SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
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QUESTION BANK (DESCRIPTIVE)

Subject with Code : PEDC (16EE4303) **Course & Branch**: M.Tech - PE
Year & Sem: I M.Tech & I-Sem **Regulation:** R16

UNIT –I
Controlled Bridge Rectifier (1-Φ & 3-Φ) with DC Motor Load

1. Explain the operation of a single phase semi-converter fed separately excited d.c motor with the help of speed-torque characteristic for different firing angles. 10M
2. Explain the operation of a single phase full-converter fed separately excited d.c motor with the help of speed-torque characteristic for different firing angles. 10M
3. A 220V, 1500 rpm, 11.6 A separately excited d.c motor is controlled by a1-phase fully controlled rectifier with an ac source voltage of 230V, 50 Hz. Enough filter inductance is added to ensure continuous conduction for any torque greater than 25 percent of rated torque R_a = 2 Ω? . 10M
4. Draw and explain the power circuit of single phase semi converter feeding a separately excited dc motor. Explain the operation in both continuous and discontinuous armature current modes with suitable wave forms. 10M
5. Explain the operation of a three phase full converter drive. Also, sketch and explain the output voltage and output current waveforms at firing angle of 60^o, 90^o and 120^o. 10M
6. Explain the closed loop operation of two quadrant converter controlled separately excited dc motor using a suitable block diagram. 10M
7. A freewheeling diode reduced the harmonics in the output current. This is true for triggering angles above a certain values. What is that limiting triggering angle? 10M
8. Explain the operation of a three phase semi converter drive. Also, sketch and explain the output voltage and output current waveforms at firing angle of 60^o, 90^o and 120^o. 10M
9. Derive the expressions for average load voltage and load current for single phase full converter fed separately excited D.C. motor. Draw the output voltage and current wave forms for $\alpha = 60^0$. Assume continuous conduction 10M
10. A 200 Volts, 875 RPM, 150 A separately excited D.C. motor has an armature resistance of 0.06 ohms. It is fed from a single phase fully controlled rectifier with an ac source voltage of 220V, 50 Hz. Assuming continuous conduction, calculate
    i. Firing angle for rated motor torque and 750 RPM.
    ii. Firing angle for rated motor torque and (-500) RPM. 10M

UNIT –II

Three phase naturally commutated bridge circuit as a rectifier or as an inverter

1. Explain the operation of 3-Φ controlled bridge rectifier with passive load impedance, resistive load and ideal supply. 10M
2. Explain the operation of three phase controlled bridge rectifier with highly inductive load and ideal supply for load side and supply side. 10M
3. Explain the concept of shunt capacitor compensation in detail. 10M
4. Explain the operation of three phase controlled bridge rectifier inverter. 10M
5. Discuss in detail the effect of highly inductive load on the performance of 3-Φ converter. 10M
6. Discuss the effects of implementing shunt capacitor compensation with 3-Φ converter. 10M
7. A three phase full converting is feeding a highly inductive load. Derive the expression for average output voltage, maximum average output voltage, normalized average output and the r.m.s value of the output . 10M
8. Explain the concept of natural commutation. With the help of necessary 1- power circuit and associated waveforms, explain how an AC-DC converter operated as line-commutated inverter. 10M
9. Explain the operation of the 3- fully controlled converter with resistive load and ideal supply. Is this circuit can be operated as line commutated inverter-explain. 10M
10. Explain the concept of shunt capacitor compensation and phase controlled bridge rectifier inverter. 10M

UNIT –III

Phase Controlled DC Motor Drives, Current and Speed controlled DC Motor drives

1. Discuss in detail the steady – state analysis of a 3−Φ converter controlled DC motor drive? 10M.
2. Explain in detail about the steady state analysis of 3-phase converter control fed DC motor drive? 10M
3. Discuss the effect of harmonics and its associated problems in DC drive. 10M
4. Develop the flow-chart for simulation of a single-quadrant phase controlled DC motor drive. Discuss about the expected simulation results, harmonic and associated problems. 10M
5. With the help of block diagram implement the control circuit for 3- controlled converter and also obtain the expression for gain of the converter. 10M
6. With the help of the schematic diagram, explain the operation of 3- converter controlled DC motor drive. 10M
7. With the help of suitable converter and associated waveforms explain selective harmonic elimination and power factor improvement? 10M
8. Obtain the expression for the magnitude of sixth-harmonic torque and also write its effects on the armature heating. 10M
9. Obtain overall block diagram of D.C motor drive. Also explain the functions of current-controller and speed controller separately with help of block diagrams and transfer functions. 10M
10. Explain Steady state analysis of three phase converter control DC motor drive. 10M

UNIT –IV

Chopper controlled DC motor drives

1. Explain the operation of the closed loop speed controlled separately excited dc motor chopper drive. 10M
2. Explain the principle of operation of chopper with suitable power circuit & associated waveforms. 10M
3. A 200 hp, 230 v, 500 rpm separately excited dc motor is controlled by the chopper. The chopper is connected to a bridge – diode rectifier supplied from a 230 v, 3-, 60 Hz ac mains. The motor chopper details are as follows:

   Ra=0.04Ω ,La=0.0015 H, Kb=4.172 v/rad/sec, fc=2KHz

   The motor is running at 300 rpm with 55 % duty cycle in the chopper. Determine the average current from steady state current waveforms and electromagnetic torque produced in the motor. 10M
4. Explain the principle of operation of chopper in four quadrants. 10M
5. What is pulsating torque? Give the ratings of the devices generally used. 10M
6. (a) With the help of neat diagrams, explain the principle of operation of the chopper. 5M

   (b) Describe how a four quadrant operation can be obtained from a chopper fed DC drive.5M
7. (a) Explain the operation of four quadrant chopper circuit elaborately. 5M

   (b) Explain the concept of pulsating torques in detail. 5M
8. Explain the principle of regenerative brake control of a chopper fed separately excited dc motor. 10M
9. A separately excited dc motor with armature resistance of 0.01 Ω with dc supply 220 V, 100 A, 1000 rpm is fed with chopper for its motoring and braking operations Assuming continuous conduction, calculate (i) the duty of the chopper at rated torque with speed of 500 rpm for its motoring operation. (ii) duty ratio of the chopper at rated torque with speed of 500 rpm for its braking operation. 10M
10. Explain Steady state analysis of chopper controlled DC motor drives, rating of the devices and Pulsating torque. 10M

UNIT –V

Closed loop operation of DC motor Drives, Simulation of DC motor Drives

1. Explain the dynamic simulation of the speed-controlled dc motor drive with necessary equations. 10M
2. Obtain state diagrams for speed feedback and speed controllers in the above speed-controlled dc motor drive. 10M
3. Write short notes on:
   (a) Simulation of speed feedback controller 5M
   (b) Simulation of current controller. 5M
4. Draw a block schematic diagram of a speed-controlled separately excited DC motor drive. 10M
5. Discuss in detail about pulse-width modulated current controlled and hysteresis current Controller. 10M
6. Develop a flow chart for the dynamic simulation of the chopper controlled DC motor drive. 10M
7. Discuss about dynamic performance of one-quadrant chopper controlled separately excited DC motor drive for a step-command in speed reference in normalized form. 10M
8. (a) Realize hysteresis current controller 5M
   (b) Explain the modeling of a current controller 5M
9. (a) Explain command-current generator with necessary equations 5M
   (b) Explain current controller and its significance 5M
10. Draw the speed controlled dc motor chopper drive block diagram and explain the operation of pulse-width-modulation current controller.

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