Code No: **R32021** **R10** **Set No. 1**

III B.Tech II Semester Supplementary Examinations, April - 2017

ELECTRICAL MACHINE DESIGN

(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1	a)	What are the limitations in the design of Electrical Machines? Discuss.	[8M]
	b)	Explain in different cooling techniques used in electrical machines.	[7M]
2	a)	Explain the following terms: Back pitch, front pitch, winding pitch and Commutator pitch	[8M]
	b)	Find out whether the following windings are symmetrical or not i) 12 pole, 74 slot, 4 coil sides per slot, simplex wave winding ii) 4 pole, 63 slot, 3 coil sides per slot, duplex wave winding	[7M]
3	a)	Discuss in detail about the choice of specific electric and magnetic loadings for DC Machines	[7M]
	b)	Determine the total commutator losses for a 500 kW, 400 V, 800 rpm, 10 pole generator. Given commutator diameter = 0.8 m; current density at brush contact = 40 X 10^{-3} A/mm^2; brush pressure = 10 kN/m^2; co-efficient of friction = 0.28; brush contact drop 2 V	[8M]
4	a)	Compare the performances of single and three phase transformers in detail.	[8M]
	b)	Discuss in detail about different methods of cooling of transformers.	[7M]
5	a)	Discuss in detail about the design of single phase transformers.	[7M]
	b)	Estimate the dimensions of a 3 phase delta/star core type transformer rated at 200 kVA, 3000/400V, 50 Hz. A suitable core with three steps having a circumscribing circle of 0.25 diameter and a leg spacing of 0.4 m is available. the emf per turn is 7V; assuming a current density, 2.5 A/m^2; window space factor, 0.28 and a stacking factor of 0.9	[8M]
6	a)	Explain in detail about the design of the stator slots of wound rotor induction machines.	[7M]
	b)	Find the main dimensions of a 12 kW, 3 phase, 400 V, 50 Hz, 2810 rpm, squirrel cage induction motor having efficiency of 0.95 and a full load power factor of 0.89. Assume: Specific magnetic loading = 0.3 Wb/m^2; specific electric loading = 24000 A/m. Take the rotor peripheral speed as approximately 30 m/s at synchronous speed	[8M]
7	a)	Explain in detail about the design of the rotor slots of wound rotor induction machines.	[7M]
	b)	Calculate the equivalent resistance of rotor per phase with respect to stator, the current in each bar and end ring and the total copper loss for a 415 V, 50 Hz, 4 pole, three phase induction motor having the following data: Stator: Slots = 48; conductors in each slot =35;current in each conductor = 10A Rotor: Slots = 57; length of each bar =0.12 m; area of each bar = 9.5 X 5.5 mm^2; mean diameter of end ring = 0.2 m; area of each end ring = 175 mm^2. Resistivity of copper is 0.02 Ω/m and mm^2. Full load power factor is 0.85.	[8M]
8	a)	With the help of the equation, explain the output of Synchronous Machines in detail.	[7M]
	b)	Find the main dimensions of a 70 MVA, 11 kV, 50 Hz, 200 rpm, 3 phase water wheel generator. The average gap density is 0.55 Wb/m^2 and ampere conductors per meter are 32000. The peripheral speed should not exceed 40 m/s at normal running speed in order to limit the run-away peripheral speed.	[8M]

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