F 3133 (Pages : 6) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Third Semester

Branch : Electrical and Electronics Engineering

EE 010 303—ELECTRIC CIRCUIT THEORY (EE)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *question briefly.*
Each question carries 3 *marks.*

1. Explain the differences between dependent and independent sources.
2. The natural frequencies of a linear time invariant network are given by $s_1 = -2 + j3$ and $s_2 = -2 - j3$. Give expressions for step response.
3. Define the following with reference to network topology :
   (a) Tree. (b) Branch.
   (c) Oriented graph.
4. List the properties of Hurwitz polynomial.
5. A 3-wire, 3-phase supply feeds a load consisting of 3 equal resistors. By how much is the load reduced if one of the resistors is removed, if the load is star connected.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Calculate the open circuit voltage v_{oc} in the circuit shown in Fig. 1.

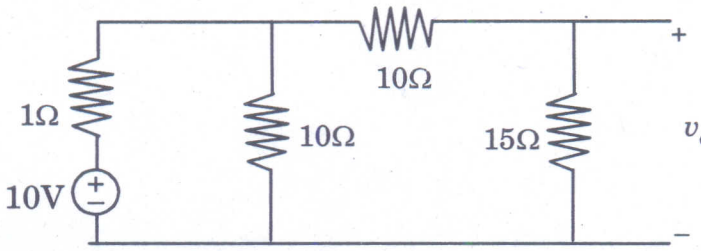

Fig. 1

Turn over

7. An RL circuit has R = 2Ω and L = 4H. Find the time required for the inductor current to reach 50 % of its steady state value.

8. For the network graph shown in Fig. 2, select a tree T (1, 2, 3, 4) and write the basic cut-set matrix.

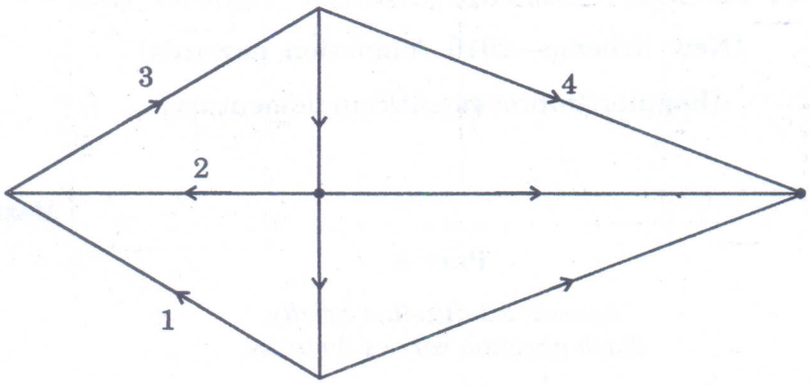

Fig. 2

9. Find V_o in the circuit in Fig.3

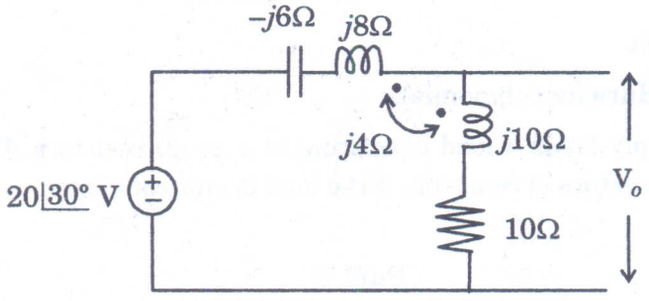

Fig. 3

10. Three equal star-connected inductors take 8 kW at power factor 0.8 when connected to a 415 V, 3-phase, 3 wire supply. Calculate the line currents when one inductor is short circuited.

(5 × 5 = 25 marks)

Part C

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

11. (a) Find the current through the 1 Ω resistor in Fig. 4 using Millman's theorem.

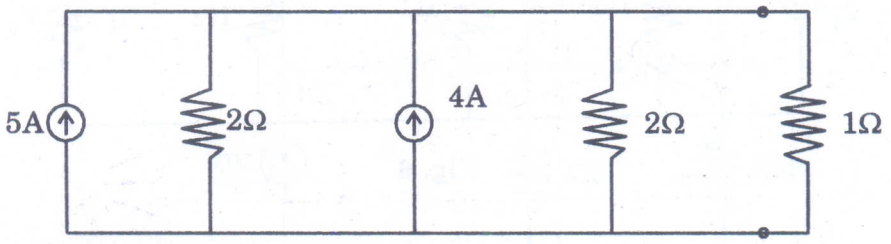

Fig. 4

(6 marks)

(b) Check the validity of Tellegen's theorem provided

$V_1 = 8V$, $V_2 = 4V$, $V_4 = 2V$, $I_1 = 4A$, $I_2 = 2A$ and $I_3 = 1A$ in Fig. 5

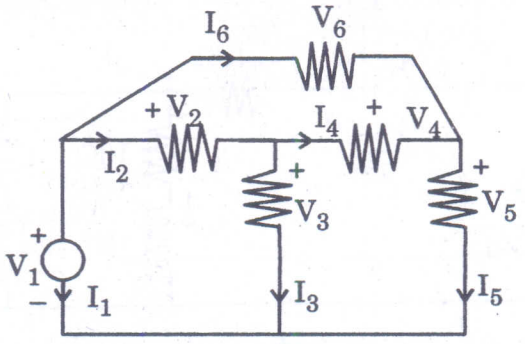

Fig. 5

Or

(6 marks)

12. For the network shown in Fig. 6 determine the numerical values of (a) voltage transfer function (ii) driving point impedance.

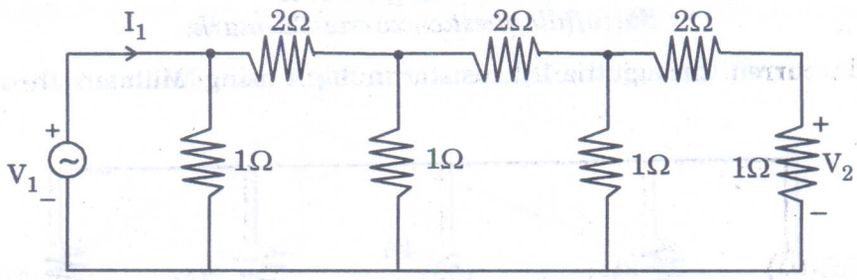

Fig. 6

13. With $V_s = 10$ volt, R = 10 Ω, L = 1H and C = 1 μF, $V_c(0^-) = 0$, find $i(0^+)$, $\frac{di}{dt}(0^+)$ and $\frac{d^2i}{dt^2}(0^+)$ for the series RLC circuit connected to the d.c. voltage at $t = 0$, where $i(t)$ is the current in the circuit.

Or

14. In the circuit shown in Fig 7, the switch K is closed at $t = 0$ with network previously unenergized. For the network element values shown in Fig. 7, find $i_1(t)$ and $i_2(t)$. Use Laplace Transform method.

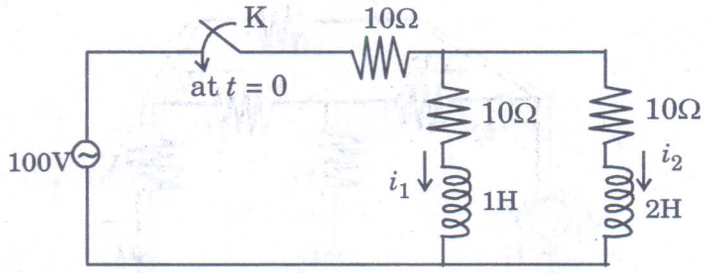

Fig. 7

15. For the network graph shown in Fig. 8, select a suitable tree and obtain the tie-set matrix. Hence write the Kirchoff's voltage law equations

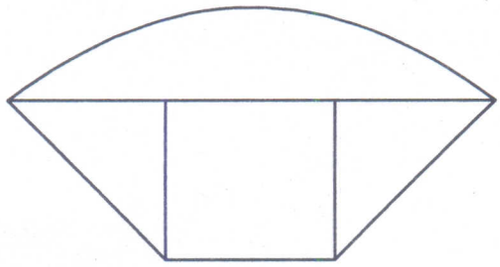

Fig. 8

Or

16. Find v_1, v_2 and v_3 by node analysis, using MATAB program, for the network shown in Fig. 9.

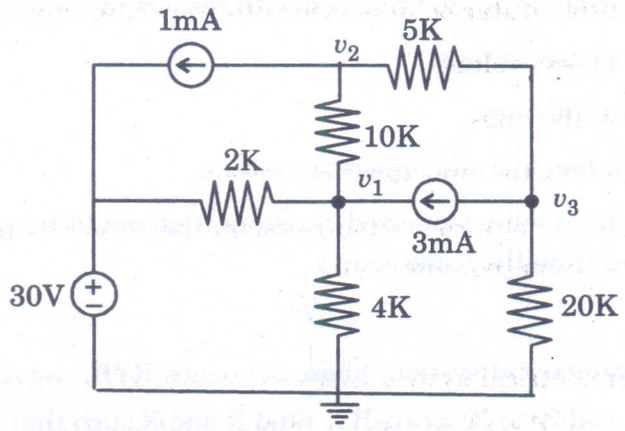

Fig. 9

17. Find $I_1(s)$ and $I_2(s)$ in the following circuit (Fig. 10)

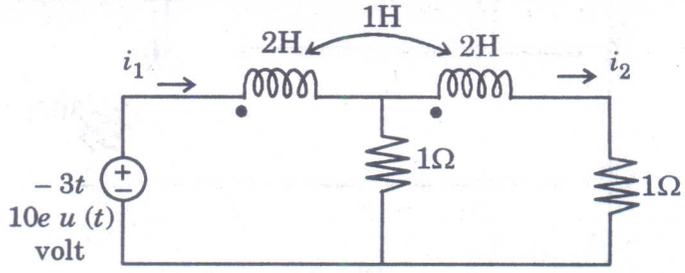

Fig. 10

Or

18. (a) Test whether $s^5 + 3s^4 + 3s^3 + 4s^2 + s + 1$ is Hurwitz or not. (6 marks)

(b) Synthesise the admittance function $Y(s) = \dfrac{4s^2 + 6s}{s+1}$. (6 marks)

19. Three impedances $Z_A = 20 \angle 30° \Omega$, $Z_B = 20 \angle -30° \Omega$ and $Z_C = 20 \angle 60° \Omega$ are connected in Y across a 400 V, 3 phase, 3 wire, ACB sequence symmetrical sources. Find :

(i) The potential of star point of load with respect to supply neutral.

(ii) The load phase voltage.

(iii) Current in the lines.

(iv) Total real, reactive and apparent powers.

(v) The balanced delta connected resistors that would take the same real power as the above load from the same source.

Or

20. (a) In a 3-phase symmetrical system, phase sequence RYB, capacitive reactance $X_C = 10\Omega$ is across YB and a coil $R + jX$ across RY. Find R and X such that $I_Y = 0$.

(b) The circuit in Fig. 11 shows an infinite impedance (open circuit) in phase B of the star-connected load. Find the phasor voltage V_{OB} if the system is 208 volt, sequence ABC.

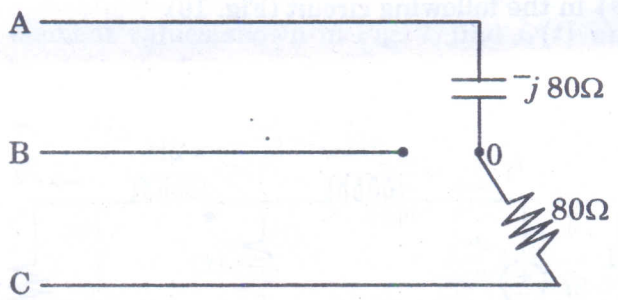

Fig. 11

(5 × 12 = 60 marks)