CBCS SCHEME

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

18EE32

Third Semester B.E. Degree Examination, Aug./Sept.2020
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. Determine voltage V_3 for the circuit shown in Fig.Q1(a), using Mesh analysis method.

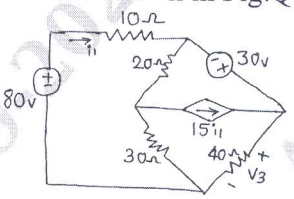


Fig.Q1(a) **(08 Marks)**

b. Apply node analysis method to find node voltages V1, V2, V3 for the circuit shown in Fig.Q1(b).

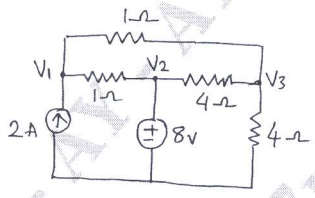


Fig.Q1(b) **(07 Marks)**

c. Determine the equivalent resistance between the terminals AB for circuit shown in Fig.Q1(c).

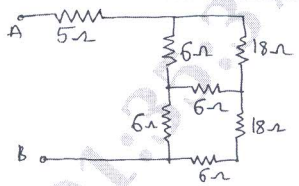


Fig.Q1(c) **(05 Marks)**

OR

2 a. Apply loop analysis method to find voltage V, such that current through (2 + j3) Ω resistor is zero. For the circuit shown in Fig.Q2(a).

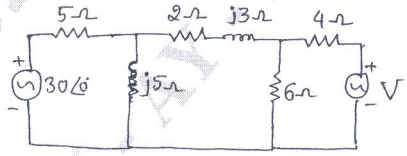


Fig.Q2(a) **(07 Marks)**

b. Determine the voltage V_X in the circuit shown in Fig.Q2(b) using Nodal analysis method.

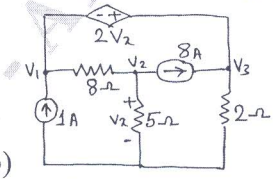


Fig.Q2(b) **(07 Marks)**

c. Apply source transformation and shifting method to reduce the circuit shown in Fig.Q2(c) to a single voltage source in series with resistance.

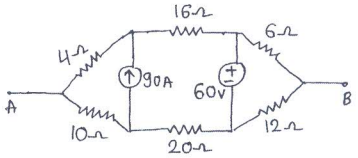


Fig.Q2(c) **(06 Marks)**

Module-2

3 a. In the circuit shown in Fig.Q3(a), determine current I_X using super position theorem.

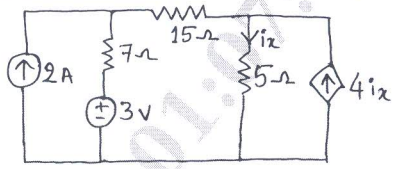


Fig.Q3(a) **(07 Marks)**

b. Determine Thevenin's equivalent of the circuit in Fig.Q3(b).

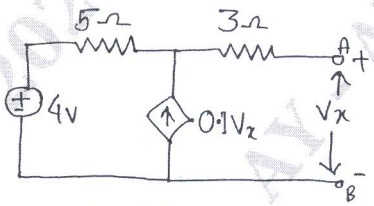


Fig.Q3(b) **(07 Marks)**

c. Use Millman's theorem to find current I, for the circuit shown in Fig.Q3(c).

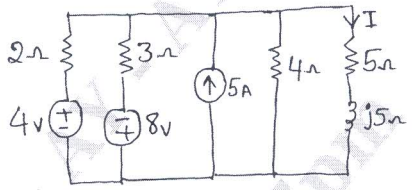


Fig.Q3(c) **(06 Marks)**

OR

4 a. Determine current thorough 1Ω resistor. Using Nortan's theorem for the circuit shown in Fig.Q4(a).

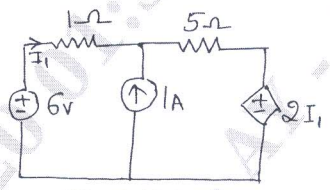


Fig.Q4(a) **(07 Marks)**

b. Determine the load resistance R_L to receive maximum power from the source. Also find maximum power delivered to the load in the circuit shown in Fig.Q4(b).

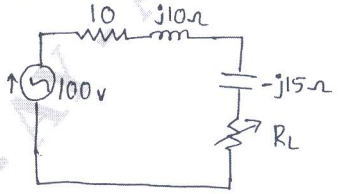


Fig.Q4(b) **(07 Marks)**

c. State and verify reciprocity theorem for the circuit shown in Fig.Q4(c).

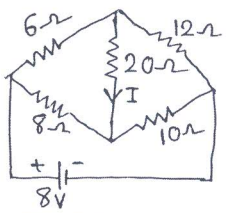


Fig.Q4(c) **(06 Marks)**

Module-3

5 a. Derive an expression for the resonance frequency of a resonant circuit consisting of R_L, XL in parallel with RC, XC. **(07 Marks)**

b. An impedance coil having a resistance of 4Ω and an inductance of 1mH connected in series with 10μF capacitor. Determine resonant frequency, impedance at resonance, half power frequencies, Q of the circuit and bandwidth. **(08 Marks)**

c. For the circuit shown in Fig.Q5(C), the switch is moved from position 1 to 2 at $t = 0$. The steady state has been reached before switching. Determine : i, $\frac{di}{dt}, \frac{d^2i}{dt^2}$ at $t = 0^+$.

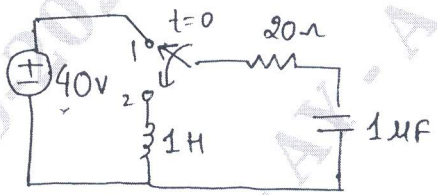


Fig.Q5(c) **(05 Marks)**

OR

6 a. In circuit shown in Fig.Q6(a), the switch K is closed at $t = 0$. Calculate $\frac{di_1(0^+)}{dt}$ and $\frac{di_2(0^+)}{dt}$. Assume that the circuit was not activated before $t = 0$.

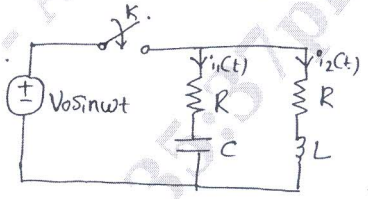


Fig.Q6(a) **(10 Marks)**

b. Determine R_L and R_C for which the circuit shown in Fig.Q6(b), resonances at all frequencies.

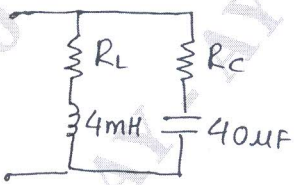


Fig.Q6(b) **(04 Marks)**

c Show that in series RLC circuit, the resonant frequency $f_0 = \sqrt{f_1 f_2}$. **(06 Marks)**

Module-4

7 a. State and prove initial and final value theorem in Lapalce transformation. **(08 Marks)**

b. Find Lapalce transform of the signal shown in Fig.Q7(b).

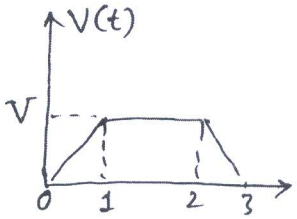


Fig.Q7(b) **(08 Marks)**

c. Find Laplace transform of unit step function. **(04 Marks)**

OR

8 a. State and prove shifting theorem. **(05 Marks)**

b. Verify initial value theorem, given $f(t) = 10e^{5t}$. **(05 Marks)**

c. Find Laplace transform of the signal in Fig.Q8(c).

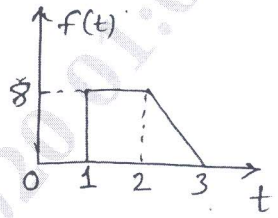
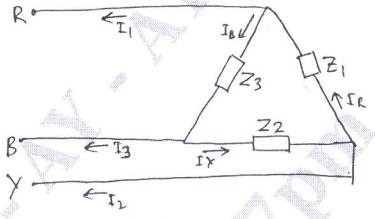


Fig.Q8(c) **(10 Marks)**

Module-5

9 a. Three impedances $Z_1 = 20\angle 30°\Omega$, $Z_2 = 40\angle 60°\Omega$ and $Z_3 = 10\angle -90°\Omega$ are delta connected to a 400V, 3 – phase system as show in Fig.Q9(a). Determine the :
i) Phase currents ii) Line currents.



FigQ9(a) **(06 Marks)**

b. Determine Y–parameters for the circuit shown in Fig.Q9(b).

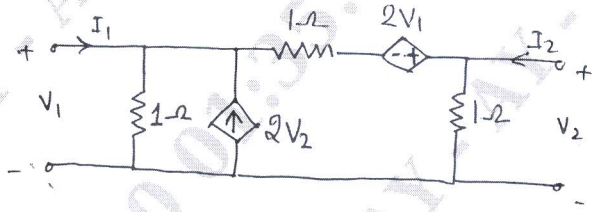


Fig.9(b) **(08 Marks)**

c. Express Y–parameters interms of Z–parameters. **(06 Marks)**

OR

10 a. An unbalanced four-wire, star connected load has a balanced voltage of 400V, the loads are $Z_1 = (4 + j8)\Omega$, $Z_2 = (3 + j4)\Omega$, $Z_3 = (15 + j20)\Omega$.
Calculate the : i) line currents ii) current in the neutral wire. **(06 Marks)**

b. Find Z-parameters and T-parameters for the circuit shown in Fig.Q10(b).

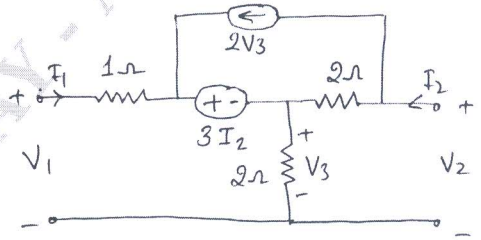


Fig.Q10(b) **(10 Marks)**

c. Define H – parameters with necessary equations. **(04 Marks)**

* * * * *