F 3128 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Third Semester

Branch : Applied Electronics and Instrumentation/Electronics and Communication/ Electronics and Instrumentation/Instrumentation and Control Engineering

AI 010 303/EC 010 303/EI 010 303/IC 010 303—NETWORK THEORY [AI, EC, EI, IC]

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Assume any missing data suitably.

Part A

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

1. State Superposition theorem as applied to d.c. circuits.
2. Obtain impulse response of a series RL circuit.
3. Write the steps in nodal analysis of solving an electrical network.
4. Find the Laplace Transform of e^{at}.
5. Define the transmission parameters of a *two*-port network.

(5 × 3 = 15 marks)

Part B

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

6. Use source transformation to calculate the current I in the network ? Fig. 1

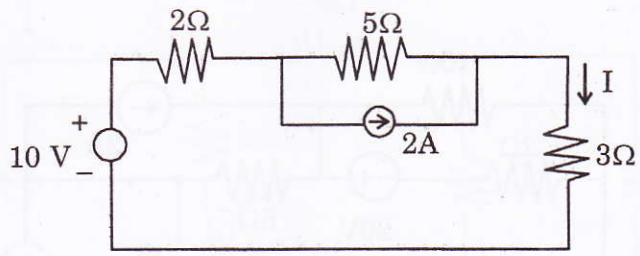

Fig. 1

Turn over

7. Initially relaxed inductances of 2, 4, 5 Henries are connected in parallel across a 12 A source at $t = 0$. Find the currents in them at $t = 0^+$.

8. Two coils having 800 turns and 1400 turns respectively are placed close to each other such that, 60 % of the flux produced by one coil links the other. If a current of 10A flouring in the first coil produces a flux of 0.5 mWb, find the inductance of the second coil.

9. Find the inverse Laplace Transforms of :

$$\frac{s^2 + 3}{\left(s^2 + 2s + 5\right)(s + 2)}.$$

10. Explain the condition for symmetry for two-port network. Show the symmetry for z-parameters.

(5 × 5 = 25 marks)

Part C

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

11. Find "i" in the circuit shown in Fig. 2 using Superposition theorem :

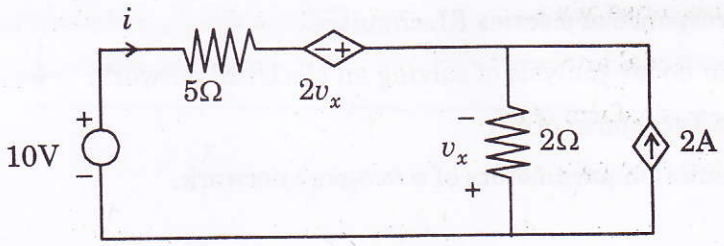

Fig. 2

Or

12. What is the value of R such that maximum power transfer takes place from the sources to R in the circuit shown in Fig. 3 ? Determine the amount of the maximum power :

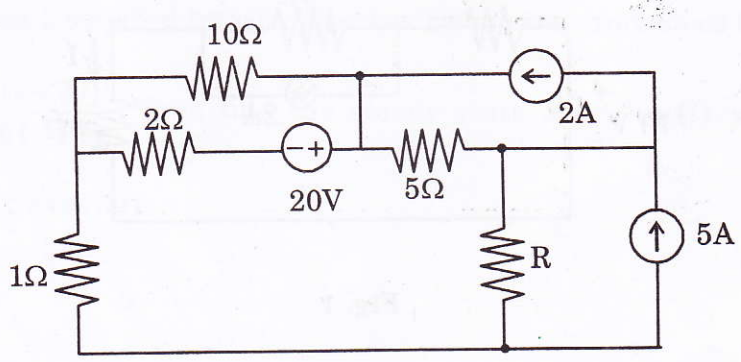

Fig. 3

13. At time $t = 0$, the switch K is opened for the network shown in Fig. 4. Find $V_1(t)$ and $V_2(t)$ for $t \geq 0$.

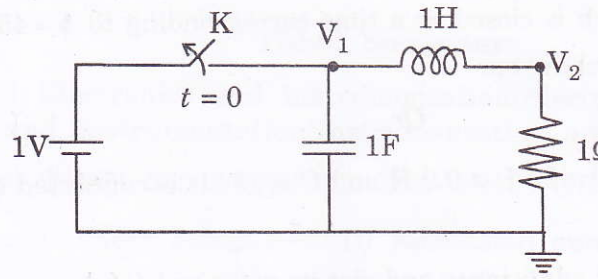

Fig. 4

Or

14. A series RLC circuit with zero initial conditions is connected to 110 V d.c. source at $t = 0$. If L = 1H, $C = \frac{1}{16}$ F and R is (a) 4 Ω ; (b) 8 Ω, find $i(t)$ in the circuit in both cases and plot it.

(6 + 6 = 12 marks)

15. Find the Thevenin and Norton equivalent circuits for the network shown in Fig. 5.

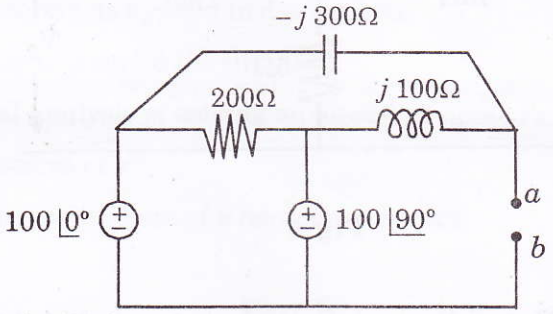

Fig. 5

Or

16. Calculate the current I_x using (a) nodal analysis ; and (b) mesh analysis and verify the result for the network in Fig. 6.

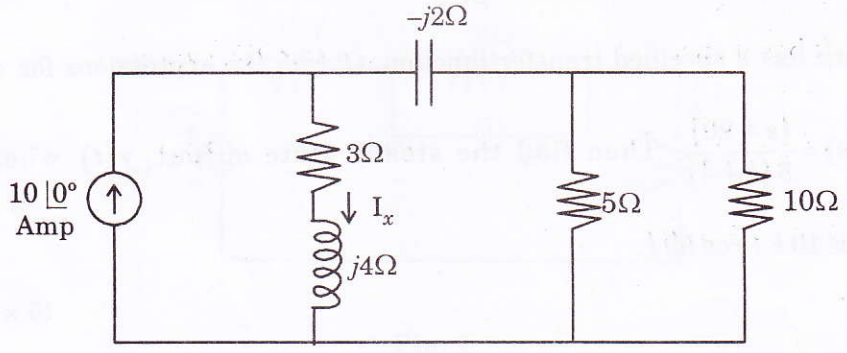

Fig. 6

17. A series RLC circuit, with R = 180 Ω, L = 0.5 H and C = 100 μF, has a sinusoidal voltage source $v = 500 \sin (500\, t + \phi)$ volts. Find from basics, using Laplace Transform, an expression for the resulting current, if the switch is closed at a time corresponding to $\phi = 45°$. Find the value of current 0.05 second after switching on.

Or

18. A series circuit has R = 0.5 Ω and L = 0.2 H and C = 2F. It is connected to a constant voltage variable frequency supply :
    (a) Find the driving point admittance and plot its poles and zeros.
    (b) Using the pole-zero plot, find expressions for amplitude response and phase response.
    (c) Find magnitude and phase of admittance function at $w = 1$.

19. (a) Determine the hybrid parameters of the network shown in Fig. 7 below :

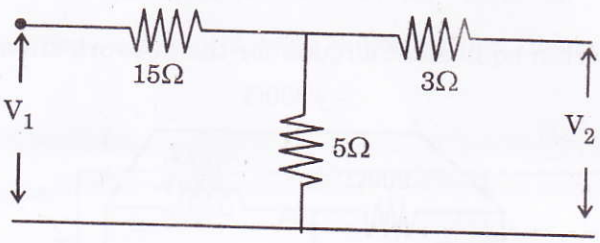

Fig. 7

(6 marks)

(b) Two 2-port networks, N_1 and N_2 are interconnected such that their input ports are in series and the output ports are in parallel. If H_1 and H_2 are the hybrid parameter matrices of N_1 and N_2 respectively, show from basis that the hybrid parameter matrix of the interconnection is $H = H_1 + H_2$.

Or

20. A certain network has a specified transfer function. Obtain the expressions for $a(w)$ and $\theta(w)$ given that $H(s) = \dfrac{(s+20)}{5(s+4)}$. Then find the steady state output $y(t)$ when the input is $x(t) = \cos 2t + \cos 10\, t + \cos 50\, t$.

(5 × 12 = 60 marks)