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C09–EE–402

3474

BOARD DIPLOMA EXAMINATION, (C–09)

APRIL/MAY—2015

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

2. Define all-day efficiency of a transformer.

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

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

5. Briefly explain the necessity of instrument transformers.

6. Briefly explain the principle of an autotransformer.

7. Define voltage regulation of an alternator.

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

9. Explain the working principle of an alternator.

10. What will be the effect of change in excitation to an alternator connected in parallel?

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. *(a)* What are the conditions for parallel operation of transformers? 3

(b) 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. 7

12. A 33000/240 V single-phase transformer is supplied at 240 V on no-load on low-voltage side. It takes no-loads current of 2 A and the power of 60 W. The resistance of the low-voltage winding is 0 8 . Find—

(a) the power factor on no-load;

(b) active current;

(c) magnetizing current;

(d) copper loss in the LV winding;

(e) core loss.

13. A 33 kVA, 2200/220 V, 50 Hz single-phase power transformer has the following parameter :

Primary winding (HV side)–Resistance r_1 2 4

Leakage reactance X_1 6

Secondary winding (LV side)–Resistance r_2 0 03

Leakage reactance X_2 0 07

(a) Find the primary resistance and leakage reactance referred to secondary.

(b) Find the secondary resistance and leakage reactance referred to primary.

(c) Find the equivalent resistance and equivalent leakage reactance referred to primary.

(d) Find the equivalent resistance and equivalent leakage reactance referred to secondary.

14. Classify transformers based on number of phases, construction and function.

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

(b) Briefly explain the 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) A 200 kVA, 415 V, 50 Hz, 3-phase alternator has effective armature resistance of 0·01 and an armature leakage reactance of 0·06 . Compute the voltage induced in the armature winding when the alternator is delivering rated current at a load p.f. of *(i)* 0·8 lag and *(ii)* 0·8 lead. 5

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 m Wb, sinusoidally distributed. The coil span is 150° (electrical). Find the e.m.f. generated when the alternator shaft is driven at 375 r.p.m.

18. Explain the procedure of synchronization of alternators using lamps.

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