BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTech   SEMESTER : VII
BRANCH: EEE   SESSION : MO/2023

SUBJECT: EE465 ELECTRICAL MACHINE DESIGN

TIME: 3 Hours   FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Describe briefly about the electrical properties of insulating material? Compare any two insulating materials in electrical machines.	[5]	CO1	BL1
Q.1(b)	Classify electrical machines from the view point of manufacturing techniques? List the standards used in the design of the electrical machines.	[5]	CO1	BL1,BL2
Q.2(a)	Explain the guiding factors for the choice of no. of poles and armature slots of a D.C. machine?	[5]	C02	BL2
Q.2(b)	Calculate the main dimensions of the D.C. machine of 5 kW, 250 V, 4 pole, 1500 rpm shunt generator is designed to have a square pole face. The loadings are: average flux density in gap = 0.42 Wb/m^2 and amp. Conductors per metre = 15000. Assume full load efficiency = 0.87 and ratio of pole arc to pole pitch = 0.66,	[5]	C04	BL4
Q.3(a)	Show the estimation of no load current of single phase and three phase transformers?	[5]	C03	BL3
Q.3(b)	Evaluate approximate overall dimensions for a 200 kVA, 6600/440 V, 50 Hz, 3-phase core type transformer. The following data may be assume: emf per turn = 10 V, maximum flux density = 1.3 Wb/m^2, current density = 2.5 A/mm^2, window space factor = 0.3, stacking factor = 0.9, overall height = overall width. Use a 3 stepped core. For a 3 stepped core: width of largest stamping = 0.9d and net iron area = $0.6d^2$, where 'd' is the diameter of the circumscribing circle.	[5]	C04	BL5
Q.4(a)	Design the expression for the no. of tubes for the design of the tank with cooling tubes of a transformer. Also, estimate the tank dimensions for single phase and three phase transformers.	[5]	C05	BL6
Q.4(b)	Write down the factors affecting due to the choice of B_{av} in a three phase induction motor?	[5]	CO3	BL3
Q.5(a)	Illustrate the two factors in each to be considered for the choice of stator slots and length of air gap of an induction motor?	[5]	C04	BL4
Q.5(b)	Explain the output equation of the synchronous machine? Discuss the factors for the choice of specific magnetic loading in a synchronous machine.	[5]	C04	BL5

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