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15EE32

Third Semester B.E. Degree Examination, Feb./Mar. 2022

**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. Using source transformation reduce the network, shown in Fig Q1(a) into a single source.

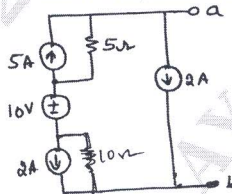


Fig Q1(a)

(04 Marks)

- b. Using star/delta transformation, determine the resistance between A and B of network shown in Fig Q1(b).

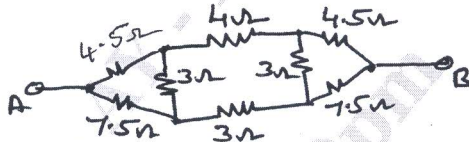


Fig Q1(b)

(06 Marks)

- c. Write the mesh equation for the circuit shown in Fig Q1(c), and determine mesh currents using mesh analysis.

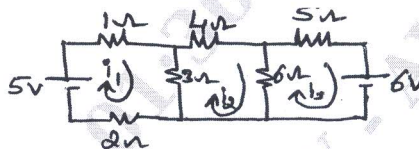


Fig Q1(c)

(06 Marks)

OR

- 2 a. Define the following terms with reference the resonance circuit i) Resonance ii) Quality factor iii) Bandwidth iv) Selectivity. (04 Marks)  
 b. A serial RLC circuit has  $R = 4\Omega$ ,  $L = 1\text{mH}$ ,  $C = 10\mu\text{F}$ . Calculate Q-factor, bandwidth and Resonant frequency  $f_1$  and  $f_2$ . (05 Marks)  
 c. Find the power delivered by 5A current source using nodal analysis for the circuit, shown in Fig Q2(c).

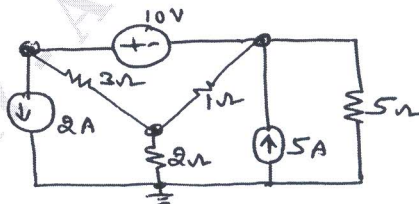


Fig Q2(c)

(07 Marks)

**Module-2**

- 3 a. For the Network shown in Fig Q3(a), obtain the Thevenin's equivalent circuit and find the load current through  $R_L$ .

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

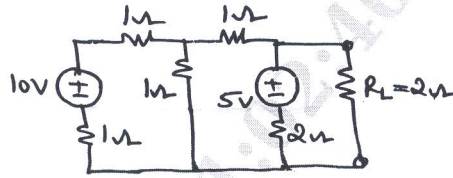


Fig Q3(a)

(08 Marks)

- b. For the Network shown in Fig Q3(b), obtain the Norton's equivalent circuit and find the current through Load \$R\_L\$.

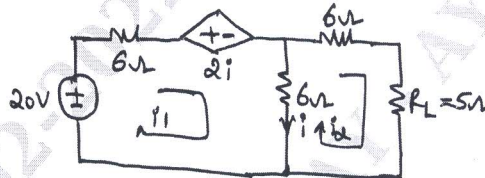


Fig Q3(b)

(08 Marks)

OR

- 4 a. State and explain the superposition theorem. (05 Marks)  
 b. Using Millman's theorem find current through \$(5 + j5)\Omega\$ for the network, shown in Fig Q4(b).

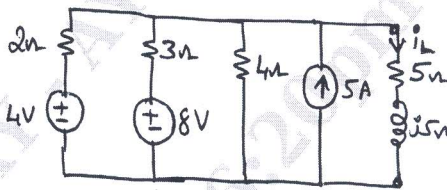


Fig Q4(b)

(05 Marks)

- c. Find \$I\_x\$ and hence verify reciprocity theorem for the network, shown in Fig Q4(c).

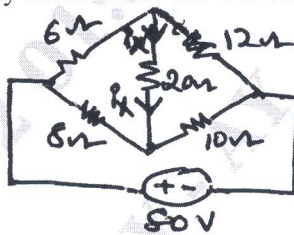


Fig Q4(c)

(06 Marks)

Module-3

- 5 a. Discuss with relevant theory how resistor, capacitor inductor elements behave at \$t = 0^+\$ and \$t = \infty\$ (06 Marks)  
 b. In the network shown in Fig Q5(b), switch 'K' is changed from 100V to \$10\mu F\$ at time \$t = 0\$. A steady state condition have been reached before switching.

Find the value of \$i\$, \$\frac{di}{dt}\$ and \$\frac{d^2i}{dt^2}\$ at \$t = 0^+\$.

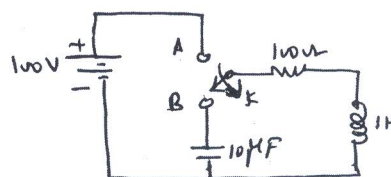


Fig Q5(b)

(10 Marks)

OR

- 6 a. In the current shown in Fig Q6(a) determine compute solution for current when switch 'K' is closed at  $t = 0$ . Applied voltage is  $v(t)$  with is given as  $100 \cos(10^3 t + \pi/2)$ .

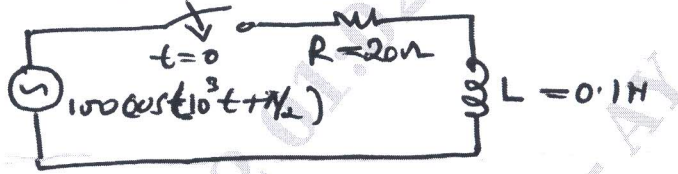


Fig Q6(a)

(08 Marks)

- b. For the network shown in Fig Q6(b), find  $\frac{d i_1(0^+)}{dt}$ ,  $\frac{d i_2(0^+)}{dt}$  and  $\frac{d^2 i_2(0^+)}{dt^2}$

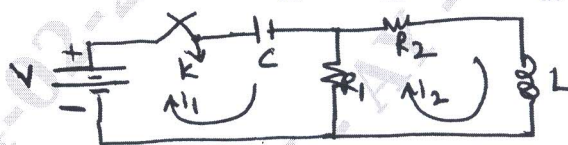


Fig Q6(b)

(08Marks)

Module-4

- 7 a. Obtain the Laplace transform of  $f(t)$  for the waveform shown in Fig Q7(a).

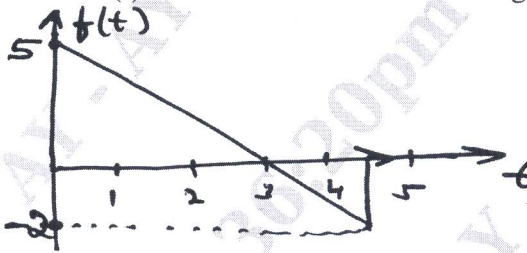


Fig Q7(a)

(08 Marks)

- b. Obtain the Laplace transform and the periodic signal shown in Fig Q7(b).

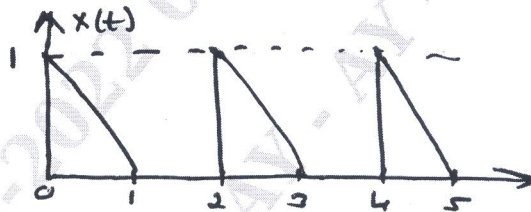


Fig Q7(b)

(08 Marks)

OR

- 8 a. State and explain convolution theorem. (08 Marks)  
 b. Obtain the inverse Laplace transform of given  $F(s)$

i)  $F(s) = \frac{s+2}{s(s+3)(s+4)}$     ii)  $F(s) = \frac{s^2+5}{s(s+2)^2}$  (08 Marks)

Module-5

- 9 a. For unbalanced delta connected load find phase currents, line currents and power consumed in each phase. When sequence is ABC and RYB. [Refer Fig Q9(a)]



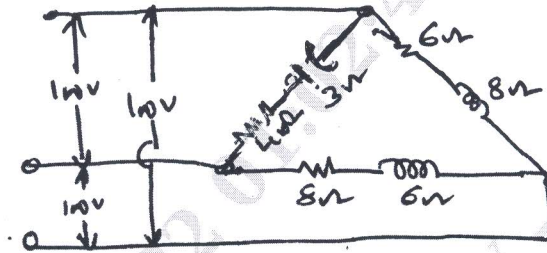


Fig Q9(a)

(08 Marks)

- b. Explain the open circuit impedance parameters. And also explain the equivalent circuit of open circuit impedance parameter. (08 Marks)

OR

- 10 a. Determine Y-parameter of the two part network shown in Fig Q10(a).

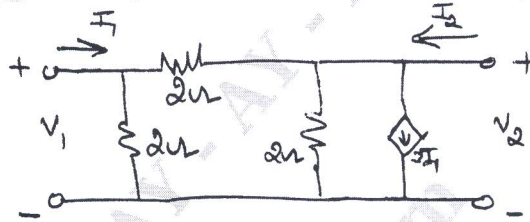


Fig Q10(a)

(08 Marks)

- b. Determine the chain parameters for the network shown in Fig Q10(b)

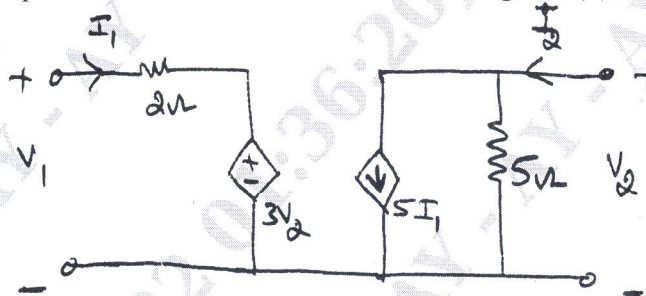


Fig Q10(b)

(08 Marks)

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