

RVK/KW/13/3278/3613

Faculty of Engineering & Technology

Eighth Semester B.E. (Electrical)/Eighth Semester

B.E. P.T. (Electrical) Examination

POWER SEMICONDUCTOR BASED DRIVES

Sections—A & B

Time—Three Hours]

[Maximum Marks—80

INSTRUCTIONS TO CANDIDATES

- (1) All questions carry marks as indicated.
- (2) Answer **THREE** questions from Section A and **THREE** questions from Section B.
- (3) Assume suitable data wherever necessary.
- (4) Illustrate your answers wherever necessary with the help of neat sketches.
- (5) Use of Non-programmable calculator is permitted.

SECTION—A

1. (a) Evaluate the different components of load torque. Derive the fundamental torque equation for an equivalent motor-load system taking into account all these components for its dynamic analysis. 7
- (b) State the essential parts of electrical drives. What are the functions of a power modulator? 6

- (b) Why it is necessary to operate a solar panel near the maximum power points? Explain how the operation near the maximum points is obtained in a pump drive using centrifugal pumps. 6
10. (a) Draw the circuit diagram and explain the operation of battery powered DC series motor drive for an electric vehicle without facility for regenerative braking. 7
- (b) Describe the operation of brushless DC motor drives and explain its advantages over unipolar drive. 7

- 2. (a) List the measures could be taken to conserve energy in electric drives. 7
- (b) 'An equilibrium of motor-load system will be stable, when an increase in speed causes load torque to exceed the motor torque.' Justify the statement. 6
- 3. (a) With the help of neat circuit diagram explain the working of Dual converter fed separately excited DC motor for circulating mode of operation. 7
- (b) A 220 V, 1500 rpm, 100 Amp, separately excited DC motor is fed from a single phase fully controlled rectifier with an a.c. source voltage of 230 V, 50 Hz with an armature resistance of 2 Ω. Assuming continuous conduction calculate firing angles for :
 - (i) Half the rated motor torque and 500 rpm
 - (ii) Rated motor torque and -1000 rpm. 6
- 4. (a) Explain two-quadrant chopper for motoring and braking operation of separately excited DC motor with necessary waveforms. 7
- (b) A 220 V, 24 Amp, 100 rpm, separately excited DC motor has an armature resistance of 2 ohms. Motor is controlled by a chopper, with frequency of 50 Hz and source voltage of 230 V. Calculate the duty ratio for 1.2 times rated torque and 500 rpm. 6

- 5. Write short notes :—
 - (a) Static Scherbius drive. 7
 - (b) CSI fed Induction motor drive. 7

SECTION—B

- 6. (a) State and explain the advantages of chopper control over resistance control. Explain chopper control traction drive with composite braking. 7
- (b) Explain with neat circuit diagram Resistance control of DC traction drive with bridge transition. 6
- 7. (a) Write a technical note on motors used in traction drives. 7
- (b) Draw a neat circuit diagram and explain the working of half controlled converter feeding DC series traction motor for shunting locomotives of 25 kV ac traction. 6
- 8. (a) What is the fundamental difference between 'True synchronous mode' and 'Self synchronous mode' for variable frequency control of synchronous motor ? Explain any one. 7
- (b) Explain in brief the working of cycloconverter fed synchronous motor drive. 6
- 9. (a) Explain with a neat circuit diagram the working of self controlled synchronous motor drive using load commutated inverter. 7