G 547 (Pages : 4) Reg. No................................

Name................................

B.TECH. DEGREE EXAMINATION, MAY 2014

Fourth Semester

Branch : Electrical and Electronics Engineering

NETWORK ANALYSIS AND SYNTHESIS (E)

(Old Scheme—Supplementary/Mercy Chance)

[Prior to 2010 Admissions]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

Each question carries 4 marks.

1. Find the Laplace Transform of a parabolic function.
2. Find an expression for $i(t)$ in a series RL circuit, energised from a voltage source V, when $t = 0$.
3. Illustrate time shifting property of Fourier Transform.
4. Discuss the symmetry in Fourier Series.
5. With necessary diagrams, explain the principle of a negative impedance converter.
6. Derive the condition of reciprocity and symmetry in ABCD parameters.
7. State and explain the conditions for a network to be of a constant-k type.
8. Design a low-pass filter in π -section with cut-off frequency at 1.25 kHz and load resistance = 600 Ω.
9. Test whether the impedance function $Z(s) = \dfrac{(s+1)(s+2)}{(s^2+8s+15)}$ represents RL or RC network ? Why ?
10. Compare and contrast the properties of Foster and Cauer forms :

(10 × 4 = 40 marks)

Turn over

Part B

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. Using Laplace Transformation technique, find $i_2(t)$ following the switching at $t = 0$ in the circuit shown in Fig. 1. Assume zero initial conditions :

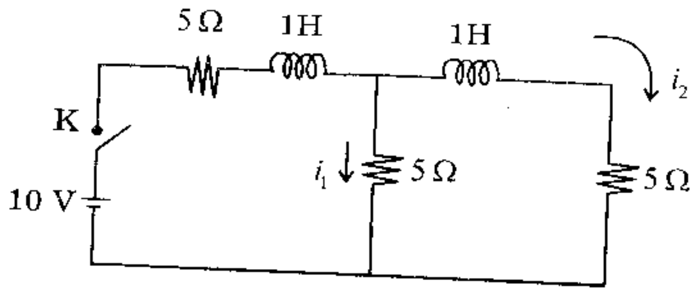

Fig. 1.

Or

12. Find the Laplace Transform of the periodic waveform shown in Fig. 2.

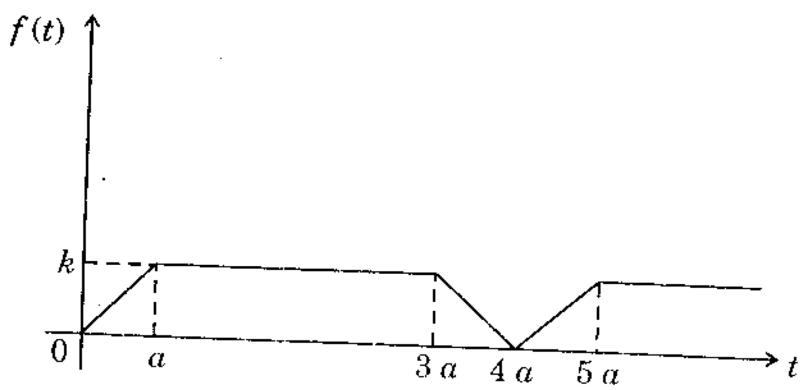

Fig. 2.

13. Find the Fourier Series of the function shown in Fig. 3.

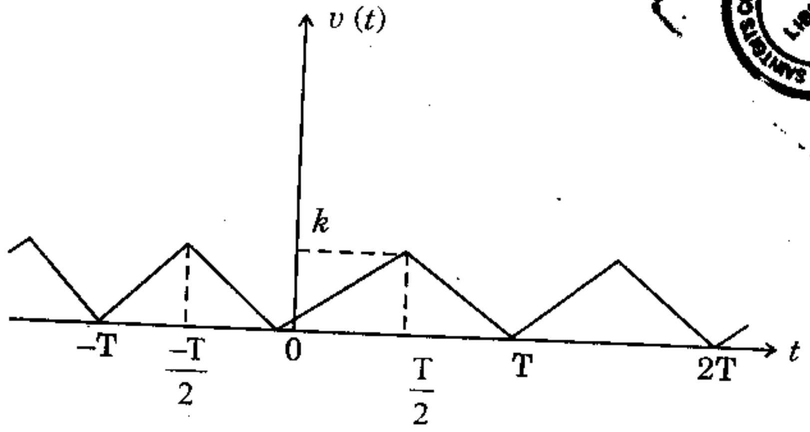

Fig. 3.

Or

14. Find the trigonometric Fourier series for the wave shown in Fig. 4.

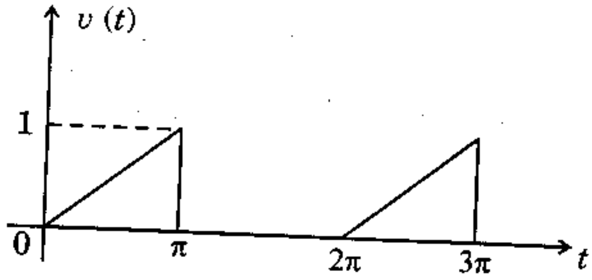

Fig. 4.

15. Find the y and z parameters for the network shown in Fig. 5.

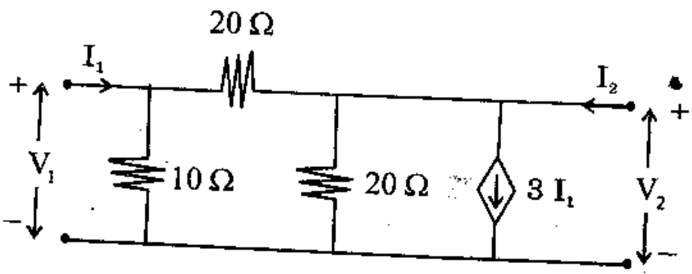

Fig. 5.

Or

16. (a) The z-parameters of a two-port network are $Z_{11} = 20\ \Omega$, $Z_{22} = 30\ \Omega$, $Z_{12} = Z_{21} = 10\ \Omega$. Find the transmission parameters for the network. (6 marks)

(b) For the transfer function $Z(s) = \dfrac{4s(s+30)}{(s+2)(s^2+9)}$ obtain the pole-zero plot.

(6 marks)

17. A composite high-pass filter has a characteristic impedance of $900\ \Omega$ and a cut-off frequency of 2.5 kHz. It has one constant K, T section, one m-derived T section with $m' = 0.3$ and two terminating half sections with $m = 0.6$. Draw the circuit diagram of the filter and insert all the numerical values.

Or

18. Derive the design equations of constant k low-pass and high-pass filters : Also design the following filters.

(a) Low-pass $f_c = 5$ kHz, $R_0 = 800\ \Omega$.

(b) High-pass $f_c = 10$ kHz, $R_0 = 1600\ \Omega$.

19. Find the Foster network which will respond as follows : Zeros at $w_1 = 5000$, $w_3 = 7000$, $w_5 = 9000$, poles at $w_2 = 6000$, $w_4 = 8000$, and at infinity. Also the input impedance at $w = 1000$ is $-j\ 1000$.

Or

20. (a) Test whether the following are Hurwitz :

(i) $p_1(s) = s^3 + 2s^2 + 4s + 1$. (4 marks)

(ii) $p_2(s) = s^4 + 3s^3 + 2s^2 + s + 5$. (4 marks)

(b) Check if $N(s) = \dfrac{2s^2 + 2s + 3}{(s+1)(s+2)}$ is positive real or not. (4 marks)

[5 × 12 = 60 marks]