Code No: 126AJ **R13**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech III Year II Semester Examinations, May - 2016
STATIC DRIVES
(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A
(25 Marks)

1.a) Explain what is meant by rectification mode? [2]
b) What is the principle of phase control? [3]
c) What is four quadrant operation? Explain. [2]
d) Draw the equivalent circuit of dual converter driving a dc motor. [3]
e) Give three advantages of chopper drives compared to rectifier drives. [2]
f) What are the two control strategies of dc chopper? [3]
g) What are the applications of rotor resistance control? [2]
h) What are the advantages of Kramer drive compared to scherbius drive? [3]
i) What are the applications of load commutated CSI fed synchronous motor? [2]
j) Explain briefly about closed loop operation of synchronous motor drive. [3]

PART - B
(50 Marks)

2.a) Derive the expression for critical speed which separates continuous conduction from discontinuous conduction for a 1-Φ full converter fed separated excited dc motor.
b) A 200V, 875 rpm, 150A separately excited dc motor has an armature resistance of 0.06 ohm. It is fed from a single phase fully controlled rectifier with an a.c source voltage of 220V, 50Hz. Assuming continuous conduction mode. Calculate:
i) Firing angle for rated motor torque and 750 rpm
ii) Firing angle for rated motor torque and 500 rpm
iii) Motor speed for a firing angle of 160^0 and rated torque. [5+5]

OR

3.a) Derive the relation between speed and torque of a single phase full wave converter feeding a series excited dc motor for continuous mode of operation and draw its speed-torque characteristics.
b) Explain the effect of armature inductance on the performance of a d.c drive. [5+5]

4.a) Draw the speed torque characteristics for dynamic braking of d.c series motor. Why torque becomes zero at finite speed?
b) Discuss relative merits and demerits of four quadrant d.c drives employing non-circulating and circulating current dual converters. [5+5]

OR

5.a) Draw speed torque characteristic for regenerative braking operation of a d.c shunt motor and explain the operation.

b) Explain the principle of operation of closed loop control of dc drive using suitable block diagram. [5+5]

6.a) Derive the expressions for average motor current, ripple in motor currents and average torque for chopper fed separately excited d.c motor.

b) A dc chopper is used for regenerative braking of a separately excited d.c motor. The dc supply voltage is 400V. The motor has R_a=0.2Ω, K_m=1.2V-S/rad. The average armature current during regenerative braking is kept constant at 300A with negligible ripple. For a duty cycle of 60% for a chopper, determine

i) Power returned to supply

ii) Minimum and maximum permissible braking speeds and speed during regenerative braking. [5+5]

OR

7. Explain in detail the two quadrant and four quadrant operation of chopper fed separately excited DC motor. [10]

8.a) Explain plugging operation of 3-Φ induction motor and also explain how it is implemented using AC voltage controllers.

b) Explain why stator voltage control is an inefficient method of induction motor speed control. [5+5]

OR

9.a) Discuss about the different speed control methods of induction motor from rotor side.

b) Draw a suitable diagram and explain the working of slip power recovery system using static Scherbius drive. [5+5]

10. With suitable circuit diagrams explain the principle of operation of current source inverter fed synchronous motor drive. [10]

OR

11.a) Explain the operation of a cyclo-converter fed synchronous motor.

b) Explain the operation of a load commutated CSI fed synchronous motor. [5+5]

---ooOoo---