



C09-EE-402

**3474**

**BOARD DIPLOMA EXAMINATION, (C-09)**  
**OCT/NOV—2016**  
**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. Distinguish between shell type and core-type transformer.
2. A 230/110 V, 1 kVA single-phase power transformer is connected to 230 V AC supply. Calculate (a) primary current and (b) secondary current.
3. Explain the need for parallel operation of transformer.
4. Draw the connection diagram of delta-star configuration of 3-phase transformer.
5. Write any six cooling methods of a transformer
6. Briefly explain the necessity of instrument transformers.
7. Compare salient pole type rotor with cylindrical type rotor in any three aspects.

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8. Draw the <sup>\*</sup>scheme of exciting the main alternator field with a.c. main exciter.
9. Define voltage regulation of an alternator.
10. State the conditions for synchronization of an alternator.

**PART—B**

10×5=50

**Instructions :** (1) Answer *any five* questions.  
 (2) Each question carries **ten** marks.  
 (3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. 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. 10

12. The maximum efficiency of a 500 kVA, 3300/500 V, and 50 Hz single-phase transformer is 97% and occurs at  $\frac{3}{4}$  full load current with unity power factor. If the leakage reactance is 10%, calculate the regulation at—

(a) full load current with unity power factor;  
 (b) full load current with 0.8 power factor lagging. 5+5

13. A 230/460 V, single-phase transformer has a primary resistance of 0.2 and leakage reactance of 0.5 and the corresponding values for the secondary are 0.75 and 1.8 respectively. Find the secondary terminal voltage when supplying 10 A at 0.8 power factor lagging. 10

14. A 100 kVA, 1100/440 V single-phase transformer has the following test data :
- OC test on LV side : 440 V, 10 A, 433 W
- SC test on HV side : 570 V, 9.09 A, 1660 W
- Calculate the equivalent circuit parameters referred to LV side and HV side. Draw the equivalent circuit diagrams referred to both the sides. 5+5
15. (a) Explain briefly about open-delta connection with a neat diagram. 5
- (b) Explain the method of extending range of wattmeter using instrument transformers in single-phase circuit. 5
16. A 100 kVA, 220 V, 50 Hz 3  $\phi$  alternator has effective armature resistance of 0.015  $\Omega$  and an armature leakage reactance of 0.06  $\Omega$ . Compute the voltage induced in the armature winding when the alternator is delivering rated current at a load PF of (a) unity and (b) 0.8 lag. 5+5
17. (a) Derive an EMF equation of an alternator. 5
- (b) An alternator on open circuit generates 360 V at 60 Hz when the field current is 3.6 A. Neglecting saturation, determine the open circuit EMF when the frequency is 40 Hz and the field current is 2.4 A. 5
18. Two single-phase alternators operating in parallel have induced EMFs on open circuit of 230  $\angle 0^\circ$  and 230  $\angle 10^\circ$  and the respective resistance and reactance of  $j2 \Omega$  and  $j3 \Omega$ . Calculate (a) terminal voltage, and (b) power delivered by each of the alternators to a resistive load of 6  $\Omega$ . 5+5

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