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**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 *j*6) and (1 2 *j*4 8) 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.

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