G 1701 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Eighth Semester

Branch : Electrical and Electronics Engineering

EE 010 803—ELECTRICAL SYSTEM DESIGN (EE)

(New Scheme—2010 Admission onwards)

[Regular/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Explain the factor affecting the design of length of air gap.
2. Discuss about the different types of winding used in transformer design.
3. How the open circuit characteristics helps in designing the synchronous machine ?
4. Write short notes on standards of Bureau of Indian standards.
5. Discuss the types of cooling system.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Explain the difference between progressive and retrogressive winding of a d.c. machine. Explain their uses.
7. What are the factors affecting the selection of core flux density in a transformer ? Explain.
8. Explain the induction motor design for best power factor.
9. Write short notes on polar curve and lumen calculation.
10. Draw the single line diagram of power distribution.

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. A 5 kW, 230V, 4 pole, 1500 r.p.m., d.c. shunt generator is designed to have a square pole face. The specific magnetic and electrical loading are 0.42 Wh/m^2 and 15000 Ac/m respectively. Find the main dimensions of the machine. Assume that the pole arc is 0.6 times the pole pitch and full-load efficiency as 0.82.

Or

12. Calculate the diameter and length of armature for a 7.5 kW, 4 pole, 1000 r.p.m, 220 V shunt motor, full load $\eta = 0.83$ maximum gap flux density = 0.9 Wb/m^2, specific electric loading = 30,000 ampere conductors per meter, field form factor = 0.7. Assume that the maximum efficiency occurs at full load and the field current is 2.5 % of rated current. The pole face is square.

13. Calculate the main dimensions and winding details of a 100 kVA, 2000/400 V, 50 Hz single-phase shell type oil immersed self cooled transformer. Assume voltage/then = 10 V, flux density in core = 1.1 Wb/m^2, current density = 2A/mm^2, window space factor = 0.33. The ratio of window height to window width and ratio of core depth to width of central limb = 2.5. The stalking factor is 0.9.

Or

14. The tank of a 500 kVA, single-phase, 50 Hz, 6600/400 V transformer is 110 cm. × 155 cm. If the load losses is 6.2 kW, find the suitable arrangements for the cooling tube to limit the temperature rise to 35° C. Take the diameter of the cooling tubes as 5 cm. and average length of tube as 110 cm.

15. Design the suitable values of diameter and length of a 75 MVA, 11 kV, 50 Hz, 3000 r.p.m., 3-phase, star-connected alternator. Also determine the value of flux conductor per slot, no. of turns per phase and size of armature conductors :

    Average gap density = 0.6 T
    Ampere conductors per m = 50,000
    Peripheral speed = 180 m./sec.
    Winding factor = 0.95
    Current density = 6 A/mm^2

Or

16. Determine approximate values for the stator bore and the effective core length of a 55 kW, 415 V, 3-phase, star connected, 50 Hz four pole induction motor. Efficiency = 90 %, power factor = 0.91, winding factor = 0.955. Assume suitable data wherever necessary with proper justification. Also explain the relevant expression used.

17. Design a lighting installation for a room having dimensions 12 m. long × 8 m. × 3.2 m. height having working plane 0.7 m. above floor. The other given factors are as below :

    Ceiling = 70 %, Walls = 50 %, Working plane = 20 %, light loss factor = 0.779 luminance type = 1800 mm. twin tube with opal diffuser ceiling mounted.

    Downward light output ratio – 36 %
    $SHR_{max} = 1.60 : 1$
    $SHR_{non} = 1.50 : 1$
    Dimensions = 1800 mm long × 20 mm wide
    Lamps = 1800 mm., 15 W plus white
    Initial lumen per lamp = 5800
    Lamps per luminaries = Two
    Desired average illuminance on working plane = 500 lux.

Or

18. Explain the basic electrical schemes and layout drawing of a high-rise building.

19. Discuss about the layout and estimation of overhead and underground power distribution system.

Or

20. Draw the single line diagram and layout diagrams of an HT industrial consumer with 11 kV indoor substation. Discuss about the various accessories and protection used.

(5 × 12 = 60 marks)