

**N.B.:**

- 1) **Q. No. 1 and Q. No. 5 are COMPULSORY.** Out of the remaining questions attempt any **TWO** questions from each section.
- 2) Both the sections should be written in **SEPARATE** answer books.
- 3) Figures to the **RIGHT** indicate **FULL** marks.
- 4) Draw neat labeled diagrams **WHEREVER** necessary.
- 5) Assume suitable data, if necessary.

**SECTION – I**

- Q.1** a) State and explain factors involved in selection of a electrical drive for a particular application. (05)  
b) Explain four quadrant operation of electrical drive. Briefly explain each operation / action. (05)  
c) Draw a circuit diagram for a  $3\phi$  fully controlled converter and draw input and output waveforms. (04)
- Q.2** a) Draw and explain block diagram of electrical drive. (07)  
b) How do you define active and passive load torques? What are differences between the two? (06)
- Q.3** a) Explain rheostatic braking in case of  $3\phi$  induction motor. With necessary circuit diagram. (07)  
b) Draw the speed torque characteristics for dynamic braking operation of DC series motor. Why torque become 0 at finite speed. (06)
- Q.4** a) A 230V, 960rpm, 200A, separately excited DC motor has an armature resistance of 0.02ohm. The motor is fed from a chopper which provides both motoring and braking operation. The source voltage is 230 V. Assuming continuous conduction calculate duty ratio of chopper for motoring operation at rated torque and 350rpm. (07)  
b) Explain the method of chopper control of separately excited DC motor with motoring and regenerative braking action. (06)

**SECTION – II**

- Q.5** a) Explain why CSI fed induction motor drive is operated at constant rated flux? (05)  
b) Explain why a motor of smaller rating is selected for a short time duty? (05)  
c) Describe an efficient unipolar drive for stepper motors (04)
- Q.6** a) What are the advantages of static rotor resistance control over conventional methods of rotor resistance control? (06)  
b) A star connected squirrel cage induction motor has following ratings and parameters, 400V, 50Hz, 4 Pole, 1370rpm,  $R_s=2$  ohm,  $R_r'=3$  ohm,  $X_s=X_r'=3.5$  ohm,  $X_m=55$  ohm. It is controlled by CSI at a constant flux. Calculate motor torque, speed and stator current when operating at 30Hz and rated slip speed. (07)
- Q.7** a) State and explain disadvantages of using a motor of wrong rating. (06)  
b) A constant speed drive has following duty cycle, (07)  
i) load rising from 0-400kW in 5 min  
ii) uniform load of 500kW for 5 min  
iii) regenerative power of 400kW returned to the supply for 4 min  
iv) remains idle for 2 min.  
Estimate power rating of the motor. Assume losses to be proportional to square of the power.
- Q.8** a) Explain the torque versus stepping rate Characteristics of a stepper motor. What is slew range? What is ramping? (07)  
b) Explain the centrifugal drive in case of sugar mills. (06)