Code No: 156CJ **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, July - 2023

POWER SEMICONDUCTOR DRIVES

(Electrical and Electronics Engineering)

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

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a)	Draw the circuit diagram of 3-phase semi converter.	[2]
b)	What are the advantages of thyristor controlled electrical drives?	[3]
c)	What is single quadrant chopper?	[2]
d)	List out the advantages offered by DC chopper drives over line commutated converter controlled DC drives.	[3]
e)	Give the advantages of PWM control used in induction motor drive.	[2]
f)	Write short notes on modes of variable frequency control using cyclo converter in synchronous motor drive.	[3]
g)	In which way a static Kramer control is different from static scherbius drive?	[2]
h)	Give the advantages of rotor side control of induction motor over stator side.	[3]
i)	Explain true synchronous mode operation of synchronous motor drive.	[2]
j)	Compare VSI and CSI operation in 3-ϕ I. M. control.	[3]

PART – B

(50 Marks)

2. Explain in detail the operation of a 1-phase full converter feeding a d.c separately excited motor with reference to voltage and current waveforms, assume motor current is continuous. [10]

OR

3. A 220 V, 1500 rpm, 50 A separately excited d.c motor with armature resistance is fed from a 3-phase fully-controlled rectifier. Available ac source has a line voltage of 440 V, 50 Hz. A star- delta connected transformer is used to feed the armature so that motor terminal voltage equals rated voltage when converter firing angle is zero. Determine the value of firing angle when motor is running at -800 rpm and twice the rated torque. [10]

4. A three phase DC drive is to be selected for the four quadrant operation of a large power high inertia load. Suggest a suitable drive and explain reasons for your choice. [10]

OR

5. Draw the circuit diagram of closed loop operation of d.c. motor control by two quadrant chopper. Explain its operation with relevant waveform in continuous current operation. [10]

6. Draw a neat circuit diagram for speed control of 3-phase induction motor in four quadrants using AC voltage controller and draw the relevant speed-torque characteristics. [10]

OR

7. For variable frequency control of induction motor for speeds below base speed V/f ratio is maintained. Why? [10]

8.a) What are the advantages of static rotor resistance control over conventional methods of rotor resistance control?

b) Explain the static Kramer drive operation used in 3-ϕ I. M. control. [5+5]

OR

9. A 440 V, 50 Hz, 6-pole Y-connected wound rotor motor has the following parameters: Rs=0.5 Ω,Rr′=0.4 Ω, Xs=Xr′=1.2 Ω, Xm=50 Ω, stator to rotor turns ratio is 3.5. Motor is controlled by static rotor resistance control. External resistance is chosen such that the breakdown torque is produced at standstill for a duty ratio of zero. Calculate the value of external resistance. [10]

10. Describe PWM based VSI speed control method of a synchronous motor. [10]

OR

11. Draw the neat block diagram of Closed Loop control operation of synchronous motor drives. [10]

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