

Printed Pages—3

EEE023

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2497

Roll No.

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B. Tech.

(SEM. VI) THEORY EXAMINATION 2011-12
**CONVENTIONAL AND CAD OF ELECTRICAL
MACHINES**

*Time : 2 Hours**Total Marks : 50***Note :—** (1) Attempt all questions.

(2) Each question carries equal marks.

1. Answer any **three** parts of the following :— ($3\frac{1}{2} \times 4 = 14$)
- What are the different properties of conducting materials which decides whether the material is suitable or not for a particular application ?
 - How the specific magnetic loading effects the design of electrical machines ?
 - Calculate the volume of cooling air in cubic meter per sec required to dissipate the losses of a 12 MW generator whose efficiency is 96%. The inlet temperature is 14°C and that of outlet temperature of air is 34°C.
 - Explain continuous rating, short time rating and intermittant rating with reference to electrical machines.
 - Explain the use of Simpson's rule to find out the ampere/turn/m in teeth of the electrical machine.

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2. Answer any **two** parts of the following :— (6×2=12)
- (a) Derive the output equation for a 3-phase shell type transformer. State the assumptions made. Explain why stepped core is used in transformers.
 - (b) A 300 kVA; 3-phase, 50 Hz, 6600/400 volts, delta/star, core type transformer intended for lighting load is to be designed with approximately 9 volts per turn and a flux density of 1.4 Tesla. Take a three-stepped core and yoke area 15% more than core area. Calculate :—
 - (i) Core section and yoke's section.
 - (ii) Primary and secondary turn per phase.
 - (c) Discuss an arrangement of low voltage and high voltage winding on core of 3-phase core type and 3-phase shell type transformers.
3. Answer any **two** parts of the following :— (6×2=12)
- (a) Design the stator frame for a 500 kVA, 6600 V, 50 Hz, 12-pole, star-connected, 3-phase salient pole alternator, giving the following informations :
 - (i) Internal diameter and gross length of stator frame.
 - (ii) Number of stator conductors.
 - (iii) Number of stator slots.Specific magnetic loading = 0.6 Tesla
Specific electric loading = 26000 Ampere-conductor per meter.
Assume other data needed if any.
 - (b) Explain :
 - (i) Leakage reactance in an alternator having double layer winding.
 - (ii) Ventilation of electrical machines.

- (c) Explain the method of determination of full-load mmf for a salient pole synchronous generator.
4. Answer any **two** parts of the following :— (6×2=12)
- (a) What is gap expansion factor ? How does it affect the calculation of ampere-turn of air-gap of induction motor ? What changes would you suggest in the design of a 3-phase squirrel cage Induction motor to achieve increased starting torque ?
- (b) Determine main dimensions, turns per phase, number of slots, conductor section and slot area of 200 H.P., 3-phase, 50 Hz, 400 volts, 1475 rpm slip ring induction motor. Assume $B_{av} = 0.5 \text{ wb/m}^2$, $a_c = 30,000 \text{ Ac/m}$, efficiency = 0.9 and power factor = 0.9 , current density = 3.5 amperes/mm².
- (c) Write a program with flowchart to estimate the main dimensions of 1800 kVA, 50 Hz, 3 phase, 175 rpm water cooled wheel generator. The specific magnetic loading is 0.8 wb/m² and the specific electric loading is 26,000 ampere-conductor/m. Pole arc to pole pitch ratio is 0.7.