VIT
Vellore Institute of Technology

Reg. No. :

## Final Assessment Test (FAT) – November/December 2022

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| Programme | **B.Tech.** | Semester | **Fall Semester 2022-23** |
| Course Title | **CIRCUIT THEORY** | Course Code | **BECE203L** |
| Faculty Name | **Prof. Anith Nelleri** | Slot | **A1+TA1+TAA1** |
| | | Class Nbr | **CH2022231001147** |
| Time | **3 Hours** | Max. Marks | **100** |

### Section-A (6 X 15 Marks)
### Answer All questions

1. (a) Use nodal analysis and find $V_x$ in the circuit shown in Fig.1. [8 Marks] **[15]**

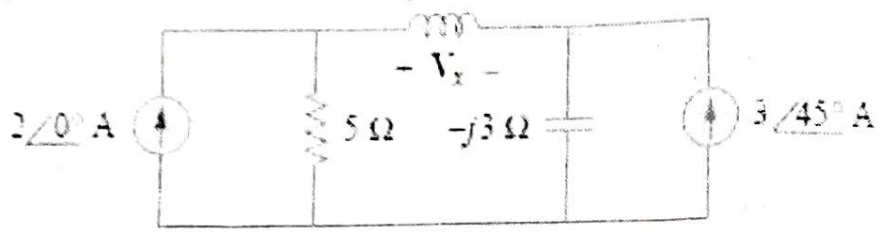


Fig.1

(b) The variable resistor *R* in the circuit shown in Fig.2 is adjusted until it absorbs the maximum average power. Find *R* and the maximum average power absorbed. [7 Marks]

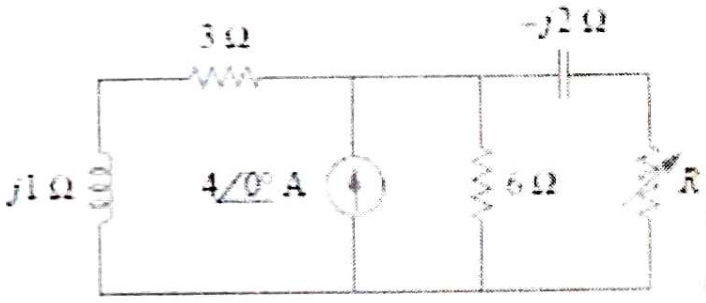


Fig.2

2. (a) The switch was in position 'a' for a long time in Fig.3. At t=0, the switch is moved to position 'b'. Find v(t) and $v_R(t)$ for t>0. [8 Marks] **[15]**

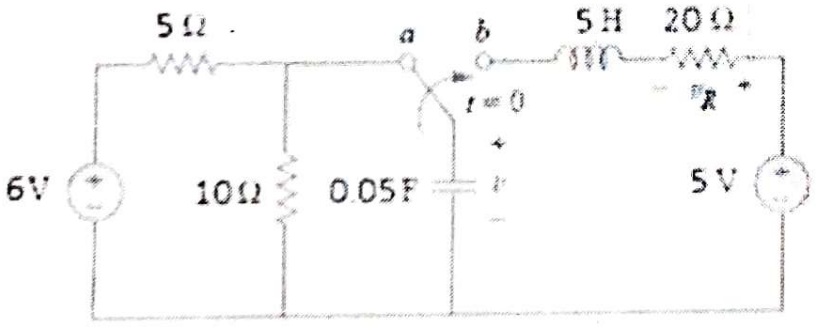


Fig.3

(b) A circuit consisting of a coil with inductance 10 mH and resistance 20 Ω is connected in series with a capacitor and a generator with an rms voltage of
120 V. Find:
(i) the value of the capacitance that will cause the circuit to be in resonance at 15 kHz
(ii) the current through the coil at resonance
(iii) the Q of the circuit
[7 Marks]

3. (a) For the circuit shown in the Fig.4, Calculate the Y parameters. [8 Marks] **[15]**

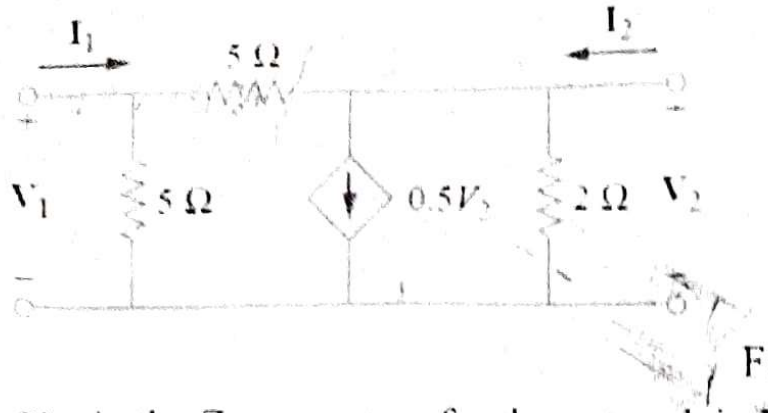


Fig.4

(b) Obtain the Z parameters for the network in Fig.5. [7 Marks]

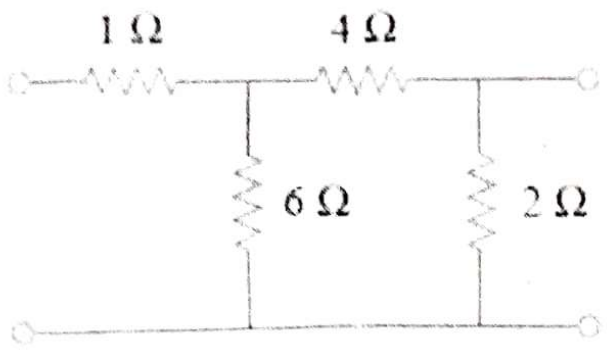


Fig.5

4. (a) Design a T type attenuator to provide 80dB attenuation with a characteristic impedance of 70 Ω . [8 Marks] **[15]**

(b) What is the significance of a filter and explain briefly the different types of filters using appropriate illustration. [7 Marks]

5. (a) A parallel RL circuit has R = 4 Ω and L = 1 H. The input to the circuit is $i_s(t) = 2e^{-t}u(t)$ A. Find the inductor current $i_L(t)$ for all $t > 0$ and assume that $i_L(0) = -2$ A. Solve this problem using Laplace transform. [8 Marks] **[15]**

(b) A circuit has a transfer function, $H(S) = \frac{(S+4)}{(S+1)(S+2)(S+2)}$ Find the impulse response, using Laplace transform. [7 Marks]

6. (a) Determine the Fourier series of the given signal *x(t)* shown in Fig.6. [8 Marks] **[15]**

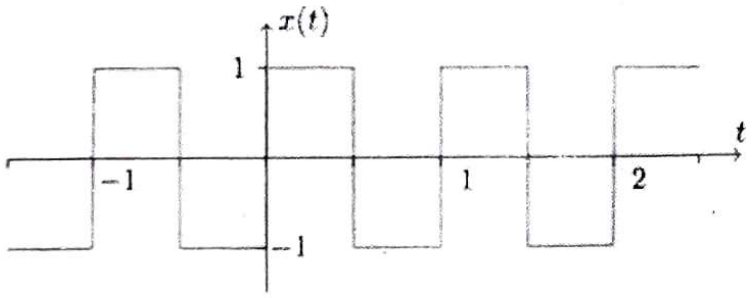


Fig.6

(b) Compare Fourier transform and Laplace transform and point out their similarities and differences. [7 Marks]

## Section-B (1 X 10 Marks)
## Answer All questions

7. For the network given in Fig.7, draw the graph and write a tie-set matrix. Using the tie-set matrix, obtain the loop equations and find the current i. Consider branches 2,4, and 5 as the twigs of the tree. **[10]**

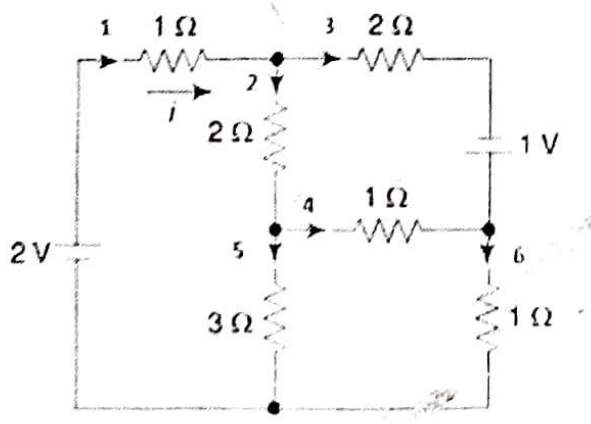


Fig.7