Code: 15A02601 **R15**

B.Tech III Year II Semester (R15) Supplementary Examinations December/January 2018/19

POWER SEMICONDUCTOR DRIVES

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Write the basic performance equations of a DC series motor.
(b) Name some single phase DC drives.
(c) What is plugging?
(d) What are the steps to be followed to change the forward motoring mode of operation of DC motor to reverse motoring mode?
(e) What is a chopper?
(f) Draw the circuit diagram of a two quadrant chopper.
(g) List the various methods of speed control of a 3-phase induction motor when fed through semiconductor devices.
(h) What are the advantages of slip power recovery scheme?
(i) What is a cycloconverter?
(j) Mention the features of load commutated CSI fed synchronous motor.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 Describe with appropriate voltage and current waveforms, the working of a single-phase full-converter fed dc drive. Derive the expression for its input power factor.

OR

3 The speed of a DC series motor is controlled by a 3-phase semi converter connected to 3–ø, 400 V, 50 Hz source. The motor constant is 0.4 V.s/A.rad. Total field and armature resistance is 1Ω. Assuming continuous and ripple free armature current at a firing angle of 40^0 and speed of 1000 rpm, determine: (i) Motor current and motor torque. (ii) Power delivered to motor. (iii) Reactive power drawn from the supply.

UNIT – II

4 With a neat circuit diagram, explain the four quadrant operation of DC motor fed by dual converter?

OR

5 What is regenerative braking? Describe the regenerative braking of separately excited DC motor fed by a suitable power converter. Draw relevant circuit diagram and waveforms.

UNIT – III

6 Obtain the speed torque expressions of a chopper fed separately excited DC motor. Also draw and explain the speed torque characteristics.

OR

7 Explain the working two quadrant chopper fed DC series excited motor. Draw relevant circuit diagram and waveforms.

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UNIT – IV

8 Write short note on the following:
(a) Vector control principle of induction motor.
(b) State rotor resistance control.

OR

9 (a) Draw neatly the block diagram of closed loop operation of induction motor drive.
(b) Compare VSI and CSI.

UNIT – V

10 Elaborately explain about self control of synchronous motor.

OR

11 A 415 V, 50 Hz, 4-pole star connected synchronous motor has X_s = 1.5 Ω. Load torque, proportional to speed is 300 Nm, at synchronous speed the speed of the motor is lowered by keeping v/f constant and maintaining 0.8 p.f leading for the motor operation at 840 rpm, determine:
(i) Supply voltage.
(ii) Armature.
(iii) Excitation voltage.
(iv) Load angle.
(v) Pull-out torque. Neglect rotational losses.

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