Sub Code: R2321024

R23

Set No. 1

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY-GURAJADA VIZINAGARAM
II B. Tech I Semester Regular/Supply Examinations, November – 2025
DC Machines & Transformers
(EEE)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part A, Part B.
Part A is compulsory, Answer all questions.
In Part B, Answer any one question from each unit.

*****

PART-A **(20 Marks)**

1	a)	Why is commutator employed in DC machines?	[2]
	b)	State the effects of armature reaction in DC machines.	[2]
	c)	Why is field coils of a DC shunt generator are wound with a large number of turns of fine wire.	[2]
	d)	Explain the causes of failure to build up voltage in a generator	[2]
	e)	Does the magnetizing current of a transformer lie in-phase with the applied voltage? Justify.	[2]
	f)	What type of load should be connected to a transformer for getting zero voltage regulation?	[2]
	g)	What are no-load losses occurring in the transformer?	[2]
	h)	List the conditions to be fulfilled if two or more transformers are to operated successfully in parallel to deliver a common load	[2]
	i)	Draw the circuit diagram of an auto transformer	[2]
	j)	Explain the construction aspect of three phase transformers	[2]

PART-B **(50 Marks)**

Unit-1

2	a)	Explain the principle of action of a DC generator. Describe briefly its important parts.	[5]
	b)	A 4-pole machine has an armature with 90 slots and 8 conductors per slot, the flux per pole is 0.05 Wb and runs at 1200 rpm. Determine induced emf if winding is i) lap connected ii) wave connected.	[5]

(OR)

3	a)	Derive emf equation of a DC generator	[5]
	b)	The field and armature resistance of a four-pole shunt generator with lap connected armature is 50 ohms and 0.1 ohms respectively. It is supplying a 2400 W load at a terminal voltage of 100 V. Calculate the total armature current, the current per armature path and the generated emf.	[5]

Unit-2

4	a)	How demagnetizing and cross-magnetizing ampere-turns per pole are derived in a DC machine?	[5]
	b)	A 250 kW, 500 V, 4 pole lap wound armature has 720 conductors. It is given a brush lead of 3° mechanical from its geometrical neutral axis (GNA). Calculate demagnetizing and cross magnetizing ampere-turns per pole. Neglect shunt field current.	[5]

(OR)

5	a)	Explain the different methods of speed control employed in DC Series motor	[5]
	b)	A 200 V shunt motor has R_a = 0.1 ohm, R_f = 240 ohm and rotational loss = 240 W. On full load the line current is 10 A with the motor running at 1450 rpm. Determine i) the mechanical power developed ii) the power output iii) the load torque and iv) the full load efficiency	[5]

Unit-3

6	a)	Explain the working principle of a Single-phase transformer with a neat diagram	[5]
	b)	A 3300/250 V, 50 Hz, single-phase transformer has an effective cross-sectional area of 125 cm^2. It has 70 turns on its low-voltage side. Calculate i) the value of the maximum flux density ii) the number of turns on the high-voltage winding.	[5]

(OR)

7	a)	Draw the equivalent circuit for a loaded transformer and explain it in detail.	[5]
	b)	A 40 kVA, 6600/250 V, 50 Hz transformer is having total reactance of 35 ohm when referred to primary side whereas its primary and secondary winding resistance is 10 ohm and 0.02 ohm, respectively. Find full load regulation of at a power factor 0.8 lagging.	[5]

Unit-4

8		A 500 kVA, 600/400V, Single-phase transformer has primary and secondary winding resistance of 0.42 ohm and 0.0011 ohm, respectively. The primary and secondary voltages are 600 V and 400 V, respectively. The iron loss is 2·9 kW. Calculate the efficiency at half full load at a power factor of 0·8 lagging.	[10]

(OR)

9	a)	Explain the test steps involved in separation of hysteresis and eddy current losses of a transformer	[5]
	b)	The hysteresis and eddy current loss of a ferromagnetic sample at a frequency of 50 Hz is 25 watts and 30 watts, respectively, when the flux density of 0.75 tesla. Calculate the total iron loss at a frequency of 400 Hz, when the operating flux density is 0.3 tesla.	[5]

Unit-5

10	a)	Explain the necessity of parallel operation of three-phase transformers?	[5]
	b)	Distinguish in detail between Delta and open Delta connections	[5]

(OR)

11		A balanced three-phase, 100 kW load at 400 V and 0.8 power factor lagging is to be obtained from a balanced two phase 1100 V lines. Determine the kVA rating of each unit of the Scott-connected transformer	[10]

*****