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M.E. DEGREE EXAMINATIONS: JUNE 2012

Second Semester

POWER ELECTRONICS AND DRIVES

PED506: Solid State DC Drives

Time: Three Hours **Maximum Marks: 100**

Answer ALL Questions:-

PART A (10 x 2 = 20 Marks)

1. Draw the constant torque and constant power regions of operation of DC motors.
2. What is short time duty?
3. The supply power factor of semi converter fed drive is greater than that of full converter fed DC drive. Why?
4. Give the relation between the firing angles of dual converters.
5. Mention the control strategies used in chopper fed DC motors.
6. What are the braking schemes used for the DC drives?
7. What are the equivalent circuit parameters of DC motor drives?
8. Mention the advantages of closed loop control of DC drives?
9. What are the advantages of microcomputer control of DC drives?
10. Mention the different factors considered for the selection of electric drives?

PART B (5 x 16 = 80 Marks)

11. a) (i) Explain Ward- Leonard speed control of DC motor. (8)

(ii) Explain multi quadrant operation of drive system with suitable example. (8)

(OR)

b) (i) Explain the different types of classes of motor duty. (8)

(ii) A 200V, 200 rpm, 10.5A, DC shunt motor has $R_a = 0.5\Omega$, $R_f = 400\Omega$ and driving a constant torque load. Calculate the speed if the dc source voltage is reduced to 175V. (8)

12. a) Explain the single phase two quadrant converter fed separately excited DC motor with necessary circuit, waveforms, expression for speed and speed control characteristics.

(OR)

b) (i) A separately excited DC motor is fed from single phase semi converter. The supply voltage is 240V. The thyristors are triggered at 110°. The armature current continues to flow for 50° beyond the voltage zero. The constant, K_T=1 N-m/A;

R_a=6Ω. Neglect the converter losses. Determine the motor speed at a torque of 1.8 N-m. (8)

(ii) Draw and explain the circuit of three phase dual converter fed DC motor. (8)

13. a) Obtain the expression for ripple current in step down chopper fed separately excited DC motor with time ratio control.

(OR)

b) Explain the different modes of operation of four quadrant chopper fed separately excited DC motor.

14. a) Derive the transfer function of separately excited DC motor with armature voltage control.

(OR)

b) Draw and explain the closed loop speed control of separately excited DC motor incorporating the inner current loop.

15. a) With neat diagram and flowchart, explain microcomputer control of a DC motor drive.

(OR)

b) Explain any two gate firing circuits for DC motor drive.

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