Code: 17D54102

M.Tech I Semester Regular & Supplementary Examinations January/February 2019

SOLID STATE DC DRIVES

(Common to PE, PID, PEED and PED)

(For students admitted in 2017 & 2018 only)

Time: 3 hours

Max. Marks: 60

Answer all the questions

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1 (a) Explain Ward-Leonard speed control of dc motor.

(b) Briefly explain how the rating of a motor is selected.

OR

2 The speed of a 10 HP, 230 V, 1200 rpm separately excited dc motor is controlled by a single phase full converter. The rated motor armature current is 38A and the armature resistance is 0.3Ω. The ac supply voltage is 260 V. The motor voltage constant is $K_a \Phi = 0.182$ V/rpm. Assume that sufficient inductance is present in the armature circuit to make the motor current continuous and ripple free.

Rectifier operation (Motoring Action): for a firing angle $\alpha = 30^0$ and rated motor current calculate:

(i) The motor torque. (ii)The speed of the motor. (iii) The supply power factor

Inverter operation (Regenerating Action): The polarity of the motor back emf E_b is reversed by reversing the field excitation. Calculate

(i) The firing angle to keep the motor current at its rated value

(ii) The power fed back to the supply

3 Explain the working of a single phase semi converter fed dc drive with wave forms and basic equations.

OR

4 Explain the operation of three phase dual converter fed DC drives

5 What is a multiphase chopper? Bring out clearly with appropriate waveforms the difference between the in-phase operation and phase shifted operation of a multiphase chopper. Also explain why is phase shifted operation always preferred.

OR

6 Explain in detail dynamic braking of dc motor using chopper.

7 The speed of a separately excited dc motor is controlled by a chopper. The dc supply voltage is 120 V, armature circuit resistance is 0.5 Ω, and armature circuit inductance is 20mH and motor constant is $K_a \Phi = 0.05$ V/rpm. The motor drives a constant torque load requiring an average armature current of 20A. Assume that motor current is continuous.

Determine: (i) The range of speed control. (ii) The range of duty cycle α.

OR

8 Explain in detail the design of current controller of closed loop control system of separately excited DC motor.

9 Draw and explain the program flow chart for constant horse power and load distributed operations.

OR

10 Explain in detail about micro computer control of DC drives.

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