M.E. ELECTRICAL ENGINEERING
FIRST YEAR
FIRST SEMESTER EXAM 2025

Sub: STATIC CONVERTERS IN ELECTRIC DRIVES (MC)

Time: Three Hours **Full Marks:** 100

(50 marks for each part)
Use a separate Answer-Script for each Part

PART-I.

Answer *all* questions from this part.

PART-II.

Answer *Any three* questions from this part.

Two marks are for neatness and systematic answer

6.	(a) Explain the method of regenerative braking in a dc separately excited motor drive system with the help of machine characteristics and block diagram. Also discuss its advantages for the drive system. (CO1)	8
	(b) A 220V, 2.0kW, 1100 rpm DC separately excited motor with Ra=0.6 ohm is delivering rated load at rated speed and rated supply voltage. Suddenly the input voltage is disconnected and the armature is connected to a resistance of 2.5 ohm with field excitation remaining same. Find the machine torque at the instant of this changeover and the speed of the machine at half of the above calculated torque after the changeover. Assume that the current and speed transitions between the two operating points are linear.(CO4)	8
7.	With the help of block diagram, explain the method of speed control technique of a three phase slip ring induction motor using static Kramer scheme. Also indicate the operating speed range for this method and its limitations.(CO2)	16
8.	(a) Explain the types of losses that occur in three phase induction motor during its operation and methods to reduce the same.(CO3)	6
	(b) 2. A 2.0 kW, 415V, 970 rpm, 3-phase, star connected, cage type induction motor is undergoing variable frequency control. The motor is driving a load taking a current of 2.0A. Neglecting friction and windage losses, compute its total power losses and hence calculate its efficiency under when it is controlled at 70% of rated V/f ratio, for the above load current. (Assume Lm=470mH, Rs=Rr=0.9 ohm, Xlr=Xls=3.1 ohm, Rc=1100 ohm all at 50Hz and per phase basis for the motor and no core saturation). (CO4)	10
9	(a) Explain with the help of block diagram, the method of starting a slip ring induction machine with the help of chopper based rotor resistance control. Deduce necessary formula used for explanation.(CO2)	6
	(b) A 415V, 50 Hz, three phase, 2.2 kW, 970 rpm cage type induction motor is directly connected to its rated three phase supply voltage. The motor is started using a power electronic converter supplying 10 Hz at 80V three phase supply. Determine the starting	10

	current and starting torque and compare the same when it is stated at rated voltage and frequency. Per Phase IM parameters at rated condition: Rs=Rr=0.9 ohm, X_{ls}=X_{lr}=2.9 ohm, Xm=217 ohm, Rc is very large. Assume linear magnetising characteristics for the machine. (CO4)	
10	Explain with proper block diagram the static Scherbius Drive system for a three phase slip ring induction motor drive system. Indicate also the advantage and disadvantages of the same.(CO3)	16