

D 11966

(Pages : 2)

Name

Reg. No.

**SEVENTH SEMESTER B.TECH. (ENGINEERING) [09 SCHEME] DEGREE
EXAMINATION, NOVEMBER 2016**

EE/PTEE 09 704—ELECTRICAL MACHINE DESIGN

Time : Three Hours

Maximum : 70 Marks

Part A

Answer all questions.

1. List the factors that influence the separation of D and L of a d.c. machine.
2. How the heat dissipation is improved by the provision of cooling tubes ?
3. Write the advantages and disadvantages of stepped cores.
4. State three important features of turbo alternator rotors.
5. What are the factors which influence the power factor of an induction motor ?

(5 × 2 = 10 marks)

Part B

Answer any four questions.

6. Explain the factors to be considered during the choice of specific magnetic loading.
7. Derive the output equation of single-phase transformer.
8. Discuss the prediction of open circuit characteristics of salient pole alternator.
9. With suitable equations, explain the design of stator core of a 3 Φ induction motor.
10. Write short notes on the transformer tank design.
11. Show that the ratio of net core area to area of circumscribing circle in two stepped core of a transformer is 0.71.

(4 × 5 = 20 marks)

Part C

Answer all questions.

12. (a) Design a suitable commutator for a 350 kW, 600 r.p.m., 440 V, 6 poles D.C. generator having an armature diameter of 0.75 m. The number of slots is 288. Assume suitable values where it's necessary ?

Or

Turn over

- (b) Determine the diameter and length of armature core for a 55 kW, 110 V, 1000 r.p.m., 4 pole shunt generator, assuming specific electric and magnetic loadings of 26000 amp.cond./m and 0.5 Wb/m^2 respectively. The pole arc should be about 70% of pole pitch and length of core about 1.1 times the pole arc. Allow 10 ampere for the field current and assume a voltage drop of 4 volts for the armature circuit. Specify the winding to be used and also determine suitable values for the number of armature conductors and slots.
13. (a) The tank of 1250 kVA, natural oil cooled transformer has the dimensions length, width and height as $0.65 \times 1.55 \times 1.85 \text{ m}$ respectively. The full-load loss = 13.1 kW, loss dissipation due to radiations = $6 \text{ W/m}^2\text{-}^\circ\text{C}$, loss dissipation due to convection = $6.5 \text{ W/m}^2\text{-}^\circ\text{C}$, improvement in convection due to provision of tubes = 40%, temperature rise = 40°C , length of each tube = 1 m, diameter of tube = 50 mm. Find the number of tubes for this transformer. Neglect the top and bottom surface of the tank as regards the cooling.

Or

- (b) What is widow space factor ? Find the width of the window for the optimum output of a transformer.
14. (a) With the help of neat diagram, showing current distribution in cage rotor, obtain the expression for RMS value of end ring current.

Or

- (b) Determine the main dimensions of a 100 kVA, 50 Hz, three-phase 375 r.p.m. alternator. The average air gap flux density is 0.55 Wb/m^2 and ampere conductors per metre is 28000. Given that L/T must be between 1 to 5. The maximum permissible peripheral speed is 50 m/sec. The run away speed is 1.8 times synchronous speed.
15. (a) Discuss the methods to employed to reduce the effects of harmonics in selection of the combination of rotor and stator slots in induction machines.

Or

- (b) Design a cage rotor for a 18.8 HP, 3-phase, 440 V, 50 Hz, 1000 r.p.m., induction motor having full load efficiency of 0.86, power factor = 0.86, $D = 0.25 \text{ m}$, $L = 0.14 \text{ m}$, $Z_{gs}/S_g = 54$. Assume missing data if any.

(4 × 10 = 40 marks)