Reg. No. : | | | | | | | | | | | | |

# Question Paper Code : 11231

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2014.

Sixth Semester

Electrical and Electronics Engineering

080280035 — ELECTRICAL MACHINE DESIGN

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish the magnetic and electric circuits.

2. What are the factors to be considered in the design of commutator?

3. What are the main dimension of the rotating machine?

4. List out the demerits of slip ring induction motor?

5. Salient pole alternator is not suitable for high speeds. Why?

6. What are the methods used for estimating the m.m.f. for teeth?

7. How do you design the number of brushes for a dc machines?

8. List the different methods of cooling of transformer.

9. What is crawling and cogging in induction motor?

10. What are the functions of damper winding?

PART B — (5 × 16 = 80 marks)

11. (a) Determine the air gap length of a dc machine from the following particulars : gross length of core = 0.12m, No. of ducts = one and is 10mm wide, slot pitch = 25mm, slot width = 10mm, carter's co – efficient for slots and ducts = 0.32, gap density at pole centre = 0.7 wb/$m^2$; field mmf / pole = 3900AT, mmf required for iron pans of magnetic circuit = 800AT. (16)

Or

(b) (i) A 175 MVA, 20 pole water wheel generator has a core length 1.72m and a diameter of 6.5 m. The stator slots (open) have a width of 22mm, the slot pitch being 64mm and the air gap length at the centre of the pole is 30mm. There are 41 radial ventilation ducts each 6mm wide. The total mmf per pole is 27000A. The mmf required for the air gap is 87% of the total mmf per pole. Estimate the average flux density in the air gap if the field form factor is 0.7. (10)

(ii) Derive the equation for finding leakage permeance of parallel sided slots. (6)

12. (a) Calculate the main dimensions of a 20HP, 1000 rpm, 400 V, dc motor given that $B_{av}$ = 0.37 Wb/m$^2$ and ac = 16000 amp cond/m. Assume an efficiency of 90%. (16)

Or

(b) A 4 pole, 25HP, 500V, 600 rpm series motor has an efficiency of 82%. The pole faces are square and the ratio of pole arc to pole pitch is 0.67. Take $B_{av}$ = 0.55 Wb/m$^2$ and ac = 17000 amp.cond/m. Obtain the, main dimension of the core and particular of a suitable armature winding. (16)

13. (a) Discuss about the various methods of cooling of power transformer. (16)

Or

(b) Derive the output equation of single phase and three phase transformer. (16)

14. (a) Find the main dimension of a 2500KVA, 187.5 r.p.m., 50HZ, 3 phase, 3 KV, salient pole synchronous generator. The generator is to be a vertical, water wheel type. The specific magnetic loading is 0.6 W/bm$^2$ and the specific electric loading is 34,000 A/m. Use circular poles with ratio of core length to pole pitch = 0.65. Specify the type of pole construction used if the runaway speed is about 2 times the normal speed. (16)

Or

(b) Discuss about the effect of short circuit ratio on the performance of synchronous machine. (16)

15. (a) Estimate the stator core dimensions, number of stator slots and no. of stator conductor/slot for a 100KW, 3300V, 50 HZ, 12 pole, star connected slip ring induction motor. $B_{av}$ = 0.4 Wb/m$^2$; ac = 25000 ampere conductors/m; efficiency = 90%; Power factor = 0.9; Winding factor = 0.96; Choose main dimensions to give best power factor. The slot loading should not exceed 500 ampere conductors. (16)

Or

(b) State and explain the factors governing the choice of average flux density in the air gap and ampere conductors per meter in the design of three phase induction motor. (16)

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