Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

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S.E. (Mech./Mech. S/W/Prod.) (II Sem.) EXAMINATION, 2010

ELECTRICAL TECHNOLOGY

(2008 COURSE)

Time : Three Hours **Maximum Marks : 100**

N.B. :— (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12**.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of non-programmable pocket size scientific calculator is permitted.

(*v*) Neat diagrams must be drawn wherever necessary.

(*vi*) Assume suitable additional data, if necessary.

SECTION I

1. (*a*) Two wattmeters are connected to measure total input power in a three-phase, delta connected balanced inductive load circuit. Draw the neat connection and relevant phasor diagram and derive the equations for reading on each wattmeter. [10]

P.T.O.

(*b*) Why is p.f. improvement essential ? State methods used for p.f. improvement and explain any *one* of them. [6]

Or

2. (*a*) Explain with neat diagram how reactive power can be measured for 3-phase balanced load using a single wattmeter. Draw the relevant phasor diagram also. [8]

(*b*) Explain in brief what are the constituents of HT/LT energy bill. [4]

(*c*) Define :

(*i*) Luminous flux and

(*ii*) Luminous intensity. [4]

3. (*a*) Derive the torque equation and hence obtain the condition for maximum torque for 3-phase induction motor. Sketch the torque-slip characteristic for motor. [10]

(*b*) The power input to a 3-phase induction motor is 40 kW under certain load. The stator losses are 1.5 kW and mechanical losses are 2 kW. If the motor is operating with a slip of 4%, calculate the rotor copper loss and the efficiency of the motor. [8]

Or

4. Write short notes on any *three* : [18]

(*i*) Equivalent circuit of a single-phase transformer

(*ii*) Three-phase transformer connections

(*iii*) Star-Delta starter for 3-phase induction motor

(*iv*) Power flow diagram for 3-phase induction motor.

5. (*a*) Compare salient pole and non-salient pole construction of rotor for a 3-phase A.C. generator. [6]

(*b*) An alternator runs at 250 rpm and has got 24 poles. There are 216 slots each containing 5 conductors. The conductors of each phase are in series and flux per pole is 30 mWb which is sinusoidally distributed. If coil span factor is 01 and distribution factor is 0.9597, determine the value of induced e.m.f. available per phase. [6]

(*c*) What are the advantages of stationary armature and rotating field in alternator. [4]

Or

6. (*a*) Why single phase induction motors are not self-starting ? How are they made self-starting ? Explain working of any *one* type of motor and state its applications. [10]

(*b*) Derive the e.m.f. equation of a 3-phase Alternator and state the types of Alternators. [6]

SECTION II

7. (*a*) Draw and explain electrical and mechanical characteristics of :

(*i*) D.C. shunt motor and

(*ii*) D.C. series motor. [8]

(*b*) Why is starter necessary for D.C. shunt motor ? Draw a neat diagram and explain working of three-point starter. [10]

Or

8. (*a*) A 250 V D.C. shunt motor has armature circuit resistance of 0.2 Ω and field resistance of 125 Ω. It runs at 1500 r.p.m. and draws a current of 50 amp. on full load. Calculate its speed at half load condition. [6]

(*b*) Write short notes on :

(*i*) Variable reluctance stepper motor and

(*ii*) Universal motor. [12]

9. (*a*) Explain the V-I characteristics of SCR. [6]

(*b*) Explain the working of TRIAC and sketch its V-I characteristic. [6]

(*c*) State applications of

(*i*) DIAC and

(*ii*) MOSFET. [4]

Or

10. (*a*) Draw the symbol of *p*-channel and *n*-channel MOSFET. [4]

(*b*) Draw and explain switching characteristics of MOSFET. [6]

(*c*) Explain construction and working of GTO. [6]

11. (*a*) Classify the electrical drives. State advantages and disadvantages of each type and state applications of each. [10]

(*b*) Write a short note on (V/*f*) control for 3-phase induction motor. [6]

Or

12. (*a*) State the factors which are governing selection of drives. [6]

(*b*) Write a short note on two quadrant and Four quadrant chopper drives. [10]