2001015022

Sr. No. 015306

January 2023

B.Tech- III SEMESTER

Time: 3 Hours

Circuit Analysis and Synthesis (ECP 305)

Max. Marks:75

Instructions:

1. *It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART -A

Q1 (a) State compensation theorem. When is the use of this theorem preferred in solution of ac networks? (1.5)

(b) In what respects are Kirchoff's laws as applicable to ac circuits different from those for dc circuits? (1.5)

(c) How is the concept of transfer function important in system studies? (1.5)

(d) Determine the initial value $f(o^+)$, if $F(s) = \frac{2(s+1)}{s^2+2s+5}$ (1.5)

(e) Draw the equivalent circuit of a two port network in terms of Z-parameters. (1.5)

(f) Derive the condition for reciprocity in case of T-parameters. (1.5)

(g) List the network functions of a two port network. (1.5)

(h) Obtain the pole zero plot of the following function $f(t) = \cos\omega t$ (1.5)

(i) What are the units of attenuation? (1.5)

(j) Define all the parameters of a filter. (1.5)

PART -B

Q2 (a) Obtain the h-parameters of the network in terms of all other parameters. (7.5)

(b) The network of Fig. 1 contains both a dependent current source and a dependent voltage source. For the element values given, determine the Y and Z parameters. (7.5)

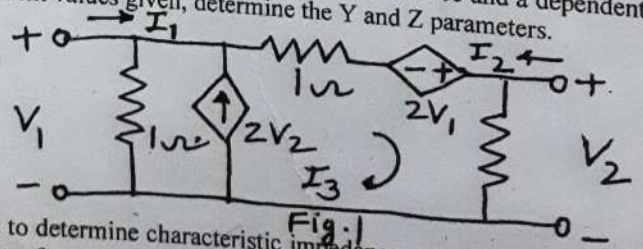

Fig. 1

Q3 Derive expressions to determine characteristic impedance, cut off frequency, attenuation and phase constant of a constant- K high pass filter and also draw variation of all characteristics with frequency. Design a high pass filter (both π and T-networks) having a cut off frequency of 2 kHz to operate with a terminated load resistance of 300 Ω. (15)

Q4 (a) Discuss the graphical procedure to determine time domain response from the pole zero plot with a suitable example. (7.5)

(b) Differentiate between one port and two port network. Find $Z_{11}(s)$, $G_{21}(s)$ and $Z_{21}(s)$ for the circuit of Fig.2 (7.5)

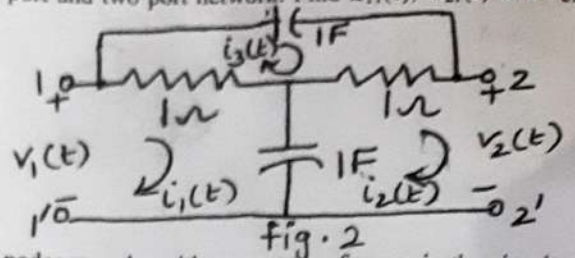

fig. 2

Q5 (a) Determine the voltages of nodes m and n with respect to reference in the circuit of Fig.3 using nodal analysis. Use matrix approach. (7.5)

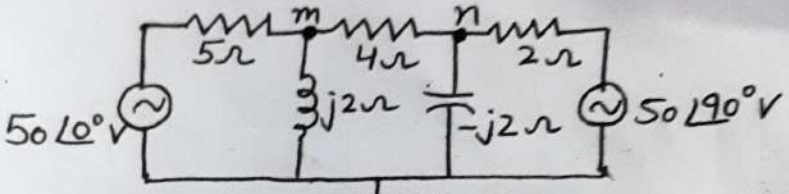

Fig.3

(b) State superposition theorem as applied for ac circuit. Determine current I in Fig.4, using superposition theorem. (7.5)

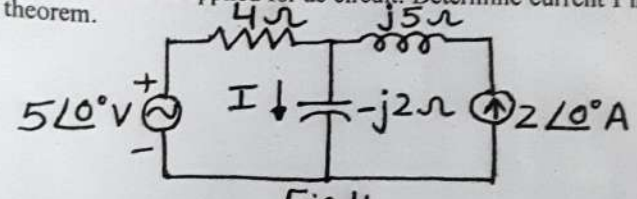

Fig.4

Q6 (a) In the circuit of Fig.5, L = 2H, R = 12Ω and C = 62.5mF. The initial conditions are $v_c(0+)$ = 100V and $i_L(0+)$ = 1.0A. The switch is closed at t=0. Find i(t) using Laplace transform and partial fraction expansion. (7.5)

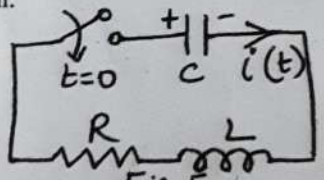

Fig.5

(b) State and prove time shifting theorem of Laplace transform. Find the Laplace transform of the following function: $f(t) = e^{-at} \sin\omega t$. (7.5)

Q7 (a) State reciprocity theorem and verify it for circuit as shown in Fig. 6 (7.5)

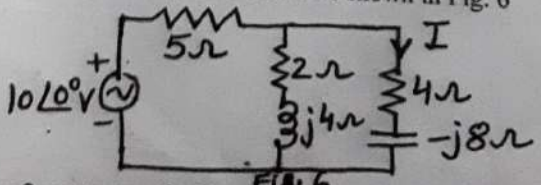

Fig. 6

(b) Show that when two 2-port networks N_1 and N_2 are connected in parallel, the equivalent Y- parameters of the combined network is the sum of Y-parameters of each individual 2-port network. (7.5)

****