CBCS SCHEME

USN | | | | | | | | | | |

18EC32

Third Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Network Theory

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Derive the expression for Delta to Star transformation and Star to Delta transformation. **(10 Marks)**

b. For the network shown in Fig.Q1(b) find the node voltages V_C and V_d.

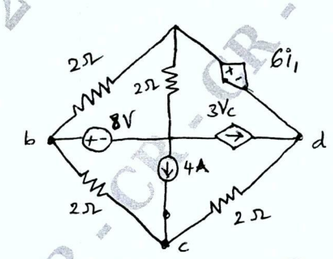

Fig.Q1(b) **(10 Marks)**

OR

2 a. Explain the classification of electrical networks by providing an example. **(08 Marks)**

b. Reduce the network shown in Fig.Q2(b) to a single voltage source in series with a resistance using source shifting and source transformations.

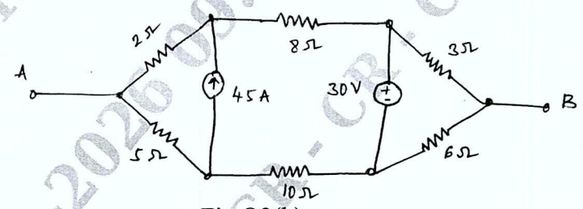

Fig.Q2(b) **(07 Marks)**

c. Find the equivalent resistance at terminals AB in Fig.Q2(c).

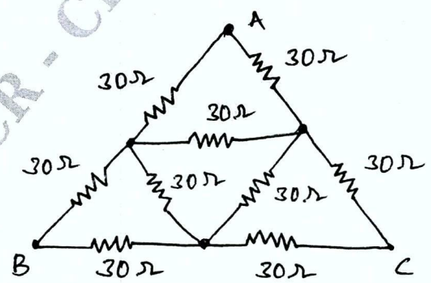

Fig.Q2(c) **(05 Marks)**

Module-2

3 a. State and prove Thevenin's Theorem. **(08 Marks)**

b. In the circuit shown in Fig.Q3(b), find the value of the current through 667Ω resistor using Norton's theorem.

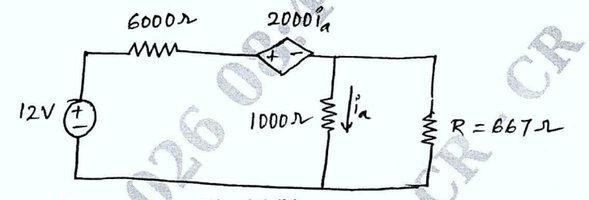

Fig.Q3(b) **(06 Marks)**

c. For the circuit shown in Fig.Q3(c), find the current i using super position theorem.

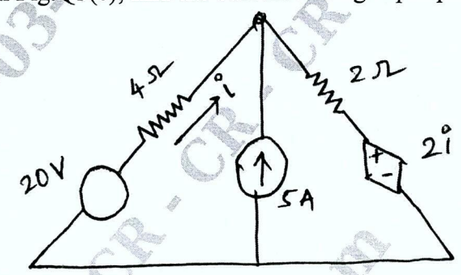

Fig.Q3(c) **(06 Marks)**

OR

4 a. State and prove maximum power transfer theorem. **(08 Marks)**

b. Find the current flowing through (2 + j3)Ω impedance using Millman's theorem for the circuit shown in Fig.Q4(b).

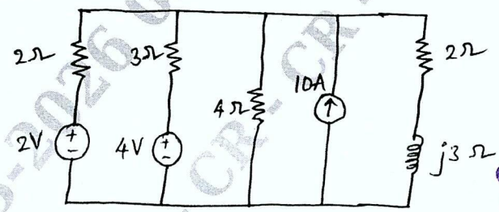

Fig.Q4(b) **(06 Marks)**

c. For the network shown in Fig.Q4(c), obtain Thevenin's equivalent as seen from terminals A and B.

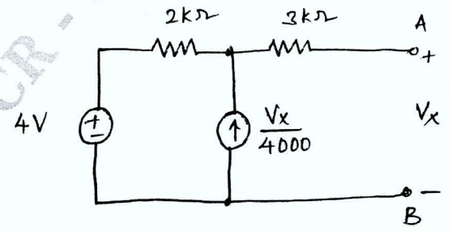

Fig.Q4(c) **(06 Marks)**

Module-3

5 a. For the given network shown in Fig.Q5(a), K is closed at t = 0 with zero current in the inductor. Find the values of i, $\frac{di}{dt}$, $\frac{d^2i}{dt^2}$ at $t = 0^+$ if R = 8Ω and L = 0.2H.

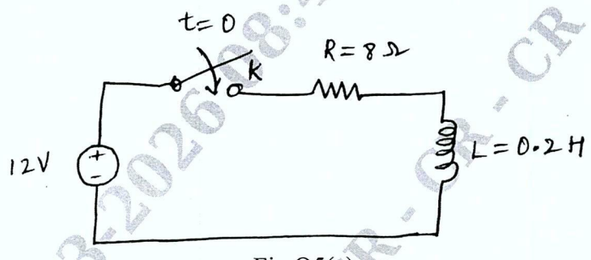

Fig.Q5(a) **(08 Marks)**

b. For the Fig.Q5(b). The switch K is opened at t = 0. At $t = 0^+$, solve for the values of V, $\frac{dv}{dt}$ and $\frac{d^2V}{dt^2}$ if I = 2A, R = 200Ω and L = 1 H.

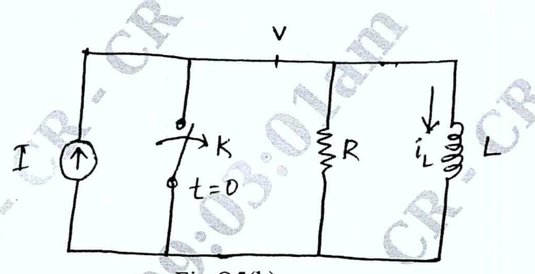

Fig.Q5(b) **(08 Marks)**

c. In how many seconds after t = 0 has the current i(t) become one half of its initial value in the given circuit shown in Fig.Q5(c).

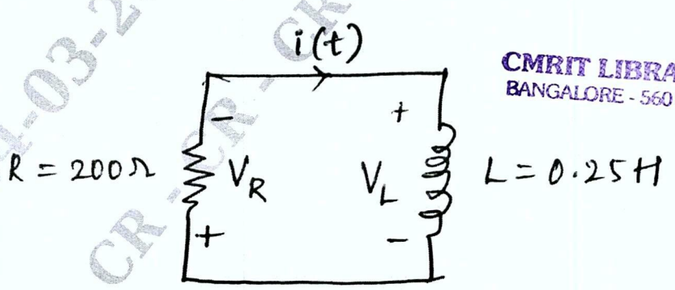

Fig.Q5(c) **(04 Marks)**

OR

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

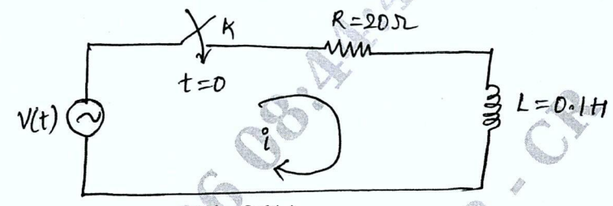

Fig.Q6(a) **(10 Marks)**

b. In the Fig.Q6(b), switch K is closed at t = 0. Find value of $i_1, i_2, \frac{di}{dt}, \frac{di_2}{dt}, \frac{d^2i_1}{dt^2}, \frac{d^2i_2}{dt^2}$ at $t = 0^+$.

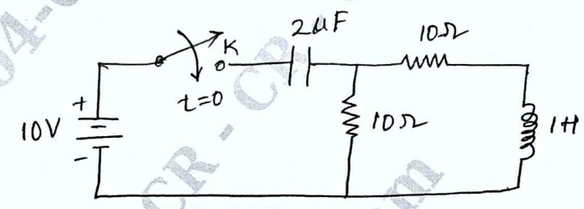

Fig.Q6(b) **(10 Marks)**

Module-4

7 a. State and prove initial and final value theorem. **(08 marks)**

b. Obtain the Laplace transform of sawtooth waveform shown in Fig.Q7(b).

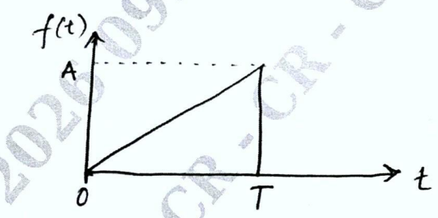

Fig.Q7(b) **(06 Marks)**

c. Obtain the Laplace transform of squarewave train shown in Fig.Q7(c).

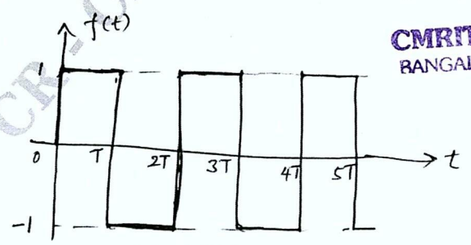

Fig.Q7(c) **(06 Marks)**

OR

8 a. Obtain the Lapace transform of step, ramp and impulse functions. **(06 Marks)**

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

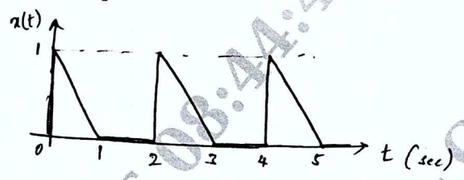

Fig.Q8(b) **(06 Marks)**

c. Obtain the Laplace transform of f(t) of the waveform shown in Fig.Q8(c).

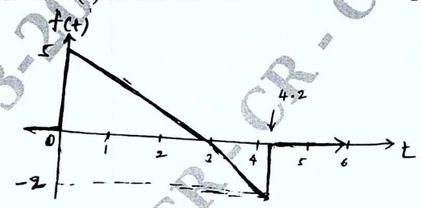

Fig.Q8(c) **(08 Marks)**

Module-5

9 a. Derive Z-parameters interms of h-parameters and ABCD – parameters. **(10 Marks)**

b. The bridged T-RC network is as shown in Fig.Q9(b). For the values given, find y and z parameters.

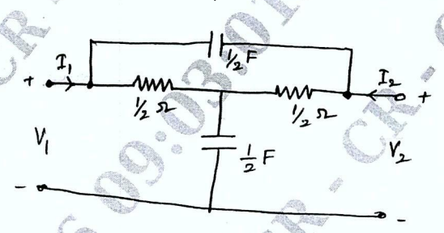

Fig.Q9(b) **(10 Marks)**

OR

10 a. Prove that $f_0 = \sqrt{f_1 f_2}$ where f_1 and f_2 are the two half power frequencies of a resonant circuit. **(08 Marks)**

b. Find the value of R such that the given circuit in Fig.Q10(b) is resonant.

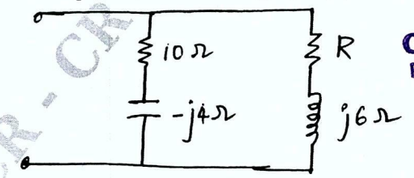

Fig.Q10(b) **(04 Marks)**

c. A series RLC circuit has R = 4Ω, L = 1 mH and C = 10 μF. Calculate Q-factor, bandwidth, resonant frequency and half power frequencies f_1 and f_2. **(08 Marks)**

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