



C09-EE-402

3474

**BOARD DIPLOMA EXAMINATION, (C-09)
MARCH/APRIL—2017
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. Define the term 'transformer'.
2. Draw the phasor diagram of a single-phase transformer when it is supplying capacitive load.
3. List various losses in a transformer and explain how each loss varies with load current.
4. Write the purpose of conservator in a transformer.
5. State any three advantages of 3-phase transformer over bank of three single-phase transformers.
6. Briefly explain the principle of an autotransformer.

7. Draw the phasor diagram of an alternator for a leading power factor load.
8. Draw the scheme of exciting the main alternator field with pilot exciter.
9. Define pitch factor of a synchronous generator.
10. Write the conditions for operating alternators 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. Two single-phase transformers *A* and *B* rated at 250 kVA each are operated in parallel, on both sides percentage impedances on *A* and *B* are $(1 - j6)$ and $(1 - j4)$ respectively. Compute the load shared by each when the total load is 500 kVA at 0.8 PF lagging.
12. With neat connection diagrams, explain the open-circuit test and short-circuit test on a single-phase transformer.
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 p.f.
 - 5 hours—10 kW at 0.8 p.f.
 - 5 hours—18 kW at 0.9 p.f.
 - 4 hours—no load

Calculate the all-day efficiency of a transformer.

- 14.** A 33000/240 V single-phase transformer is supplied at 240 V on no-load on low-voltage side. It takes no-load current of 2 A and the power of 60 W. The resistance of the low-voltage winding is 0.8 . Find the—
- (a) power factor on no-load;
 - (b) active current;
 - (c) magnetizing current;
 - (d) copper loss in the LV winding;
 - (e) core loss.
- 15.** (a) Explain briefly the construction of a current transformer. 5
- (b) Explain briefly the construction of a potential transformer. 5
- 16.** A 100 kVA, 3000 V, 50 Hz, 3-phase star-connected alternator has effective armature resistance of 0.2 . The field current of 4 A produces short circuit of 200 A and an open-circuit EMF of 1040 V (line value). Calculate the full-load voltage regulation at (a) 0.8 PF lag and (b) 0.8 PF lead.
- 17.** (a) Explain the working principle of an alternator. 4
- (b) Explain with a neat sketch the constructional details of a salient pole synchronous machine. 6
- 18.** Two alternators working in parallel supply the following loads :
- Lighting load of 500 kW
 - 1000 kW at PF of 0.9 lagging
 - 800 kW at PF of 0.8 lagging
 - 500 kW at PF of 0.9 leading
- One alternator is supply 1500 kW at 0.95 PF lagging. Calculate the kW output and power factor of the other machine.
