Reg. No:

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
B.Tech III Year II Semester Regular & Supplementary Examinations October-2020
POWER SEMICONDUCTOR DRIVES
(Electrical & Electronics Engineering)

Time: 3 hours   Max. Marks: 60

(Answer all Five Units **5 x 12 = 60** Marks)

UNIT-I

1 a Draw and explain operation of 1-Ø semi controlled converter fed by dc series motor. **6M**
   b The speed of a 20HP,210V,1000rpm,series dc motor is controlled by a semi- **6M**
   converter , the combined field and armature circuit resistance is 0.25Ω , Kaf=0.03N-
   m/ A2 and Kres=0.075 V-S/rad. The supply voltage is 230V.Assuming continuous
   and ripple –free motor current, determine the following for a firing angle α=300 and
   speed N=1000 rpm. I) the motor torque ii) the motor current iii)the supply power-
   factor.

OR

2 a Explain the operation of single phase fully controlled converter fed DC series motor **6M**
   with neat Waveforms and derive the expressions for speed and torque.
   b A 1-Ø,230V,50HZ supply feeds a separately excited dc motor through two 1-Øsemi **6M**
   converters, one for the field and the other for the armature. The firing angle for the
   semi converter in field circuit is zero, the field resistance is 200Ω and the armature
   resistance Ra is 0.3Ω. The load torque is 50 N-m at 900 rpm, the voltage constant is
   0.8V/A-rad/s and the torque constant is 0.8N-m/A2 .assume that the armature and
   field currents are continuous and constant, and neglect the losses. Find the following
   (a) the field current (b) the firing angle and (c) the power factor of semi-converters
   in the armature circuit.

UNIT-II

3 With a neat diagram, explain the four quadrant operation of a DC drive in all four **12M**
   quadrants When fed by a Three phase circulating current mode dual converter.

OR

4 a A 230V, 870rpm, 100A separately excited DC motor has an armature resistance of **6M**
   0.02Ω.It is coupled to an over halling with a torque of 400N-m.Determine the speed
   at which motor can Hold the Load by regenerative braking.
   b Explain the operation of closed loop speed control of dc drive. **6M**

UNIT-III

5 Explain the operation of dynamic braking for series & separately excited DC motor. **12M**
   OR
6 Explain the operation of second quadrant chopper fed by separately excited DC motor **12M**
   with necessary waveforms.

UNIT-IV

7 What is meant by slip power and Explain using a power circuit the working of a static Kramer drive system? **12M**

OR

8 A 3-Ø, 4-pole, 50Hz induction motor has a chopper – controlled resistance in the rotor circuit for speed control load torque is $\omega 2$ .when the thyristor is on, the torque is 40-N-m at an average slip of 0.04. If Ton/Toff=1, compute the average torque and speed. The motor develops a torque of 75% when the thyristor is off. If the speed variation range is down to 1250 rpm from synchronous speed, determine the ratio Ton/Toff requires to obtain an average torque of 35N-m. **12M**

UNIT-V

9 Explain the closed loop control scheme of adjustable speed synchronous motor drive and mention its need and advantages. **12M**

OR

10 A 3 phase 400 volt 50 Hz 6 pole star connected wound rotor synchronous motor has Zs=0+j2 Ω. Load torque proportional to speed 2, is 340 NM at rated synchronous speed. The speed of the motor is lowered by keeping V/F constant maintain unity power factor by field control of the motor. For the motor operation at 600 rpm, calculate i. Supply voltage ii. Armature current iii. Excitation angle iv. Load angle. **12M**

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