Question Paper Code: R18A32EE03/R15A32EE03

R18/R15

ANURAG Engineering College

(An Autonomous Institution)

III B.Tech II Semester Supplementary Examinations, Dec–2023/Jan-2024

POWER SEMICONDUCTOR DRIVES

(ELECTRICAL AND ELECTRONICS ENGINEERING)

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

Section – A (Short Answer type questions) (25 Marks)

Answer All Questions

		Course Outcome	B.T Level	Marks
1.	Draw the voltage waveform of single phase full controlled converter fed dc motor for firing angle 60^0	CO1	L2	2M
2.	What is the Speed and Torque expressions of a Single Phase semi controlled converters connected d.c series motors	CO1	L1	3M
3.	Draw the Speed – Torque characteristics of a Three phase fully controlled converters connected to d.c separately excited motors	CO2	L2	2M
4.	What is the voltage and current expressions of a Three phase semi controlled converters connected to d.c separately excited motors	CO2	L1	3M
5.	Briefly explain the Regenerative Braking operations	CO3	L2	2M
6.	What are the advantages of operating choppers at high frequency?	CO3	L1	3M
7.	Can V/f ratio maintain constant for above base speed?	CO4	L1	2M
8.	What are the advantages of static rotor resistance control method?	CO4	L1	3M
9.	In separate control of synchronous motor how the frequency of the supply to motor is changed?	CO5	L1	2M
10.	When can be a synchronous motor is load commutated?	CO5	L1	3M

Section B (Essay Questions)

Answer all questions, each question carries equal marks. **(5 X 10M = 50M)**

11. A)	A 220V, 1500 rpm, 10A Separately excited dc motor has an armature resistance of 1Ω. It is fed from a single phase fully controlled converter with an ac source voltage of 230V, 50Hz assuming continuous load current. Find i) motor speed at the firing angle of 30° and torque of 5Nm ii) Developed torque at the firing angle of 45° and speed of 1000rpm.	CO1	L3	10M
	OR			
B)	i) Draw and Analyze speed torque characteristics of single-phase full converter fed separately excited DC motor.	CO1	L3	5M
	ii) A 200 V, 1000 rpm, 10 A separately excited dc motor is fed from a single-phase semi converter with ac source voltage of 230 V, 50 Hz. Armature circuit resistance is 1Ω. Armature current is continuous. Find firing angle for rated motor torque at 500 rpm.			5M
12. A)	Analyze the motoring operation of a three-phase semi-converter fed separately excited d.c. motor with the help of voltage and current waveforms when α is 30^0. Assume continuous conduction.	CO2	L3	10M
	OR			
B)	A 600V, 1500 rpm, 80A separately excited dc motor is fed through a three-phase semi converter from 400v supply. Motor armature resistance 1 Ω armature current is assumed constant. For a firing angle of 45° at 1200 rpm, Find the r.m.s values of source and thyristor current and the input supply power factor.	CO2	L3	10M

13. A)	i) Identify the how four quadrant operation of DC motor is achieved with dual converters?	CO3	L3	5M
	ii) A 440V, 750 rpm, 70A dc shunt motor has an armature resistance of 0.3 when running under rated conditions, the motor is to be braked by plugging with armature current limited to 90A. What external resistance should be connected in series with the armature? Find the initial braking torque and its value when the speed has fallen to 300rpm.			5M
	OR			
B)	i) Develop the speed-torque expression of class-B chopper operating in time ratio control is supplying the armature of the separately excited dc motor. And draw speed torque characteristics.	CO3	L3	5M
	ii) A 220 V, 24A, 1000 rpm separately excited dc motor having an armature resistance of 2 ohm is controlled by a chopper. The chopping frequency is 500 Hz and the input voltage is 230 V. solve the duty ratio for a motor torque of 1.2 times rated torque at 500 rpm.			5M
14. A)	i) Analyze the control of single-phase induction motor using AC voltage controller	CO4	L3	5M
	ii) Analyze that variable frequency control yields higher torque to current ratio during starting.			5M
	OR			
B)	A Three phase, 400v, 6-pole, 50hz delta connected slip ring induction motor has rotor resistance of 0.25Ω and leakage reactance of 12Ω per phase referred to stator. When driving a fan load it runs at full load at 3% slip. Choose What resistance must be inserted in the rotor circuit to obtain a speed of 850 rpm. Neglect stator impedance and magnetizing branch? Stator to rotor turns ratio is 2.2.	CO4	L3	10M
15. A)	Describe self-controlled and separate controlled mode of operation of a synchronous motor drive in detail and compare them.	CO5	L3	10M
	OR			
B)	Analyze the Operation of Load commutated CSI fed Synchronous Motor with neat Waveforms.	CO5	L3	10M