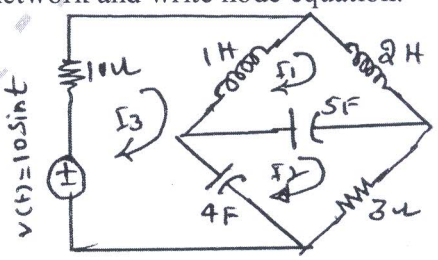

Fig.2.(b)

c. For the circuit shown in Fig.Q.2(c), determine the resistance between M and N using star-delta transformation. **(06 Marks)**

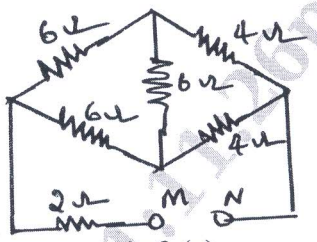

Fig.2.(c)

Module-2

3 a. State and explain superposition theorem. **(06 Marks)**

b. Use Millman's theorem to determine the voltage V_s of the network shown in Fig.Q.3(b)

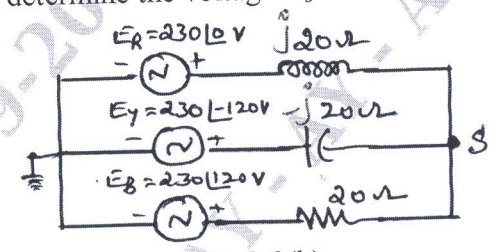

Fig.Q.3(b)

(06 Marks)

c. Find the Thevenins equivalent circuit at the terminals A and B of the network shown in Fig.Q.3(c).

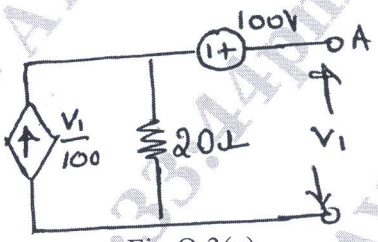

Fig.Q.3(c)

(08 Marks)

OR

4 a. Find the maximum power transferred to the load impedance Z_L shown in Fig.Q.4(a).

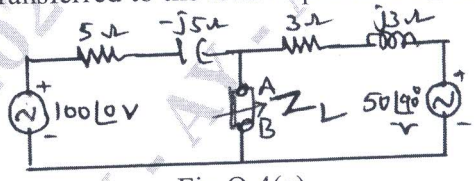

Fig.Q.4(a)

(08 Marks)

b. Use Super position theorem, to find the current 'I' in the network shown in Fig.Q.4(b).

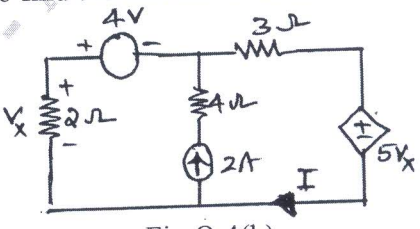

Fig.Q.4(b)

(08 Marks)

c. State the reciprocity theorem. **(04 Marks)**

Module-3

5 a. Derive the expression for the resonant frequency 'f_r' for the parallel resonant circuit shown in Fig.Q.5(a). **(08 Marks)**

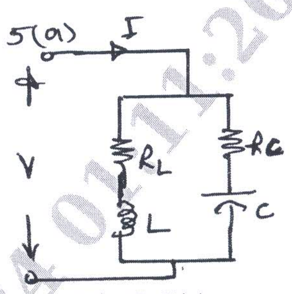

Fig.Q.5(a)

b. A resistor and a capacitor are in series with a variable inductor across 100V, 50Hz supply. The maximum current obtained by varying inductance is 5A voltage across capacitance is then 250V. Find R, L and C **(06 Marks)**

c. Find the value of 'R_L' for the circuit shown in Fig.Q.5(c) is resonant.

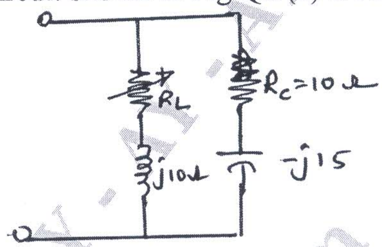

Fig.Q.5(c)

(06 Marks)

OR

6 a. In the circuit shown in Fig.Q.6(a) switch 'K' is changed from position 1 to 2 at time t = 0, steady state reached before switching. Find the value of i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at t = 0+. **(08 Marks)**

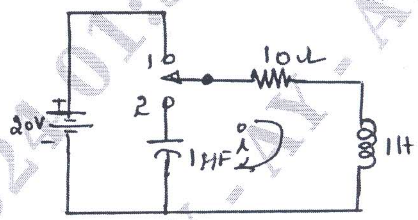

Fig.Q.6(a)

b. In the given circuit shown in Fig.Q.6(b) switch 'K' is opened at time t = 0. Find v, $\frac{dv}{dt}$ and $\frac{d^2v}{dt^2}$ at t = 0+. **(06 Marks)**

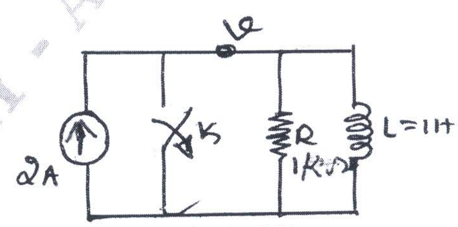

Fig.Q.6(b)

c. In the network shown in Fig.Q.6(c) the switch 'K' is closed at t = 0+. Find the current i(t). **(06 Marks)**

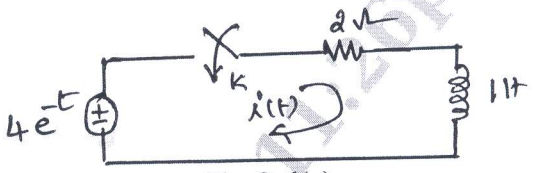

Fig.Q.6(c)

Module-4

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

b. Find the inverse Laplace transform of H(S) where $H(S) = \frac{7S+2}{S^3+3S^2+2S}$. **(06 Marks)**

c. Obtain the complete solution for current i(t) using Laplace transformation method. Assume all initial conditions are zero for the circuit shown in Fig.Q.7(c). **(08 Marks)**

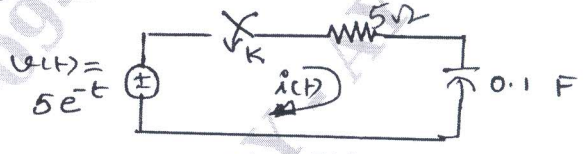

Fig.Q.7(c)

OR

8 a. Using the Laplace transformation of Ramp function, find the L.T. of triangular wave shown in Fig.Q.8(a). **(08 Marks)**

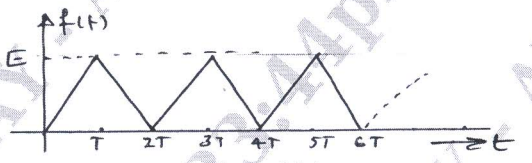

Fig.Q.8(a)

b. Determine the L.T. of wave form shown in Fig.Q.8(b). **(06 Marks)**

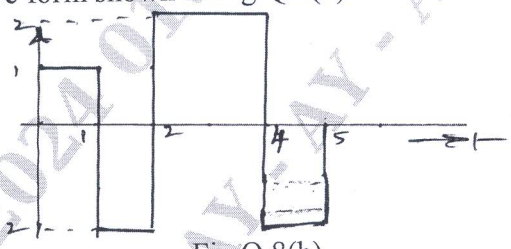

Fig.Q.8(b)

c. Sketch the waveform from given equation
i) r(t + 2) – r(t + 1) – r(t – 2) + r(t – 3). **(06 Marks)**

Module-5

9 a. A three phase, 3 wire, 400V delta connected load impedances. $Z_{RY} = 10\angle 0\,\Omega$, $Z_{YB} = 10\angle -30\Omega$, $Z_{BR} = 10\angle 30^\circ\,\Omega$. Calculate the line currents and power consumed by each load. Also calculate total power. **(10 Marks)**

b. A 400V, 3ϕ supply feeds an unbalanced 3 wire star connected load shown in Fig.Q.9(b). For the phase sequence RYB. Determine line currents. **(10 Marks)**

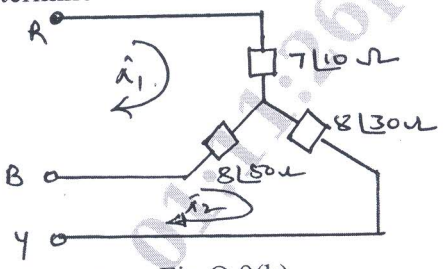

Fig.Q.9(b)

OR

10 a. Obtain the impedance parameter interms of ABCD parameters. **(06 Marks)**

b. Find the Z-parameter of the network shown in Fig.Q.10(b). **(08 Marks)**

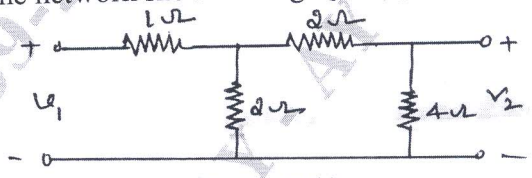

Fig.Q.10(b)

c. Determine the ABCD parameter of the network shown in Fig.Q.10(c). **(06 Marks)**

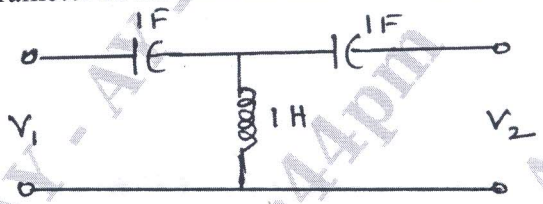

Fig.Q.10(c)

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