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Reg. No. : .....

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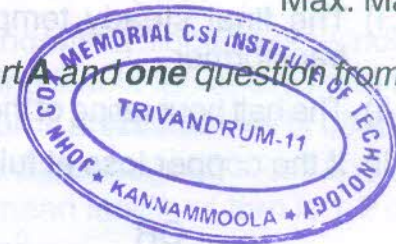
**Eighth Semester B.Tech. Degree Examination, November 2015  
(2008 Scheme)**

**08.802 : ELECTRICAL MACHINE DESIGN (E)**

Time : 3 Hours

Max. Marks : 100

**Instruction :** Answer *all* questions from Part **A** and *one* question from *each* Module of Part **B**.



**PART – A**

1. What are the temperature limits of different classes of Insulating materials ?
2. Explain the term "hot spot temperature" with respect to electrical machines.
3. Discuss the advantages of hydrogen as a cooling medium as compared to air.
4. What are the differences between distribution and power transformers ?
5. Distinguish between apparant flux density and real flux density in a highly saturated armature teeth.
6. Derive the output equation of a DC machine.
7. Explain the factors to be considered for the selection of specific electric loading of DC machines.
8. Explain the factors to be considered for separation of D and L for cylindrical rotor machines.
9. Derive an expression for determining the end ring current of a squirrel cage Induction Motor.
10. Compare the analysis and synthesis method of computer Aided Design of an electrical machine. **(10×4=40 Marks)**



## PART – B

## Module – I

11. a) Derive an expression for temperature rise time curve for an electrical machine. 8
- b) A 450 KVA transformer has a total loss of 7.5 kW at full load. The rate of heat dissipation from tank walls is 300 W/°C. The heat energy required to raise its temperature by 1°C is 0.5 kwh. Calculate
- The final steady temperature rise and thermal time constant of the transformer.
  - The half hour rating of the transformer to give the same temperature rise as in
  - If the copper loss at full load is twice the iron loss. 12

OR

12. a) Derive the output equation of a 3 phase transformer. 5
- b) Calculate the main dimensions and winding details of a 100 KVA, 2000/400V, 50Hz, single phase shell type, oil immersed, self cooled transformer. Assume,
- Voltage/turn = 10
- Flux density in core = 1 Wb/m<sup>2</sup>
- Current density = 2A/mm<sup>2</sup>
- Window space factor = 0.35
- Ratio of height to width of window = 3
- Ratio of core depth to width of central limb = 2.5. 15

## Module – II

13. a) Derive the expression for MMF required for the airgap of a machine with salient poles and slotted armature. 8
- b) Determine the main dimensions of a 45kW, 220V, 850 rpm, DC motor, given
- Average flux density = 0.5 Wb/m<sup>2</sup>
- Ampere conductors/m = 26,000
- Maximum efficiency = 90% on full load.
- Field current is 2.5% of full load current. 12

OR



14. A 150 kW, 6 pole, 230 V, 500 rpm, dc short motor has an efficiency of 91%. Design the main dimensions, no. of slots, no. of conductors and dimensions of slot. The following data are available. Specific magnetic loading = 0.6, specific electric loading = 29 kA/m. 20

**Module – III**

15. a) Derive the output equation of a synchronous machine. 6
- b) The field coils of a salient pole alternator wound with a single layer winding of bare copper strip 30 mm deep, with separating insulation of 0.15 mm thick. Determine a suitable winding, height, no. of turns and thickness of conductor to develop an mmf of 12,000A with a potential difference of 5 V/coil and with a loss of 1200 W/m<sup>2</sup> of total coil surface. The mean length of turn is 1.2 m. Resistivity of copper = 0.021 ohms/m and mm<sup>2</sup>. 14

OR

16. Determine the main dimensions, turns per phase, no. of slots, conductor cross section and slot area of a 250 HP, 3 phase, 50Hz, 400 V, 1410 rpm, slip ring Induction Motor. The motor is delta connected. Assume

Specific magnetic loading = 0.6 Wb/m<sup>2</sup>.

Specific electric loading = 30,000 A/m.

Efficiency = 0.91, and power factor = 0.85.

Winding factor = 0.955, current density = 4 A/mm<sup>2</sup>.

Slot space factor = 0.4 and

Ratio of core length to pole pitch is 1.3. 20

