B.TECH. DEGREE EXAMINATION, MAY 2014

Eight Semester

Branch: Electrical & Electronics Engineering

ELECTRICAL SYSTEM DESIGN

(New Scheme- Regular)

Time: 3 hours   Maximum: 100 marks

*Answer **all** questions*

PART A

Each question carries 3 marks

1. List the advantages of having large number of poles in a DC machine
2. Explain short term and intermittent rating of transformer
3. Compare water wheel and turbo alternator
4. Explain how you will determine the input current of different types of motors, stating example?
5. What are the general requirements of earthing?

PART B
Each question carries 5 marks
6. Derive the output equation of a DC machine.
7. The voltage per turn of a 500kVA , 11kV/415V delta/star three phase transformer is 8.7 V. Calculate the number of turns per phase of LV and HV windings
8. Why field structure is rotating type in three phase synchronous machine?
9. Enumerate the factors to be considered when deciding the number of circuit for a residential wiring
10. Draw a sketch of pipe earthing

PART C
Each question carries 12 marks
11. A 250kW, 500V, 600rpm dc generator is built with an armature diameter of 0.75m and a core length of 0.3m. The lap connected armature has 720 conductors. Using the data obtained from this machine , determine the armature diameter, core length, number of armature slots, armature conductors and commutator segments for a 350kW, 440V, 720 rpm, 6 pole dc generator. Assume a square pole face with ratio of pole arc to pole pitch to 0.66. The full load efficiency is 0.91.   **(12 marks)**
Or
12. (a) Describe the design procedure of shunt field winding of dc machine   **(8 marks)**
    (b) What is Carter's coefficient? Explain   **(4 marks)**
13. Determine the main dimensions of the core, the number of turns and the cross sectional area of the conductors in the primary and secondary windings of a 100kVA, 2200/480V single phase core type transformer to operate at 50 Hz. Given: approximate voltage per turn, 7.5V: maximum flux density, 1.2 Wb/m^2 ; ratio of effective cross sectional area of core to square of diameter of circumscribing circle ,0.6; ratio of height to width of window,2; window space factor, 0.28 , current density , 2.5 A/mm^2 **(12 marks)**

Or

14. Describe the design of a 230V/ 6-0-6 V transformer **(12 marks)**

15. (a) How do you find rotor bar currents of 3 phase induction motor **(4 marks)**

(b) Find the main dimensions of a 7.5k W, 220V, 50 Hz, 4 pole, 3 phase induction motor for best power factor. Given $B_{av} = 0.4$ Wb/m^2, ac= 22000 A/m, efficiency= 0.86; p.f= 0.87. Also find the main dimensions if the ratio of core length to pole pitch is unity**.** **(8 marks)**

Or

16. Estimate the diameter, core length, size and number of conductors, no of slots of stator of a 15 MVA, 11kV, 50Hz, 2 pole star connected turbo alternator with 60 phase spread. Assume B_{av}= 0.55 Wb/m^2, ac= 36,000 A/m.: Current density= 5A/ mm^2 ; peripheral speed= 160 m/s.The winding should be arranged to eliminate 5th harmonic.

17. Estimate the quantity of materials required and draw the electrical wiring layout of a residential building with two bed rooms, kitchen and a drawing room with necessary facilities.

Or

18. Explain the design and layout of a cinema theatre? **(12 marks)**

19. Explain various earthing systems. Mention the factors affecting earth resistance **(12 marks)**

Or

20. An 11kV overhead line is to be run through a distance of 3 km from an existing 11kV overhead line. An indoor substation 11kV/415V is to be erected at the terminal point of its overhead line. The 11kV/ 415V transformer is to feed the following loads:
    (i)   Production shop having a load of 400kW of three phase and single phase motors
    (ii)   Foundry shop having a load of 150kW
    (iii)   Administration block having light and fan loads of 100kW

Estimate the quantity of material required for the installation of the overhead line and the indoor substation (Assume the p.f to be 0.8 and load factor to be 0.6) **(12 marks)**