CBCS SCHEME

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

15EE32

Third Semester B.E. Degree Examination, June/July 2023
Electric Circuit Analysis

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Derive the expression for, (i) $\Delta - Y$ transformation
(ii) $Y - \Delta$ transformation **(08 Marks)**

b. Find the current I_A in 28 Ω resistance by mesh analysis for Fig. Q1 (b).

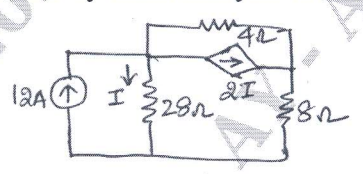

Fig. Q1 (b) **(08 Marks)**

OR

2 a. Use nodal analysis to find the value of 'V_x' in the circuit shown in Fig. Q2 (a), such that current through $(2 + j3)\Omega$ impedance is zero?

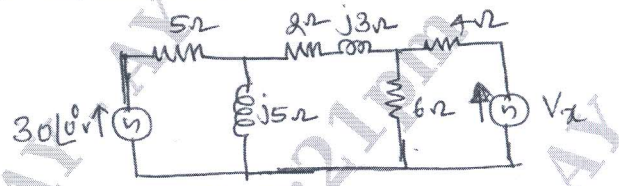

Fig. Q2 (a) **(08 Marks)**

b. A series RLC circuit has R = 2 Ω, L = 2 H and C = 10 μF. Calculate Q factor, bandwidth, the resonant frequency and half power frequencies. **(08 Marks)**

Module-2

3 a. State and explain maximum power transfer theorem when load impedance consisting of variable resistance and variable reactance? **(08 Marks)**

b. For the network shown in Fig. Q3 (b), obtain Thevenin's equivalent circuit as seen from terminals p and q.

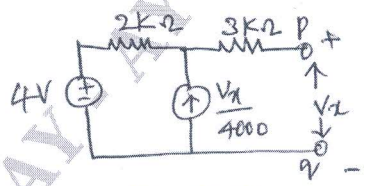

Fig. Q3 (b) **(08 Marks)**

OR

4 a. Find the current I in the circuit using superposition theorem for Fig. Q4 (a).

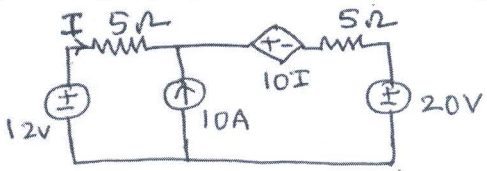

Fig. Q4 (a) **(08 Marks)**

b. Using Millman's theorem, find the current through $(2 + j3)\Omega$ impedance for Fig. Q4 (b).

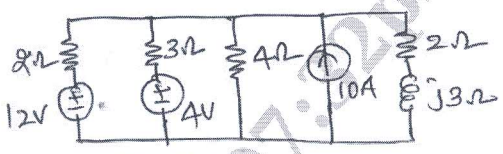

Fig. Q4 (b) **(08 Marks)**

Module-3

5 a. Show the behavior of R, L, C elements at the time of switching at $t = 0$ both at $t = 0^+$ and $t = \infty$. **(08 Marks)**

b. In the circuit shown in Fig. Q5 (b) switch 'K' is moved from Position 1 to 2 at $t = 0$, steady state condition having reached before switching. Find i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$.

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

OR

6 a. In the circuit shown in Fig. Q6 (a) initially switch 'K' is kept open for long time. At $t = 0$ switch K is closed. Obtain expression for current in the circuit for $t > 0$. Find the value of current at $t = 0.25$ sec. What will be the current in the circuit in one time constant period? Determine the instant of time at which the current in the circuit reaches 1.2 A?

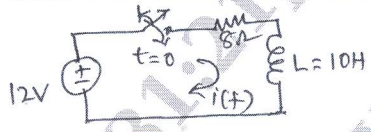

Fig. Q6 (a) **(08 Marks)**

b. In the circuit shown in Fig. Q6 (b) switch K is closed at $t = 0$, find the values of i_1, i_2, $\frac{di_1}{dt}$, $\frac{di_2}{dt}$, $\frac{d^2i_1}{dt^2}$ and $\frac{d^2i_2}{dt^2}$ at $t = 0^+$.

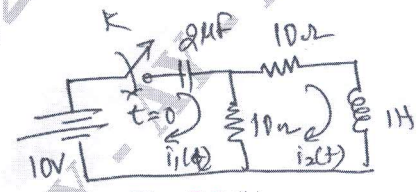

Fig. Q6 (b) **(08 Marks)**

Module-4

7 a. State and explain initial value and final value theorems. **(08 Marks)**

b. Find the Laplace transformation of function shown in Fig. Q7 (b).

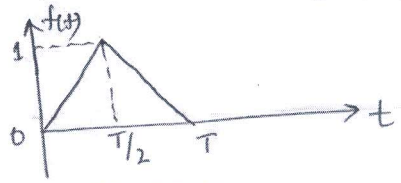

Fig. Q7 (b) **(08 Marks)**

OR

8 a. Find the inverse Laplace transform of the following functions :

(i) $\frac{s^2+5}{s(s^2+4s+4)}$ (ii) $\frac{2s+6}{s^2+6s+25}$

(08 Marks)

b. Using Laplace transformation, determine the current in the circuit shown in Fig. Q8 (b), when switch 'K' is closed at t = 0. Assume zero initial condition.

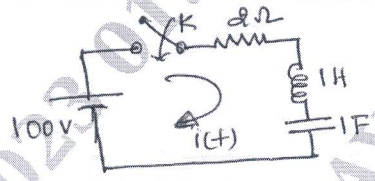

Fig. Q8 (b) **(08 Marks)**

Module-5

9 a. An unbalanced 3-phase 4-wire star connected load, has balanced voltages of 208 V with ABC phase sequence. Calculate the line currents and the neutral current.

$Z_A = 10\Omega$; $Z_B = 15\angle 30^\circ\Omega$, $Z_c = 10\angle -30^\circ\Omega$ **(08 Marks)**

b. Define Z and Y parameters? Obtain hybrid parameters (h parameters) in terms of z-parameters. **(08 Marks)**

OR

10 a. Determine the Y-parameters of the networks shown in Fig. Q10 (a).

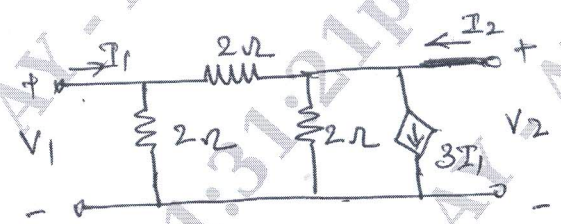

Fig.Q10 (a) **(08 Marks)**

b. What are poles and zero's? What are the properties of poles zero with pole-zero plot? **(08 Marks)**

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