

**R15**

Code No: 124DH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year II Semester Examinations, September/October - 2023

**PRINCIPLES OF ELECTRICAL ENGINEERING**

(Electronics and Communication Engineering)

Time: 3 Hours

Max. Marks: 75

**Note:** i) Question paper consists of Part A, Part B.

ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.

iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

**PART - A**

(25 Marks)

- 1.a) Define time constant and write its significance. [2]
- b) Draw the transient current growth and decay curves for an L –R circuit and find the time at which these currents are equal? [3]
- c) Find Z and Y parameters if they exist for the two-port network given in Figure 1. [2]

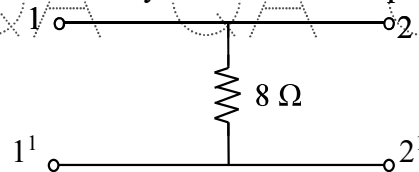


Figure 1

- d) Define term reciprocity for a given two-port network. Give the expressions reciprocity in case of impedance and hybrid parameters. [3]
- e) State advantages of m-derived filters. [2]
- f) What is a band-elimination filter? Write its properties. [3]
- g) What are the functions of field winding in DC machine? [2]
- h) List out the differences between a DC generator and a DC motor. [3]
- i) Why core of the transformer is laminated. [2]
- j) What is a stepper motor? Write its applications. [3]

**PART - B**

(50 Marks)

- 2.a) Derive an expression for voltage across capacitor in a series RC circuit excited by a unit step voltage. Assume that initial voltage across capacitor is zero.
- b) A 200Ω resistor is in series with an inductor L. The initial value of the inductor current is 5 mA and its value after 5 ms is 3 mA. Find the time constant and the inductance. [5+5]

**OR**

- 3.a) An RLC series circuit having resistance = 20 Ω, inductance = 0.05 H and capacitance = 20 μF are connected in series with a 100V constant source when the switch is closed at t=0. Find the current transient.
- b) The parameters of a series RC circuit are R=10Ω and C= 0.1 F. A constant voltage of 20V is applied to the circuit at t = 0. Obtain current equation. Determine the voltage across the resistance and the capacitance. [5+5]

- 4.a) Derive Z-parameters in terms of Y and ABCD parameters.  
 b) Find the hybrid parameters of the network shown in Figure 2. [5+5]

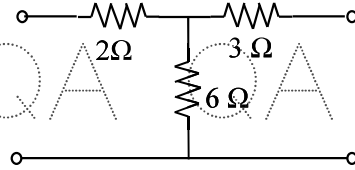


Figure 2

**OR**

- 5.a) Derive conditions of symmetry and reciprocity for Y-parameters and of given two port network.  
 b) Two 2-port networks A and B are connected in parallel. Each of these networks has their own Y-parameters. Show that resultant Y-parameters of the combined parallel network are sum of Y-parameters of the individual networks A and B. [5+5]

- 6.a) What are attenuators? Discuss various types of attenuators briefly.  
 b) Derive the expression for characteristic impedance of a symmetrical bridged T-type network. [5+5]

**OR**

- 7.a) What is the propagation constant of a symmetrical T-section and symmetrical  $\pi$ -section filters? What is its significance?  
 b) A filter is required to pass all frequencies above 30 kHz and to have a nominal impedance of 500  $\Omega$ . Design a high-pass, (i) T-section and (ii)  $\pi$ -section, filters to meet these requirements. [5+5]

- 8.a) Explain the Swinburne's test to determine the no load losses of a DC machine. What are the limitations of this test?  
 b) Briefly explain various speed control methods of a DC shunt motor. Discuss their relative merits and demerits of each method. [5+5]

**OR**

- 9.a) With a neat diagram, explain construction details and principle of operation of DC generator.  
 b) A 400V, DC series motor has an armature resistance of 0.12  $\Omega$ . When motor takes a current of 80A, its speed is 600 rpm. Determine its speed if current drawn by the motor changes to 40A. [5+5]

- 10.a) Explain how the equivalent circuit parameters are determined from OC and SC tests?  
 b) Draw the no load and on load phasor diagram for a single-phase transformer on lagging load taking secondary terminal voltage as the reference phasor and explain. [5+5]

**OR**

- 11.a) Why the primary of the transformer draws a current from the main supply when the secondary is not carrying any load. Explain in detail.  
 b) The emf per turn of a 1-phase, 6.6 kV/440 V, 50Hz transformer is 12 V. Calculate (i) the number of turns in the HV and LV windings (ii) the net cross-sectional area of the core for a maximum flux density of 1.5 T. [5+5]

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