

Printed Pages :3



*1206 *

394

EEE-023

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

PAPER ID : 120653

Roll No.

B.Tech. (Semester-VI)

SPL. THEORY EXAMINATION, 2014-15

**CONVENTIONAL AND CAD OF ELECTRICAL
MACHINES**

Time : 2 Hours]

[Total Marks : 50

Note: Attempt all questions.

Q.1. Attempt any Three parts of the following: (3.5x4=14)

- (a) What are the different properties of conducting materials which decides whether the material is suitable or not for a particular application?
- (b) How the specific magnetic loading effects the design of electrical machines?
- (c) 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.

120653]

(1)

[Contd...

- (d) Explain continuous rating, short time rating and intermittent rating with reference to electrical machines.
- (e) Explain the use of Simpson's rule to find out the ampere/turn/m in teeth of the electrical machine.

Q.2. Attempt any TWO parts of the following: (6x2=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 H466001400 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 11% 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. Briefly explain the effect of earth on the capacitance of conductors.

Q.3. Attempt any TWO parts of the following: (6x2=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. Explain inductive interference between power and communication lines with the help of Electromagnetic and electrostatic effects.

(c) Explain the method of determination of full-load mmf for a salient pole synchronous generator.

Q.4. Attempt any TWO parts of the following: (6x2=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 $B_m = 0.5 \text{ wb/m}^2$, $a_c = 30,000 \text{ Ac/m}$, 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.

—x—