Exam. Code: 0933
Sub. Code: 33741

2076
B.E. (Electrical and Electronics Engineering)
Third Semester
ES-EE-301: Network Analysis and Synthesis

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: ***Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part. Missing data (if any) can be appropriately assumed.***

x-x-x

Q1 **Explain briefly**

A) State and explain Thevenin's theorem, and specify the types of networks to which it is applicable. Also, state the theorem which is the dual of the above theorem. **(2)**

B) Explain KCL and KVL with suitable example. **(2)**

C) Write the symmetry and reciprocity conditions for ABCD and h parameters of a two port network. **(2)**

D) Write the necessary conditions for driving point impedance Function. **(2)**

E) What are the conditions to be satisfied by a function so that it represents a stable network? **(2)**

Part A

Q2 A) Determine the current through the impedance $(2 + j3)\ \Omega$ in the circuit shown in fig.1, where, $V_b = 20\angle 0^0$ (V) **(5)**

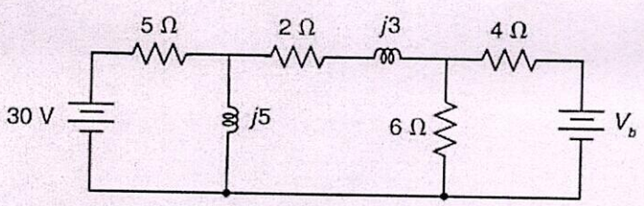

Fig. 1

B) An unbalanced star connected load has branch impedances of $Z_R = 10\angle 30^0\ \Omega$, $Z_Y = 10\angle 45^0\ \Omega$ and $Z_B = 20\angle 60^0$. It is connected to a **200V** balanced supply (three phase- three wire). Determine the line currents and the voltage across each impedance. **(5)**

Q3 A) Determine the value of the resistor R_L that will draw maximum power from the rest of the circuit as shown in fig. 2. What is the maximum power? **(5)**

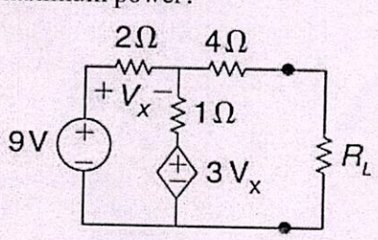

Fig.2

B) Define the following terms with suitable example. **(5)**

(i) Graph of a network
(ii) Oriented graph
(iii) Rank of a graph
(iv) Planar and non-planar graph
(v) Subgraph
(vi) Path

P.T.O.

Q4 A) The Z-parameter of a 2-port network are Z_{11}= 10 Ω , Z_{22}= 20 Ω, $Z_{12} = Z_{21}$ = 5 Ω. Find the ABCD-parameters. Also find the equivalent T-network. (5)

B) Two two-port networks are connected in parallel – parallel interconnection. Prove that the overall Y parameter matrix is the sum of individual Y parameter matrices. (5)

Part B

Q5 A) Derive the transient response of series R-L-C circuit with D.C excitation by Laplace transformation approach. (5)

B) Find the value of i(0+) using the initial-value theorem for the function given (5)

$$I(s) = \frac{2s + 3}{(s + 1)(s + 3)}$$

Verify the result by solving it for i(t).

Q6 A) A series RLC circuit shown in fig. 3 comprising **R = 10 Ω, L= 0.5 H, and C = 1μF**, is excited by a constant voltage source of **100 V**. Obtain the expression for the current. Assume that the circuit is relaxed initially. (5)

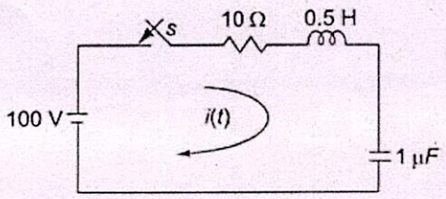

Fig. 3

B) Determine the range of values of K for the system to be stable. (5)

(i) $s^4 + 4s^3 + 13s^2 + 36s + K = 0$

(ii) $s^3 + 5s^2 + (9 - K)s + K = 0$

Q7 A) Test the following polynomial for Hurwitz property. (5)

$$F(s) = s^5 + s^4 + 6s^3 + 4s^2 + 8s + 3$$

B) Synthesize the first and second foster forms of networks for the impedance function (5)

$$F(s) = \frac{2(s + 1)(s + 3)}{(s + 2)(s + 6)}$$

x-x-x