Total No. of printed pages = 6

19/3rd Sem/UECE304

2021

NETWORK THEORY

Full Marks – 100

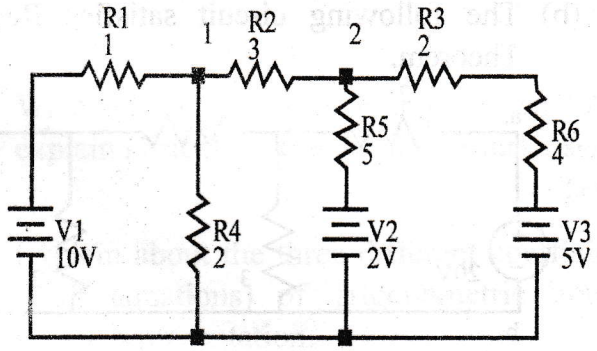
Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer any *five* questions.

1. (a) Point out the main differences between Nodal and Mesh analysis. 5

   (b) Find the voltage (V) at node 1 in the circuit shown below by using Nodal analysis. 8



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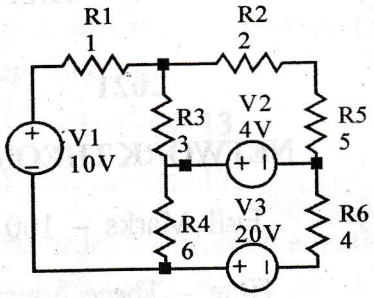
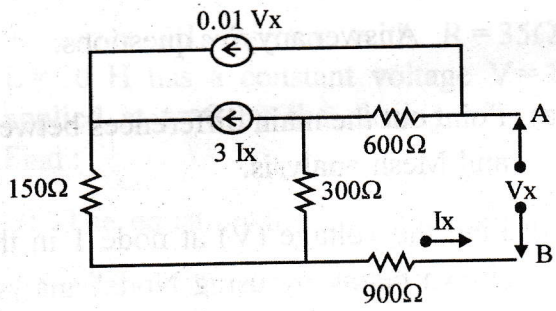
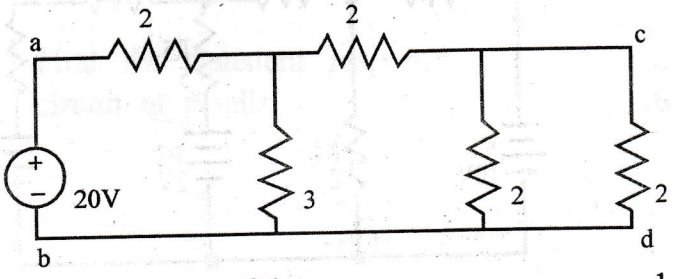
(c) Find the current I_3 (A) from the figure given below by using Mesh analysis. 7



2. (a) In the provided circuit below, find the value of open circuit voltage and the Thevenin resistance between terminals a and b. 5



(b) The following circuit satisfies Reciprocity Theorem.



Write true or false. 1

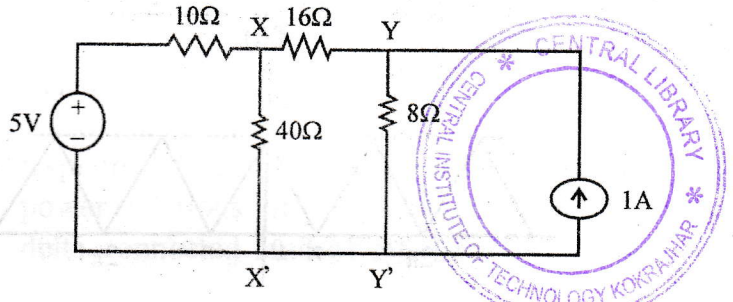
(c) The circuit which satisfies Reciprocity Theorem is called ? 1

(a) Short circuit (b) Open circuit

(c) Linear circuit (d) Non-linear circuit

(d) Define maximum power transfer theorem. Also find the condition of maximum power transfer in an electrical circuit. 1+6=7

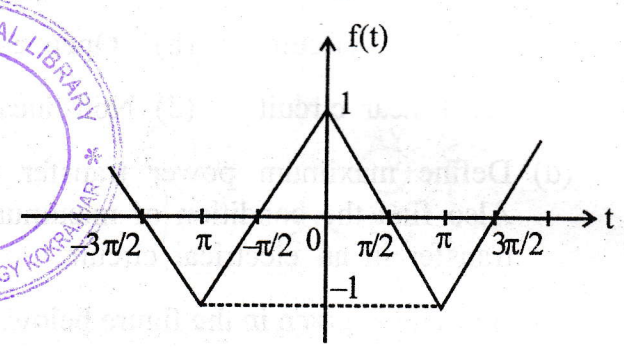
(e) A circuit is given in the figure below. Find the Norton equivalent as viewed from terminals x and x'. 6



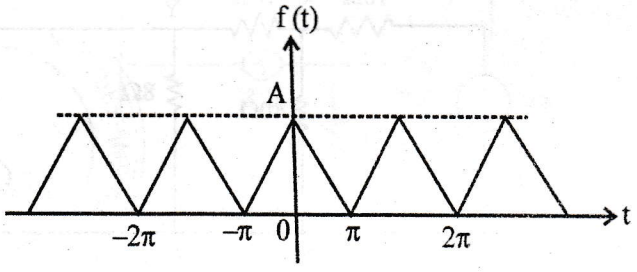
3. (a) What do you mean by Fourier series ? Also explain Dirichlet's condition of Fourier series. 2+4=6

(b) Explain about the three different coefficients (with equations) of Trigonometric Fourier series representation. 6

(c) Obtain the trigonometric Fourier series Representation for the signal shown below : 8



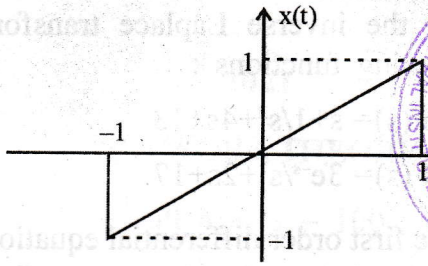
4. (a) Find the exponential Fourier series of the Waveform as shown in the following figure. 8



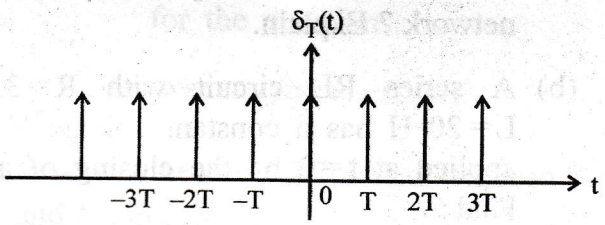
(b) A series RL circuit with R=10 Ω and L=5H contains a current i(t) = 10 sin 1000 t + 5 sin 3000 t + 3 sin 5000 t. Find the effective value of voltage. 7

(c) Differentiate between the Average value and RMS value of periodic wave in Fourier series representation by using proper equations. 5

5. (a) Find the Fourier transform of the time signal as shown in figure below. 7



(b) Find the Fourier transform of an impulse train shown in the figure below : 6



(c) Explain the differences between voltage and power relations of star-connected load and delta connected load of three phase circuits. 4

(d) Differentiate between Balanced and Un-balanced three phase circuits. 3

6. (a) Find the Laplace transform of $x(t) = \sin^2 w_o t u(t)$ 3

(b) Find the Laplace transform of $x(t) = te^{-3t}u(t)$. 2

(c) Find the convolution of $h(t) = e^{-3t}$ and $f(t) = e^{-7/8t}$. 2

(d) Find the inverse Laplace transform of the following functions :

(i) $F(s) = s+1/s^2+4s+13$

(ii) $F(s) = 3e^{-s}/s^2+2s+17$. 3+3=6

(e) Solve first order differential equation of series RC circuit by using its proper diagram. 7

7. (a) What is known as Z-parameter of two port network ? Explain. 7

(b) A series RL circuit with $R = 35\Omega$ and $L = 20$ H has a constant voltage $V = 100$ V applied at $t = 0$ by the closing of a switch. Find :

(i) The equation for i.

(ii) The current at $t = 1.65$ s.

(iii) The expressions for V_R and V_L.

(iv) The time at which $V_R = V_L$. 7

(c) Find the transient response of series RL circuit in details. 6