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Sr. No...007303.....

DEC 2023

B.Tech(EU) - B.Tech 3rd Sem
Electrical Machines-I(ELPC303)

Time: 3 hrs

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.

Part A

Q1 a)	Why is the air gap between the pole pieces and the armature kept very small?	(1.5)co2
b)	For what type of DC machine, lap winding is employed?	(1.5)co2
c)	Why does the external characteristic of DC shunt generator turn back as it is overloaded?	(1.5)co2
d)	Why are iron losses assumed to remain constant from no load to full load in a power transformer?	(1.5)co3
e)	Explain why short circuit test on a single phase transformer gives the copper losses only and not the iron losses?	(1.5)co3
f)	Why is an iron-silicon alloy core used in a transformer and why the silicon content in electrical sheet steel is limited to 4.5-5% only.	(1.5)co3
g)	Explain the scott connection by which 3 phase power is transformed using 2 single phase transformers.	(1.5)co3
h)	What do you mean by co-energy?	(1.5)co1
i)	What is linear commutation?	(1.5)co2
j)	Why do series motor is not suitable for belt driven loads?	(1.5)co3

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Part B

Q2a)	A dynamo has a rated armature current at 250 A. What is the current per path of the armature if the armature winding is simplex wave wound or simplex Lap wound? The machine has 12 poles.	7)co2
b)	A 10 HP, 230V shunt motor has an armature resistance of 0.5Ω and field circuit resistance of 115Ω . At no load and rated (full) voltage, the speed is 1200rpm and the armature current is 2A. If load is applied, the speed drops to 1100rpm. Determine the armature current and line current.	8)co3
Q3 a)	Derive the emf equation of DC generator	5 co2
b)	The armature and field resistances of a 320V, dc shunt motor are 0.5ohm and 250 ohm respectively. When driving a load of constant torque at 600rpm, the armature current is 24A. If it is required to raise the speed from 600rpm to 700 rpm, calculate the resistance to be connected in the shunt field circuit.	10) co3
Q4a)	A single phase transformer working at unity power factor has an efficiency of 90% on both half load and at full load of 500KW. Determine i) iron loss ii) Full load cu loss iii) Efficiency at 75% of full load iv) Maximum efficiency	10) co3
b)	Derive the expression of saving of copper in auto transformer as compared to an equivalent two winding transformer.	5)co3
Q5 a)	Explain with diagram on-load tap changing transformer.	7)co3
b)	Two transformers A and B are connected in parallel to a load of $(2+j1.5) \Omega$. The impedances in secondary are $Z_A = (0.15+j0.5)$ and $Z_B = (0.1+j0.6)$. Their no load terminal voltages are $E_A = 207 \text{ angle } 0^\circ$ and $E_B = 205 \text{ angle } 0^\circ$ volts. Find the shared load currents I_A and I_B .	8)co3
Q6 a)	Draw and comment on all performance characteristics of a separately excited dc generator.	8)co3
b)	What are the remedies for field distortion due to armature reaction?	7)co2
Q7 a)	Explain singly excited systems. Also mention its examples.	7)co1
b)	Explain various methods of speed control of DC motors.	8)co3