G 1002 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2014

Eighth Semester

Branch : Electrical and Electronics Engineering

EE 010 803—ELECTRICAL SYSTEM DESIGN (EE)

(New Scheme)

[Regular—2010 Admissions]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. What are the disadvantage of higher specific electrical and magnetic loading ?
2. In mines applications, transformer with oil cooling should not be used, why ?
3. Mention the advantages of fractional slot winding in a synchronous machine
4. What is the criterion for determine the sizes of conduit for motor wiring ?
5. Discuss the general requirement of earthing.

(5 × 3 = 15 marks)

Part B

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

6. Discuss briefly about main field and inter-pole winding of a DC motor.
7. How heat dissipation is improved by the provision of cooling tubes ?
8. What are the criteria used for choice of number of slots of an induction machine ?
9. Enumerate the factors to be considered, when deciding the number of circuit for a residential wiring.
10. Draw the single line diagram of a 500 kVA, 11 kV/415 V indoor substation.

(5 × 5 = 25 marks)

Part C

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

11. (a) Derive the output equation of a DC machine. (4 marks)

Turn over

(b) Calculate the diameter and length of armature for a 7.5 kW, 4 pole, 1000 r.p.m. 220 V shunt motor, given: full-load efficiency = 0.83 ; max gap flux density = 0.9 Wb/m^2 ; specific electrical loading = 30,000 ampere conductors per metre. Field form factor = 0·7. Assume that maximum efficiency occurs at full-load and the field current is 2.5 % of rated current. The pole face is square.

(8 marks)

Or

12. (a) Discuss about armature winding insulation. (4 marks)

(b) Explain the design procedure for the shunt field winding of a DC machine. (8 marks)

13. (a) What are the advantages and disadvantages of stepped cores ? (4 marks)

(b) Estimate the main dimensions of a 500 kVA, 6600 / 400 V, 3-phase, 50 Hz core type oil immersed self-cooled distribution transformer. Given : voltage per turn = 20 V, area factor for a stepped core = 0.56, window space factors = 0.3, current density = 3 A/mm^2, width of largest step = 0.85 A/mm^2, flux density B_M = 1.2 Wb/m^2, width of largest step =0.85 d, distance between centre of adjacent limbs = 1.85 a, assume $A_Y = A_i$.

(8 marks)

Or

14. Determine the dimensions of the core, number of turns and the cross-sectional area of conductors in the primary and secondary windings of a 100 kVA, 2200/480 V, single-phase core type transformer to operate at a frequency of 50 Hz, assuming the following data: Voltage per turn = 7.5 V, Maximum flux density = 1.2 Wb/m^2 , Ratio of net cross sectional area of core to the square of diameter of circumscribing circle 0.6, $\frac{Hw}{W_w} = 2$, window space factor = 0.28, current density 2.5 A/mm^2 , stacking factor = 0.9. Assume that the yoke section is 20% larger than core section.

(12 marks)

15. Find the values of diameter and length of a stator core of a 7.5 kW, 220 V, 50 Hz, 4 pole, 3-phase induction motor for the best power factor. Given: specific magnetic loading = 0.4 wb/m^2, specific electrical loading = 22000 A/m, efficiency = 0.86, and power factor = 0.87. Also find the main dimensions if the ratio of core length to pole pitch is unity.

(12 marks)

Or

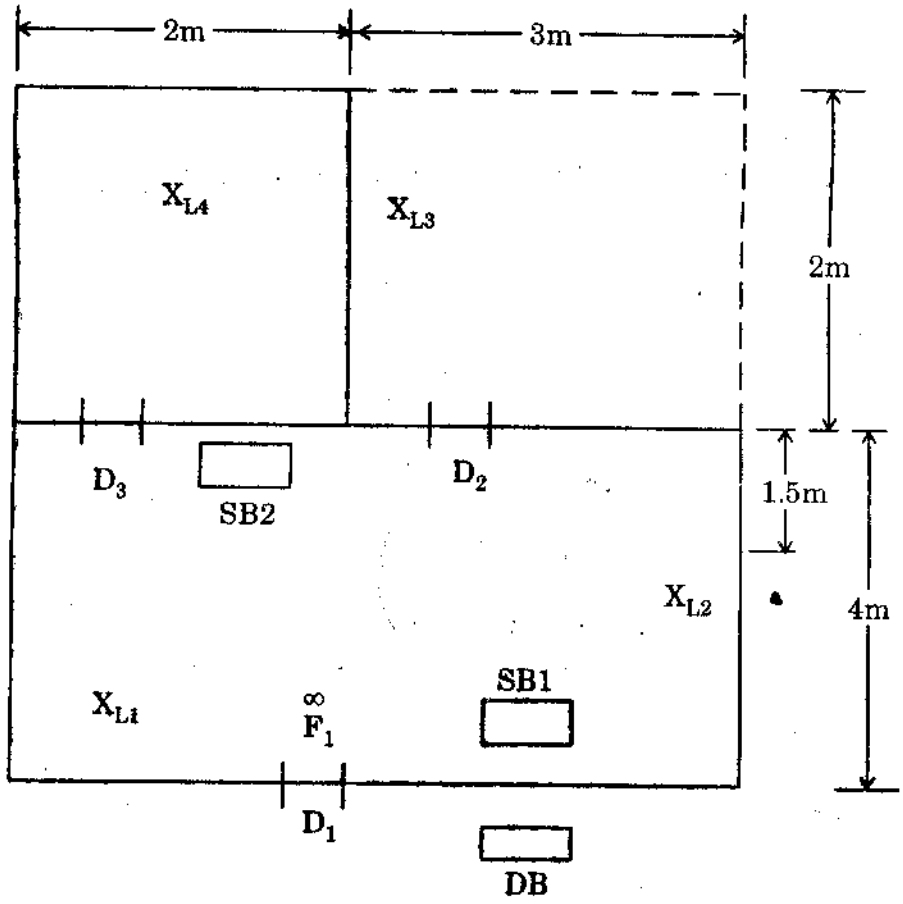
16. A three-phase alternator having a full-load rating of 11000 kVA at 0.8 power factor, 2200 V, 50 Hz, 300 r.p.m has a stator diameter of 1.9 m, core length of 0.3 m. and 180 slots. Using the information from a machine , with suitable modifications where required, determine the stator diameter core length, number of slots and conductor per slot for a three machine to give 2000 kVA at 0.8 power factor, 6600 V, 50 Hz, 600 r.p.m.

(12 marks)

17. A newly constructed small flat is to be provided electrical wiring. The plan of the flat is shown in the figure. The flat is to be provided with electrical connections. The positions of the light and fan points and switchboards has been shown in the figure. Decide the number of sub circuits and show them in the installation plan.

(i) Calculate the sizes and length of wire required for the wiring installation.

(ii) Estimate the quantity of material required for the conduit wiring system. (Necessary data may be assumed).



(12 marks)

Or

Turn over

18. A 25 × 10 m. room is to be provided with electrical connections. It has 8 light points, 4 fan points, two 5 A socket and one 15 A socket. Decide the number of sub-circuits. Draw the installation plan, calculate the size and length of wiring required for the wiring installation and estimate the quantity of materials required.

(12 marks)

19. (a) Explain about pipe earthing and plate earthing. (6 marks)

(b) What are the reasons for establishing substations? Explain the classification of substations. (6 marks)

Or

20. An indoor substation 11 kV/ 415 V, 1500 kVA, is installed in the premises of a factory for feeding three-phase and single-phase power to four work shops. The substation is fed from an 11 kV, overhead feeder running near it. Draw the layout of the substation and prepare a list of important material required.

(12 marks)

[5 × 12 = 60 marks]