

**Total No of Questions: [12]**

**SEAT NO. :**

**[Total No. of Pages : 04 ]**

**S.E. 2008 ( MECH / MECH SW / PROD / PROD SW / AUTO )**

**ELECTRICAL TECHNOLOGY**

**Time: 3 Hours**

**Max. Marks : 100**

**Instructions to the candidates:**

- 1) *Answers to the two sections should be written in separate answer books.*
- 2) *Answer any three questions from each section.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of Calculator is allowed.*
- 6) *Assume Suitable data if necessary*

**SECTION I**

- Q.1 (a) Draw the connection diagram of single phase energy measurement using CT and PT. Mention standard specifications of single phase and three phase energy meters. [06]
- (b) Explain electricity tariff and its objectives. What do you understand by TOD tariff ? [06]
- (c) Two wattmeters are connected for measuring power in a three phase balanced load. Identify the type of load; giving proper justification when [06]
- (i) the wattmeter readings are equal
  - (ii) the wattmeter readings are equal; but the later is obtained by reversing the current coil connections.

**OR**

- Q.2 (a) Discuss two wattmeter method for measurement of active power in a three phase balanced load with the help of connection diagram and phasor diagram. [06]

- (b) State types of illumination schemes. Explain in brief the requirements of good illumination scheme. [06]
- (c) A three phase, 400 V load has a power factor of 0.7 lag. Two wattmeters are used to measure power which shows the input to be 10 KW. Find the reading of each wattmeter. [06]

- Q.3 (a) State types of three phase transformer connections and their applications. Discuss the typical layout of distribution transformer substation with the help of single line diagram. [08]
- (b) Why does a three phase induction motor require starter? Explain the working of rotor resistance starter with the help of neat diagram. [08]

**OR**

- Q.4 (a) Derive the expression for torque developed in a three phase induction motor under running conditions. Hence obtain the condition for maximum torque. [08]
- (b) The power input to a 3-phase induction motor is 40 KW. The stator losses are 1 KW and the friction and windage losses are 2 KW. If the slip of the motor is 4%, find (i) the mechanical power output  
(ii) the rotor copper loss per phase and  
(iii) the efficiency of motor. [08]

- Q.5 (a) Define the term: Voltage regulation of an alternator. Discuss the synchronous impedance method of determining voltage regulation of an alternator for various types of loads. [08]
- (b) State types of single phase induction motors. Explain the construction and working principle of a split phase induction motor. Mention applications of such motors. [08]

**OR**

- Q.6 (a) Explain the construction and working of a shaded pole induction motor with the help of neat diagrams. Mention its applications. [08]
- (b) A 3-phase, 50 Hz, star-connected, 2000 KVA, 2300V alternator gives a short

circuit current of 600 A for a certain field excitation. With the same excitation, [08]  
the open circuit voltage was 900 V. The resistance between a pair of terminals  
was 0.12 ohm. Find full load regulation at

- (i) 0.8 power factor lagging
- (ii) 0.8 power factor leading.

## SECTION II

Q. 7 (a) Explain construction, working, characteristics and any two industrial [08]  
applications of Universal Motor.

(b) A 200V D.C. shunt motor has 100  $\Omega$  field resistance and 0.2  $\Omega$  armature [08]  
resistance. If this motor runs at 1000rpm when drawing 10A current from  
supply. Determine the new speed of operation after loading if motor draws  
18A current from the supply.

## OR

Q. 8 (a) A 300V D.C. shunt motor when running at 1000rpm draws 30A current from [08]  
supply. Determine new speed of operation, if load on motor is reduced in such  
a way that now it draws 15A current from supply.

( Given:- Resistance of armature = 0.02  $\Omega$  & Resistance of field = 150  $\Omega$  )

(b) State and explain following speed control methods of D.C. shunt motor with [08]  
neat circuit diagram :

- (i) Armature voltage control
- (ii) Field current control

Q. 9 (a) For semiconductor power device SCR [08]

- (i) State any five specifications.
- (ii) Draw only a V-I characteristics with marking of salient points.
- (iii) Any two applications.

(b) For enhancement type MOSFET, explain [08]

- (i) Construction

- (ii) Working
- (iii) Output characteristic
- (iv) Any two field applications

**OR**

Q.10 (a) Explain for GTO in connection with following [08]

- (i) Construction
- (ii) Working
- (iii) Characteristics
- (iv) Two applications

(b) For TRIAC & DIAC [08]

- (i) Draw symbol
- (ii) Explain V-I characteristics
- (iii) Two applications each.

Q. 11 (a) Explain various stator voltage control methods with the help of circuit diagrams of a three phase induction motor. [08]

(b) With the help of neat circuit diagram, explain step down chopper and step up chopper operations. [10]

Also derive formula for output voltage in terms of duty cycle ' $\alpha$ ' (Alpha) for step down chopper only.

**OR**

Q. 12 (a) State and explain advantages of electrical drive used in industrial applications. [08]

(b) State and explain any one operating features and two applications of any four following motors- [10]

- (i) Series D.C. motor
- (ii) Shunt D.C. motor
- (iii) Squirrel cage Induction motor
- (iv) Universal motor
- (v) Stepper motor