

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP/2025)**

**CLASS: BTECH
BRANCH: EEE**

**SEMESTER : VI
SESSION : SP/2025**

SUBJECT: EE465 ELECTRICAL MACHINE DESIGN

TIME: 02 Hours

FULL MARKS: 25

INSTRUCTIONS:

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates
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Q.1(a)	List the various design factors that are considered while designing an electrical machine.	[2] 1	1
Q.1(b)	Briefly outline the fundamental requirements of high conductivity materials.	[3] 1	1
Q.2(a)	Classify different types of electrical steel sheets and state their applications.	[2] 1	2
Q.2(b)	Classify different types of magnetic materials.	[3] 1	2
Q.3(a)	Discuss the various factors affecting the choice of ampere conductors per meter.	[2] 2	2
Q.3(b)	Derive the output equation of a dc machine.	[3] 2	3
Q.4(a)	Analyze the effect of using higher specific electric and magnetic loading on the performance of machine.	[2] 2	4
Q.4(b)	A 5kW, 250 V, 4 pole, 1500 rpm shunt generator is designed to have a square pole face. The average flux density in the gap is 0.42 Wb/m ² and ampere conductors per meter is 15,000. The efficiency of the generator at full load is 0.87 and ratio of pole arc to pole pitch is 0.66. Evaluate the main dimensions of the machine.	[3] 2	6
Q.5(a)	Explain the effect of number of poles on armature core area.	[2] 2	4
Q.5(b)	A design is required for a 50 kW, 4 pole, 600 rpm dc shunt generator, the full load terminal voltage being 220 V. Determine appropriate dimensions of armature core to give a square pole face. The full load armature voltage drop is 3% of the rated terminal voltage, and that the field is 1% of rated full current. Ratio of pole arc to pole pitch is 0.67. The maximum gap density is 0.83Wb/m ² and the armature ampere conductors per meter are 30,000.	[3] 2	6

:28/02/2025:E