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[4457]-18**S.E. (Mechanical/Automobile) (Second Semester)****EXAMINATION, 2013****ELECTRICAL TECHNOLOGY****(2008 PATTERN)****Time : Three Hours****Maximum Marks : 100**

- N.B. :—** (i) Answer any *three* questions from each Section.
- (ii) Answers to the two Sections should be written in separate answer-books.
- (iii) Neat diagrams must be drawn wherever necessary.
- (iv) Figures to the right indicate full marks.
- (v) Use of electronic pocket calculator is allowed.
- (vi) Assume suitable data, if necessary.

SECTION I

1. (a) Derive the relation between power factor angle and the two wattmeter readings W_1 and W_2 for a balanced three-phase inductive load. [6]

P.T.O.

- (b) What is tariff ? Discuss HT and LT tariff. [6]
- (c) Explain the construction and working of single-phase energy meter with the help of neat diagram. [6]

Or

2. (a) Explain one wattmeter method for measurement of reactive power in a three-phase balanced load with the help of connection diagram and phasors. [6]
 - (b) What are demerits of low power factor ? State power factor improvement methods and explain any *one* of them. [6]
 - (c) Two wattmeters connected to measure the input to a balanced three-phase circuit indicate 2500 W and 500 W respectively. Find the power factor of the circuit, when :
 - (i) Both readings are positive
 - (ii) The later reading is obtained after reversing the connections of current coil. [6]
3. (a) Discuss the typical layout of distribution transformer substation with the help of single line diagram. Mention specifications of transformer therein. [8]

- (b) A 6-pole, 50 Hz, 3-phase induction motor runs at 960 rpm when the torque on the shaft is 200 N-m. If the stator losses are 1500 W and friction and windage losses are 500 W, find :
- (i) Rotor copper loss and
- (ii) Efficiency of the motor. [8]

Or

4. (a) Discuss three-phase transformer connections with the help of suitable diagrams. Mention possible applications of these connections. [8]
- (b) State the expression for torque developed in a three-phase induction motor. Discuss the relationship between torque and slip with the help of characteristic curve. [8]
5. (a) Why is a single-phase induction motor not self-starting ? How is it made self-started ? State its types and applications. [8]
- (b) Derive equation of induced E.M.F. in an alternator. Mention typical specifications of an alternator of your choice. [8]

Or

- 6.** (a) Explain the construction and working of a shaded pole induction motor with the help of neat sketches. Mention its applications. [8]
- (b) A 1200 kVA, 3300 V, 50 Hz three-phase star connected alternator has armature resistance of 0.25 ohm per phase. A field current of 40 A produces a short circuit current of 200 A and an open circuit voltage of 1100 V line to line. Find the voltage regulation on : [8]
- (i) Full load 0.8 power factor lagging and
- (ii) Full load 0.8 power factor leading.

SECTION II

- 7.** (a) Draw and explain electrical characteristics (T Vs I_a and N Vs I_a) of the following d.c. motors : [3×3=9]
- (i) D.C. shunt motor
- (ii) D.C. series motor
- (iii) D.C. cumulative compound motor.

- (b) A d.c. motor runs at 1200 rpm by taking 100 A current from 230 V d.c. supply. If armature and series field winding resistances are $0.12\ \Omega$ and $0.03\ \Omega$ respectively, calculate the speed of motor if motor current has fallen to 50 A.

(Note : Assume flux is directly proportional to the field current). [9]

Or

8. (a) State and explain with neat construction diagram construction, working, characteristic features and industrial applications of Universal Motor. [9]

- (b) A 230 V d.c. shunt motor runs at 2000 rpm and takes 5 A current from the d.c. supply. If armature and field winding resistances are $0.25\ \Omega$ and $230\ \Omega$ respectively, determine the drop in the speed if motor is loaded in such a way that it takes current from the supply 41A.

(Note : Neglect armature reaction) [9]

9. (a) Explain with neat diagram constructional details and V-I characteristics of SCR. [8]

(b) Explain the following for n -channel enhancement mode

MOSFET : [3+3+2=8]

(i) Output V-I characteristics

(ii) Transfer characteristics

(iii) Features (any *four*).

Or

10. (a) For TRIAC (Bidirectional Triode SCR) : [3+3+2=8]

(i) Draw structure and symbol

(ii) Draw only static V-I characteristic

(iii) State only *two* applications.

(b) For DIAC : [3+3+2=8]

(i) Draw only structure and symbol

(ii) Draw only V-I characteristic

(iii) State any *two* applications.

11. (a) State and explain various advantages of electrical drives over other conventional drive system, also state factors to be considered while selecting a motor for a drive. [8]

- (b) What is chopper ? With the help of diagram explain *two* quadrant chopper circuit (Class C Chopper). [8]

Or

12. (a) State and explain advantages and disadvantages of group drive, also state any *two* field of applications of group drive. [8]
- (b) Explain V/F control of three-phase induction motor. [8]

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