3E1149

Roll No. _____

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B. Tech. III - Sem. (Main / Back) Exam., Dec. 2019
PCC Electronics & Communication Engineering
3EC4-06 Network Theory
Common For EC, EI

Maximum Marks: 160

Time: 3 Hours

Instructions to Candidates:

Attempt all ten questions from Part A, fiver questions out of seven questions from Part B and four questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL

2. NIL

PART – A

(Answer should be given up to 25 words only) **[10×3=30]**

All questions are compulsory

Q.1 State the Kirchhoff's voltage law.

Q.2 Define the node, junction, and branch of electric circuits.

Q.3 Write down the statement of superposition theorem.

Q.4 Explain the reciprocity theorem.

Q.5 Represents wave of even, odd, and half symmetry.

Q.6 Explain the shifting of function.

Q.7 Define the Laplace transformation.

Q.8 State the initial and final value theorem.

Q.9 Write down the properties of filter.

Q.10 State the convolution theorem.

PART – B

(Analytical/Problem solving questions)

Attempt any four questions [5×10=50]

Q.1 Find current through the 5Ω resistor in figure 1.

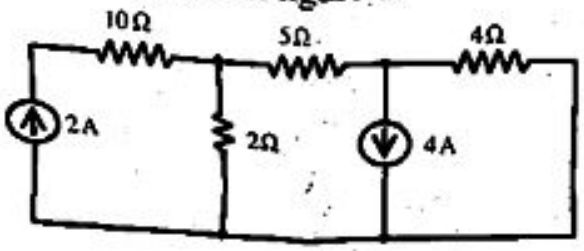

Fig .1.

Q.2 Obtain Thevenin's equivalent circuit across X –Y. (figure 2)

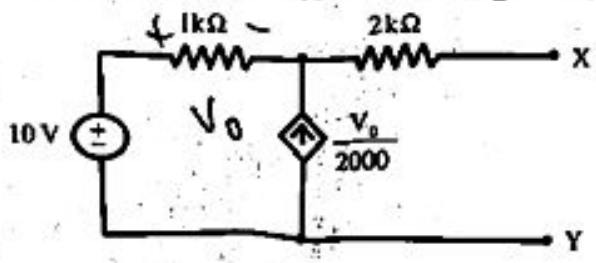

Fig .2.

Q.3 Determine the effective value of f (t) of the waveform shown in figure 3.

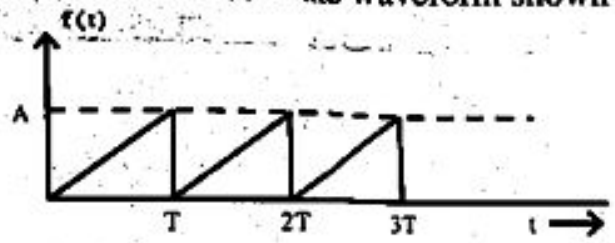

Fig .3.

Q.4 A function in s – domain is given by -

$$F(S) = \frac{50}{S^2 + 2S + 2}$$

Find the inverse Laplace transform.

Q.5 State whether the following function are driving point immittance of LC network or not:

(a) $z(s) = \frac{10(s^2+4)(s^2+6)}{(s^2+1)(s^2+9)}$

(b) $z(s) = \frac{5s(s^2+4)}{(s^2+1)(s^2+3)}$

Q.6 The current I_1 and I_2 at input and output port respectively of a two port network can be expressed as:

$I_1 = 5V_1 - V_2$

$I_2 = -V_1 + V_2$

Find the equivalent π - network.

Q.7 Determine the relationship between the resonance frequency f_0 and the half power frequency f_1 and f_2 in a series resonating circuit. [1680]

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[4×20=80]**

Attempt any two questions

Q.1 (a) Determine the node voltage and the current through the resistors using mesh method for the network shown in figure. 1(a)

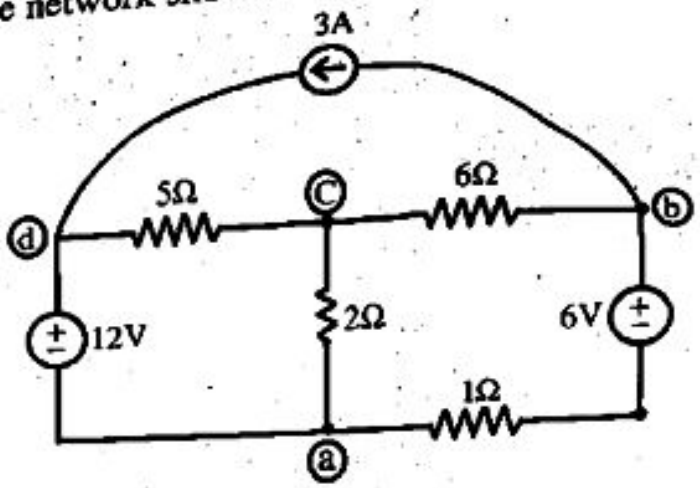

Fig.1.(a)

(b) Form the nodal equations for the network shown in figure 1(b)

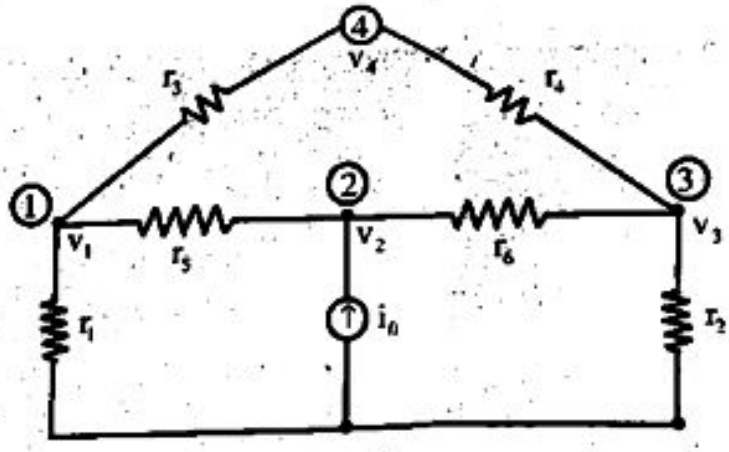

Fig.1.(b)

Q.2 Figure 2 represents a mixed circuit. Find the magnitude of V_0 by superposition theorem and find the power produced by each of the sources.

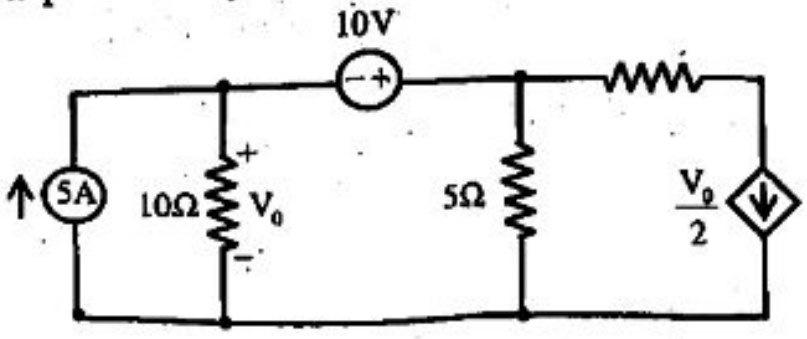

Fig.2.

Q.3 (a) Obtain the Fourier series of the waveform shown in Figure 3. (a)

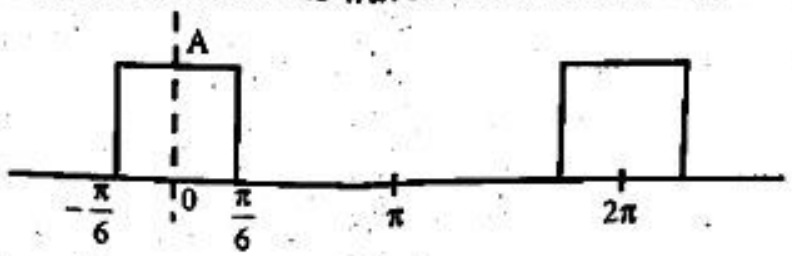

Fig. 3 (a)

(b) The phase currents in a star connected unbalanced load are $I_a = (44 - j33)$ Amps, $I_b = (-32 - j24)$ Amps, $I_c = (-40 + j25)$ Amps. Find the values of sequence currents.

Q.4 (a) A differential equation is represented by

$$\frac{d^2x}{dt^2} - x = e^{-t}$$

Assuming zero initial condition, find x (t) at $t > 0$.

(b) Find the final value of the following functions:

(i) $1 + e^{-2t}\cos 5t$

(ii) $2 - 2e^{-t}$

Q.5 (a) Design an m – derived low pass filter to match a line having characteristics impedance of 500Ω and to pass signals up to 1 kHz with infinite alternatives occurring at 1.2 kHz.

(b) Find an expression for the driving point impedance in s – domain for the reactive network shown in Figure 5(b).

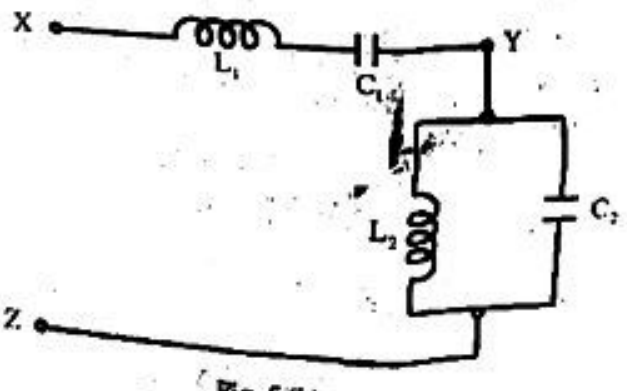

Fig. 5 (b)