CBCS SCHEME

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18EE32

Third Semester B.E. Degree Examination, Dec.2023/Jan.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. Reduce the network shown in Fig.Q1(a) to a single voltage source in series with a resistance.

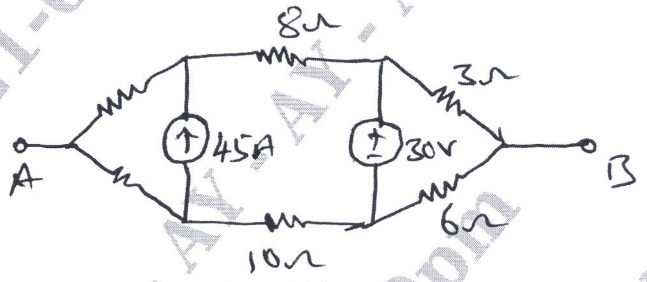

Fig.Q1(a) **(08 Marks)**

b. Determine the nodal voltages V_1, V_2, V_3 and V_4 in the circuit shown in Fig.Q1(b).

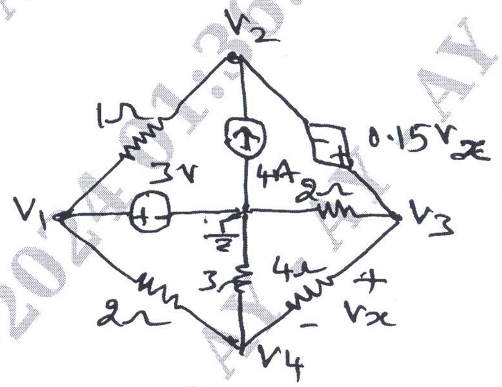

Fig.Q1(b) **(08 Marks)**

c. Compute the resistance between A and B in network shown in Fig.Q1(c) using star - Delta transformation.

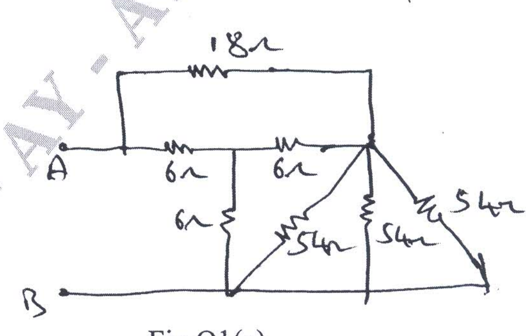

Fig.Q1(c) **(04 Marks)**

OR

2 a. For the circuit shown in Fig.Q2(a) determine I_x using Mesh analysis. **(08 Marks)**

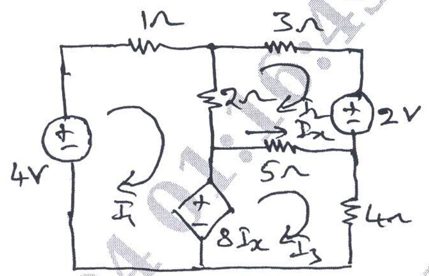

Fig.Q2(a)

b. Determine node voltages is network shown in Fig.Q2(b).

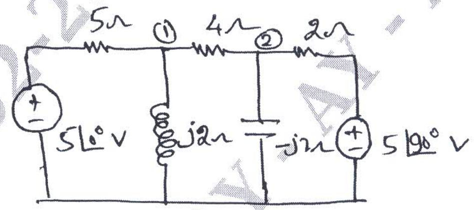

Fig.Q2(b) **(06 Marks)**

c. Find current I using Mesh analysis in the network shown in Fig.Q2(c).

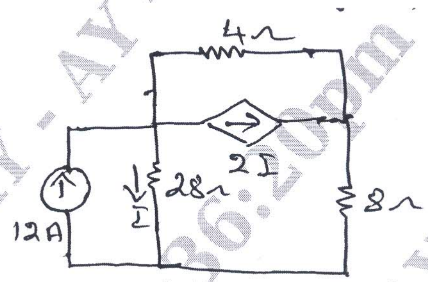

Fig.Q2(c) **(06 Marks)**

Module-2

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

b. Determine the current I in the network shown in Fig.Q3(b) and verity reciprocity theorem.

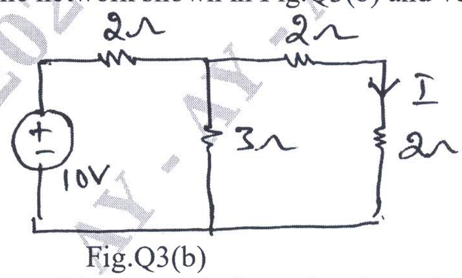

Fig.Q3(b) **(06 Marks)**

c. Obtain Thevenin's equivalent of the network shown in Fig.Q3(c) between terminals A and B and find the power dissipation in load resistance 4Ω.

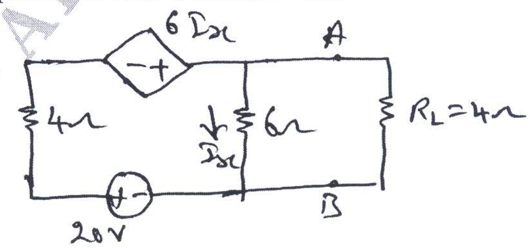

Fig.Q3(c) **(08 Marks)**

OR

4 a. State and prove Norton's theorem. **(06 Marks)**

b. Using Millman's theorem find I_L through R_L for the network shown in Fig.Q4(b).

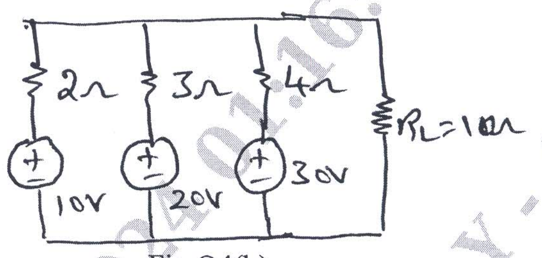

Fig.Q4(b) **(06 Marks)**

c. Find the value of load resistance when maximum power is transferred across it also find the value of maximum power transferred. (Refer Fig.Q4(c)).

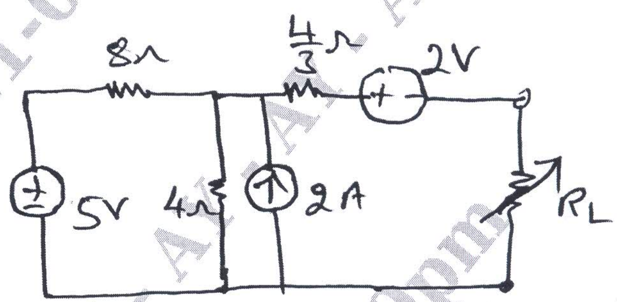

Fig.Q4(c) **(08 Marks)**

Module-3

5 a. Define the following terms with respect to resonant circuit :

i) Resonant frequency
ii) Q Factor
iii) Bandwidth
iv) Selectivity. Write the expression of each. **(08 Marks)**

b. A series RLC circuit has $R = 1\Omega$, $L = 0.01H$ and $C = 0.01\mu F$ and it is connected across θ variable frequency source. Determine :

i) Resonant frequency
ii) Quality factor
iii) Bandwidth
iv) Cut off frequencies f_1 and f_2. **(06 Marks)**

c. Find $i(0^+)$, $\frac{di}{dt}(0^+)$ and $\frac{d^2i(0^+)}{dt^2}$ in the network shown in Fig.Q5(c).

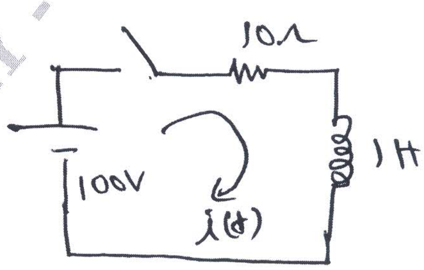

Fig.Q5(c) **(06 Marks)**

OR

6 a. In the network shown in Fig.Q6(a) switch 'K' is changed form position 'Q' to 'b' at f = 0. Solve for i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$, if R = 1000Ω, L = 1H, C = 0.1--- and v = 1000V. Assume capacitor is initially uncharged.

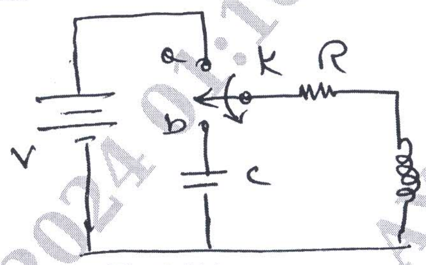

Fig.Q6(a) **(08 Marks)**

b. Show that the resonant frequency at a series RLC circuit is equal to geometric mean of two half power frequencies. **(06 Marks)**

c. For the circuit shown in Fig.Q6(c) find two values of capacitor for the reasonable. Consider f = 50Hz.

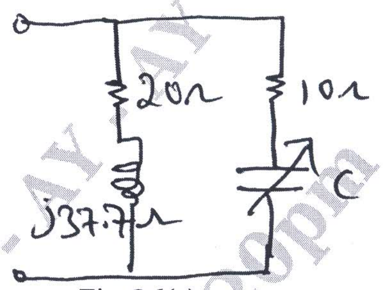

Fig.Q6(c) **(06 Marks)**

Module-4

7 a. Find i(t) for t ≥ 0 for the network shown in Fig.Q7(a) using Laplace transformers.

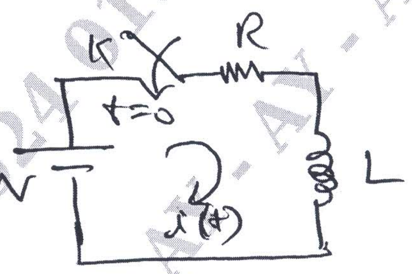

Fig.Q7(a) **(06 Marks)**

b. State and prove :
i) Initial valve theorem
ii) Final value theorem. **(06 Marks)**

c. Obtain the Laplace transform of triangular waveform shown in Fig.Q7(c).

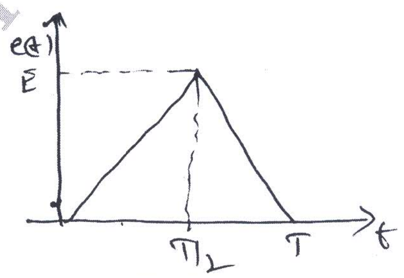

Fig.Q7(c) **(08 Marks)**

OR

8 a. Find the Laplace transform of the waveform shown in Fig.Q8(a).

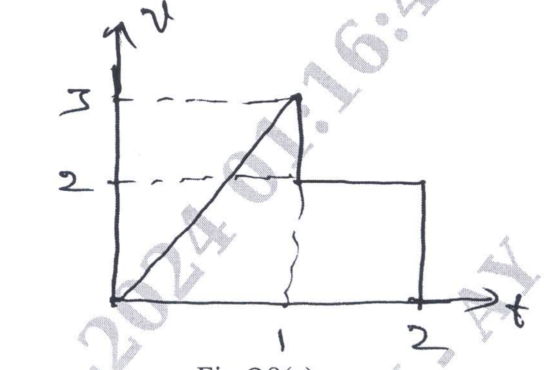

Fig.Q8(a)

(08 Marks)

b. Find the Laplace transform of periodic waveform shown in Fig.Q8(b).

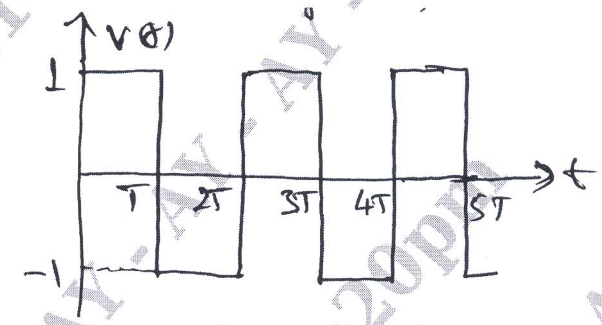

Fig.Q8(b)

(08 Marks)

c. Find the laplace transform of the following function : i) u(t) ii) δ(+). **(04 Marks)**

Module-5

9 a. Find the open circuit impedance parameters for the current shown in Fig.Q9(a).

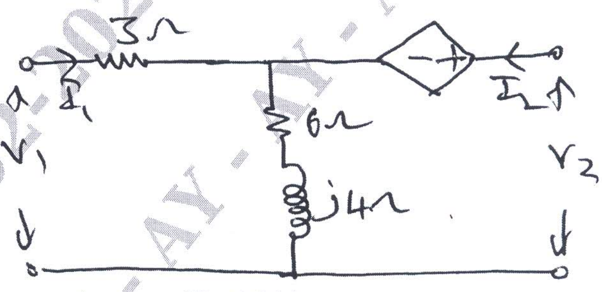

Fig.Q9(a)

(06 Marks)

b. Derive expressions for 'Y' parameters in terms of Z – parameters. **(06 Marks)**

c. A 3 – phase 400V, 4 wire system has a star connected load with $Z_R = 10\Omega$, $Z_y = (15 + j10)\Omega$ and $Z_B = j5\Omega$. Find the line current and current through natural conductor. Draw the vector diagram. **(08 Marks)**

OR

10 a. Find 'Y' parameters of the two port network shown in Fig.10(a). Also find 'Z' parameters.

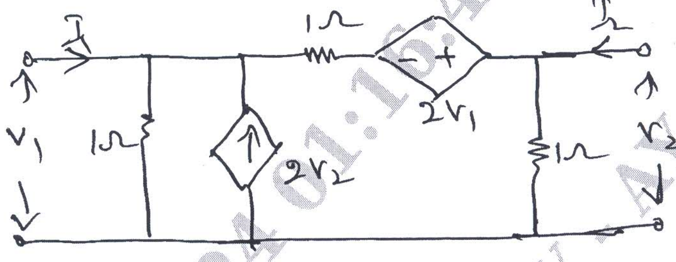

Fig.Q10(a)

(10 Marks)

b. A balanced set of three phase voltages is connected to an unbalanced set of 'Y' connected impedances. $V_{RY} = 212\angle 90^\circ V$, $V_{YB} = 212\angle -150^\circ V$ and $V_{BR} = 212\angle -30^\circ V$, $Z_R = (10 + j0)\Omega$, $Z_Y = (10 + j0)\Omega$ and $Z_C = (0 - j20)\Omega$.

Find :

i) The line current

ii) Phase voltages

iii)Power dissipated in each phase. **(10 Marks)**

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