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C09–EE–402

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BOARD DIPLOMA EXAMINATION, (C–09)

OCT/NOV—2013

DEEE—FOURTH SEMESTER EXAMINATION

AC MACHINES—I

Time : 3 hours] [*Total Marks* : 80

PART—A

Instructions : (1) Answer **all** questions.

(2) Each question carries **three** marks.

(3) Answer should be brief and straight to the point and shall not exceed *five* simple sentences.

1. Briefly explain the equivalent circuit parameters obtained from OC and SC test of a transformer.

2. Classify the transformers basing on number of phases and construction.

3. List the various losses in a transformer and explain how the copper loss varies with load current.

4. Write any three advantages of welding transformer.

5. Draw the connection diagram of delta-star configuration of 3-phase transformer.

6. Draw the circuit diagram for measurement of power in 1-phase circuit with the help of instrument transformers.

7. What are the advantages of distributed winding?

8. Draw the phasor diagram of an alternator for a lagging power factor load.

9. Explain the effect of armature reaction of alternator for zero power factor leading load.

10. State the conditions for synchronization of an alternator.

PART—B

Instructions : (1) Answer *any* **five** questions.

(2) Each question carries **ten** marks.

(3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. Two single-phase transformers with an equal voltage ratio are running in parallel and supplying a load of 100 kW at 0·8 pf lag. The equivalent impedances of the transformers as referred to secondary are (0 5 $j3$) and (0 6 $j10$) . Find the load shared by each transformer. 5+5

12. *(a)* Derive an EMF equation of single-phase transformer. 5

(b) The EMF per turn of a 260/117 V, 1 kVA single-phase power transformer is approximately 13 volts. Calculate—

(i) the number of primary and secondary turns; 3

(ii) the net cross-sectional area of the core, for a maximum flux density of the core of 1·4 tesla. 2

13. A transformer has a maximum efficiency of 98% at 15 kVA at UPF. During the day, it is loaded as follows :

10 hours—3 kW at 0·6 pf
5 hours—10 kW at 0·8 pf
5 hours—18 kW at 0·9 pf
4 hours—No-load

Calculate the all-day efficiency of a transformer. 10

14. *(a)* Develop the exact equivalent circuit of a 1-phase transformer. 5

(b) Develop the vector diagram for a transformer on load for leading power factor. 5

15. *(a)* Briefly explain the necessity of transformer cooling . 5

(b) List any five applications of auto-transformer. 5

16. *(a)* Explain the procedure for conducting open circuit test on an alternator with a neat sketch. 5

(b) Differentiate between the salient pole type rotor in any five aspects w.r.t. non-salient pole type rotor. 5

17. *(a)* For a 3-phase winding with 4-slots per pole per phase and with the coil span of 10 slots, evaluate the distribution and pitch factor. 5

(b) Explain the working principle of an alternator. 5

18. Two AC generators running in parallel supply lighting load of 2000 kW and a motor load of 4000 kW at a PF of 0·8 lagging. One machine is loaded to 2400 kW at 0·95 PF lagging. What is the kW output and PF of the second machine? 10

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