



Roll No:

BTECH
(SEM. IV) THEORY EXAMINATION 2025-26
ELECTRICAL MACHINES-I

TIME: 3 HRS**M.MARKS: 70****Note:** Attempt all Sections. In case of any missing data; choose suitably.**SECTION A****1. Attempt all questions in brief.****02 x 7 = 14**

Q no.	Question	CO	Level
a.	Define co-energy in an electromechanical system.	1	K2
b.	What is armature reaction in DC machines?	2	K2
c.	A DC motor draws 20 A from a 220 V supply. Armature resistance is 0.5 Ω. Find back EMF.	2	K2
d.	Differentiate between 3-point and 4-point starters.	3	K3
e.	Draw phasor diagram of ideal transformer at no load condition.	4	K2
f.	What is voltage regulation in a transformer?	4	K2
g.	Give conditions for three parallel operation of three phase transformer.	5	K2

SECTION B**2. Attempt any three of the following:****07 x 3 = 21**

Q no.	Question	CO	Level
a.	Show that the field energy in a linear magnetic system is given by: $W_f = \frac{1}{2} Li^2 = \frac{1}{2} \psi i = \frac{1}{2L} \psi^2$	1	K3
b.	Describe the process of commutation. Also explain its types and the methods to improve the commutation in DC machines.	2	K2
c.	A 250 V dc shunt motor has an armature resistance of 0.5Ω and a field resistance of 250 Ω. When driving a constant torque load at 600 rpm, the motor draws 21 A. What will be the new speed of the motor if an additional 250 Ω resistance is inserted in the field circuit?	3	K2
d.	The maximum efficiency of a 100 kVA, 1100/440 V, 50 Hz transformer is 96%. This occurs at 75% of full load at 0.8 power factor lagging. Calculate the efficiency of transformer at half load and at 0.6 power factor lagging.	4	K3
e.	Describe the 3-phase to 2-phase conversion in transformers with suitable diagram. Also, derive the expression for positioning of neutral point.	5	K2

SECTION C**3. Attempt any one part of the following:****07 x 1 = 07**

Q no.	Question	CO	Level
a.	Derive the expression for force and torque in a singly excited magnetic system.	1	K2
b.	Explain the generation of EMF in electrical machines with cylindrical air gap.	1	K2



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TIME: 3 HRS**M.MARKS: 70****4. Attempt any one part of the following:****07 x 1 = 07**

Q no.	Question	CO	Level
a.	Explain the armature reaction in DC generators using armature and field MMF waveforms. Describe the effects of armature reaction?	2	K2
b.	Discuss commutation and methods of improving commutation.	2	K2

5. Attempt any one part of the following:**07 x 1 = 07**

Q no.	Question	CO	Level
a.	A 230V DC series motor develops its rated output at 1500rpm while taking 20A. Armature and series field resistances are 0.3Ω and 0.2Ω respectively. Neglecting saturation, determine the resistance that must be added to obtain rated torque i) at starting and ii) at 1000 rpm.	3	K2
b.	Explain Swinburne's test to calculate no-load losses in a DC machine. State its limitations over Hopkinson's test.	3	K2

6. Attempt any one part of the following:**07 x 1 = 07**

Q no.	Question	CO	Level
a.	Describe the construction, working, and advantages of autotransformers.	4	K2
b.	A 200 kVA, 2000/440 V, 50 Hz, single phase transformer gave the following test results: O.C Test (hv) : 2 kV, 1.75 kW, 1.8 A S.C Test (lv) : 13 V, 1 kW, 300 A (i) Calculate the parameters of equivalent circuit as referred to H.V side (ii) Determine voltage regulation and efficiency at full-load, 0.8 power factor lagging.	4	K3

7. Attempt any one part of the following:**07 x 1 = 07**

Q no.	Question	CO	Level
a.	What is V-V connection? Show that the open delta connection has a kVA rating of 57.7% of the rating of the normal delta-delta connection.	5	K3
b.	Explain Sumpner's test in transformer with neat diagram.	5	K2