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

PAPER ID : 2497 Roll No. | | | | | | | | | | |

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 :— **(3½×4=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 requried 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.

(d) Explain continuous rating, short time rating and intermittant 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.

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 wb/m^2, ac = 30,000 Ac/m, efficiency = 0·9 and power factor = 0·9 , current density = 3·5 amperes/mm^2.

(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/m^2 and the specific electric loading is 26,000 ampere-conductor/m. Pole arc to pole pitch ratio is 0·7.