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C09–EE–402

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BOARD DIPLOMA EXAMINATION, (C–09)

OCT/NOV—2014

DEEE—FOURTH SEMESTER EXAMINATION

AC MACHINES—I

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

PART—A 3×10=30

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

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

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

1. List the parts of a transformer.

2. Briefly explain the equivalent circuit parameters obtained from OC and SC tests of a transformer.

3. Explain the current flow in the primary of the transformer when its secondary winding is open.

4. Draw the Scott connection diagram of 3-phase transformer.

5. Briefly explain the principle of an autotransformer.

6. Briefly explain the necessity of instrument transformers.

7. Explain the working principle of an alternator.

8. What are the factors that cause a change of alternator terminal voltage when loaded?

9. Define voltage regulation of an alternator.

10. Write the necessity for parallel operation of alternators.

PART—B

10×5=50

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 p.f. lag. The equivalent impedances of the transformers as referred to secondary are (0 5 *j*3) and (0 6 *j*10) . Find the load shared by each transformer.

12. *(a)* Derive the condition for maximum efficiency of a transformer.

(b) In a transformer, the core loss is found to be 52 watt at 40 Hz and 90 W at 60 Hz, both losses being measured at same flux density. Compute the hysteresis loss and eddy-current loss at 50 Hz supply.

13. A 5-kVA, single-phase transformer has a core loss of 40 W and full-load copper loss of 100 W. The daily variation of load of transformer is as follows :

7 AM to 1 PM — 3 kW at PF 0·6 lag
1 PM to 6 PM — 2 kW at PF 0·8 lag
6 PM to 1 AM — 6 kW at PF 0·9 lag
1 AM to 7 AM — No load

Determine the all-day efficiency of the transformer.

14. The secondary of a single-phase transformer is supplying a current of 300 A at a power factor of 0·8 lagging. The no-load current of the transformer is 5 A at a power factor of 0·2 lagging. Calculate the primary current and its power factor. Assume the ratio of transformation to be 3 and neglect voltage drops due to the impedance of the windings.

15. *(a)* Briefly explain oil-natural air-forced cooling of power transformer with a neat sketch.

(b) Briefly explain oil-forced air-forced cooling of power transformer with a neat sketch.

16. *(a)* Derive the e.m.f. equation of an alternator. 5

(b) Draw the phasor diagram for leading, lagging and unity p.f. loads are connected to an alternator. 7

17. A 3-phase, 16-pole alternator has 144 slots with 4 conductors per slot, the winding being double-layer winding. Flux in the air gap is 50 mWb, sinusoidally distributed. The coil span is 150° (electrical). Find the EMF generated when the alternator shaft is driven at 375 r.p.m.

18. A lighting load of 600 kW and a motor load of 707 kW at 0·707 PF lag are supplied by two alternators running in parallel. One of the machine supplies 900 kW at 0·9 PF lagging. Find the load and power factor of other machine.

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