Sub Code: R2321024 **R23** **Set No. 1**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY- GURAJADA VIZIANAGARAM
II B. Tech I Semester Regular Examinations, November – 2024
DC MACHINES & TRANSFORMERS
(Electrical And Electronics Engineering)

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.
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PART-A **(20 Marks)**

1	a)	Explain the working principle of a DC generator	[2]
	b)	Explain the necessity of an interpoles in a DC machine.	[2]
	c)	What is the function of compensating winding in a DC machine?	[2]
	d)	Explain the term voltage regulation of a DC Generator	[2]
	e)	Distinguish between an ideal and practical transformer	[2]
	f)	Why does voltage drop in a Single Phase transformer	[2]
	g)	Define efficiency and all day efficiency of a transformer	[2]
	h)	Why are iron losses assumed to remain constant in a Power transformer from no load to full load.	[2]
	i)	Draw the connection diagram for Delta to star connection	[2]
	j)	Explain the necessity of parallel operation of three phase transformers	[2]

PART-B **(50 Marks)**

Unit-1

2	a)	What is Commutation and explain the effect of it?	[5]
	b)	The emf generated by a 4 pole DC generation is 400 V, when the armature is driven at 1200 rpm. Calculate the flux per pole if the wave wound generator has 39 slots having 16 conductors per slot	[5]

(OR)

3	a)	Explain the salient features of separately excited DC Generator with a neat circuit diagram	[5]
	b)	A 12-pole DC shunt generator has 50 slots on its armature with 12 conductors per slot with wave winding. The armature and field winding resistance is 0.5 ohm and 60 ohm respectively. The generator is supplying a resistive load of 15 ohm at terminal voltage of 300 V when running at a speed of 625 rpm. Find the armature current, the generated emf and the flux per pole	[5]

Unit-2

4	a)	Draw and explain the load characterisitcs of a DC Series generator with a neat circuit diagram	[5]
	b)	Explain the working of a three-point shunt motor starter with a neat connection diagram	[5]

(OR)

5	a)	Derive the condition for maximum efficiency of a DC Generator	[5]
	b)	The armature and series field winding resistance of a 220 V, four-pole DC series motor is 0.75 ohm. It has 782 wave wound armature conductors. If it draws 40 A from the supply mains and has a flux of 25 mWb, determine its speed and gross torque developed.	[5]

Unit-3

6	a)	Explain the constructional aspects of a Single-phase Transformer	[5]
	b)	A 230/110 V single-phase transformer has a core loss of 100 W. If the input under no-load condition is 400 VA, find core loss current, magnetizing current and no-load power factor angle	[5]

(OR)

7	a)	Draw and explain the equivalent circuit of a Single-phase transformer on No – load.	[5]
	b)	A 63 kVA, 1100/220 V single-phase transformer has $R_1 = 0.16$ ohm, $X_1 = 0.5$ ohm, $R_2 = 0.0064$ ohm and $X_2 = 0.02$ ohm. Find equivalent resistance and reactance as referred to primary winding.	[5]

Unit-4

8		A single-phase 440/110 V transformer has primary and secondary winding resistance of 0·3 ohm and 0·02 ohm, respectively. If iron loss on normal input voltage is 150 W, calculate the secondary current at which maximum efficiency will occur. What is the value of this maximum efficiency for unity power factor load?	[10]

(OR)

9	a)	Explain the open circuit or No-load test of a Single-phase transformer with a neat circuit and also draw its equivalent circuit	[5]
	b)	The iron losses of a transformer are 2500 W when operated on 440 V, 50 Hz; these are reduced to 850 W when operated on 220V, 25 Hz. Calculate the eddy current loss at normal frequency and voltage.	[5]

Unit-5

10		A three-phase transformer, rated at 1000 kVA, 11/3.3 kV has its primary star-connected and secondary delta connected. The actual resistances per phase of these windings are, primary 0.375 ohm, secondary 0.095 ohm and the leakage reactances per phase are primary 9.5 ohm, secondary 2 ohm. Calculate the voltage at normal frequency which must be applied to the primary when the secondary terminals are short circuited. Calculate also the power under these conditions.	[10]

(OR)

11	a)	Explain the various conditions that depend on the load sharing between two three phase transformers connected in parallel.	[5]
	b)	Two 400 kVA and 800 kVA transformers are connected in parallel. one of them (400 kVA transformer) has 1.5% resistive and 5% reactive drops whereas the other (800 kVA transformer) has 1% resistive and 4% reactive drops. The secondary voltage of each transformer is 400 V on load. Determine how they will share a load of 600 kVA at a power factor of 0.8 lagging	[5]

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