G 1214 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Eighth Semester

Branch : Electrical and Electronics Engineering

ELECTRICAL SYSTEM DESIGN [E]

(Old Scheme – Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

Each question carries **4** *marks.*

1. What are the factors which influence the choice of speed and number of poles of a d.c. machine ?
2. Write down the design procedure of commutator and brushes of a d.c. machine.
3. In transformer, why the low voltage winding is placed near the core?
4. Write down about the temperature rise calculations in the case of single-phase transformers.
5. Write down the advantages and disadvantages of design of an alternator with larger air gap.
6. Why short chorded windings are employed in indiction motor?
7. Write the installation requirement of high rise building.
8. Explain how the rating of cables and fuses are described for motor installation.
9. What are the general requirement of earthing?
10. What are the conventional methods of laying underground cables?

(10 × 4 = 40 marks)

Part B

Answer **all** *questions.*

Each question carries **12** *marks.*

11. (a) Derive an expression for the output equation of a DC Machine.

    (b) Determine the number of poles, and the length of air gap of a 600 KW, 500 V, 900 r.p.m. DC Generator. Assume average gap density as 0.6 wb/m^2 and ampere conductors per metre as 35,000. The ratio of pole arc to pole pitch is 0.75 and the efficiency is 91%. The m.m.f required for air gap is 50% of armature m.m.f. and gap contraction factor is 1.15.

(7 = 5 = 12 marks)

Or

12. The following particulars refer to the shunt field coil of a 440 V, 6 pole d.c. generator m.m.f per pole = 7000 A, loss radiated from outer surface excluding ends = 400 W/m^2, space factor = 0.62, resistivity = 0.02 Ω/m. Calculate (a) Diameter of wire ; (b) Length of coil ; (c) Number of turns ; and (d) Exciting current. Assume a voltage drop of 20% of terminal voltage across the field regulator.

13. (a) What are the losses occurring in a transformer? How these vary with change in frequency?

    (b) Write down the design procedure for tank and cooling tubes of a transformer.

(5 + 7 = 12 marks)

Or

14. Calculate the dimension of core and yoke for a 200 KVA, 50 Hz single-phase transformer. A cruciform core is used with distance between adjacent limbs equal tok 1.6 time the width of core laminations. Assume voltage per turn 14 V, maximum flux density 1.1 wb/m^2 window space factor 0.32, current density 3 A/mm^2, and stacking factor 0.9. The net iron area of 0.56 d^2 in a cruciform core where d is the diameter of circumscribing circle. Also the width of largest stamping is 0.85 d.

15. (a) Write down the effects of short circuit ratio on the performance of a synchronous machine.

    (b) Determine suitable stator dimensions for a 500 KVA, 50 Hz, 3ϕ alternator to run at 375 r.p.m. Take mean gap density over the pole pitch as 0.55 wb/m^2. The specific electric loading as 25,000 A/m. The peripheral speed should not exceed 35 m/s.

(5 + 7 = 12 marks)

Or

16. A 11 KW, 3ϕ, 6 pole 50 Hz, 220 V, star connected induction motor has 54 stator slots, each containing 9 conductors. Calculate the value of bar and end ring currents. The number of rotor bars is 64. The machine has an efficiency of 0.86 and power factor 0.85. The rotor m.m.f. is 85% of stator m.m.f.

17. Draw a neat diagram showing the position of the switch boards, distribution board accessories with necessary connections for a hall of 15 m × 6 m × 5 m height. The hall is to be fitted with fan and light points. Make your own assumptions.

Or

18. Draw the layout and schematic diagram for the electrical system required for the two 5 tone air-conditioning unit and for one left of capacity 12 persons in the hotel. Estimate the rough cost and materials.

19. Describe the plate earthing and pipe earthing system with neat diagram. Clearly indicate the requirements of both type of earthing with examples.

Or

20. An outdoor substation 11 KV/415 V, 1500 KVA is installed in the presence of a factory for feeding three-phase power to four workshops. The substation is fed from 11 KV overhead feeder running near it. Draw the layout of the substation and estimate the material required for that installation.

[5 × 12 = 60 marks]