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

SPECIAL PURPOSE ELECTRICAL MACHINES

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 *all* questions from this part.

6.	a) Deduce the expression for maximum torque developed in a three phase squirrel cage induction machine taking the stator parameters in to account and compare the same for motor and generator operation. (CO2)	10
	OR	
	b) Draw the circle diagram of a three phase induction generator and explain the performance parameters from the same. (CO1)	10
7.	a) Deduce the expression for reactive power in a three phase induction generator with the help of its steady state equivalent circuit. Find the slip at which maximum reactive power occurs. (CO3)	10
	OR	
	b) Draw the phasor diagram of a three phase doubly fed induction generator under sub-synchronous operation and explain the nature of its power factor. (CO3)	10
8.	(a) Show the variable speed grid connected squirrel cage induction generator converter control scheme block diagram and explain the function of each block. (CO4)	10
	OR	
	(b) Explain the voltage build-up procedure in a self-excited induction generator. Also show one capacitor calculation method for proper voltage build-up. (CO4)	10
9	(a) A 415V, 50 Hz, 4-pole, 3 phase star connected squirrel cage induction machine is operating as generator connected with grid at rated voltage and frequency. The machine running at 1560 rpm with the help of wind turbine. Find the active and reactive power delivered to grid if the machine has: per phase Rs=Rr=1.1 ohm, Xls=Xlr=3.6 ohm, Xm= 180 ohm, core losses negligible. (CO4)	10
	OR	
	(a) Show how a slip ring induction machine can operate as generator under sub-synchronous speed operation. Deduce the necessary derivations if required.	10

10	Write short notes on any One (CO2): i) Super synchronous operation of grid connected doubly fed induction generator (DFIG). iii) Voltage and current sensing techniques for induction generator controllers.	10