PVP 23

Code: 23EE3402

II B.Tech - II Semester – Supplementary Examinations
DECEMBER 2025

INDUCTION AND SYNCHRONOUS MACHINES
(ELECTRICAL & ELECTRONICS ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
4. All parts of Question paper must be answered in one place.

PART – A

1.a)	Infer the voltage regulation in alternator.
1.b)	Interpret why synchronous motor will always run at synchronous Speed.
1.c)	Identify the merits of three phase synchronous motor over the three phase induction motor.
1.d)	Infer crawling and cogging.
1.e)	Compare Salient and cylindrical pole alternator.
1.f)	State the reason of skewed rotor bars in 3 phase squirrel cage induction motor.
1.g)	Discuss the various methods available for making a single-phase motor self-starting?
1.h)	List any four use of single-phase induction motor.
1.i)	Explain the various torques associated with synchronous motor.
1.j)	What is reason for inserting additional resistance in the circuit of a slip ring induction motor.

PART – B

			Max. Marks
		UNIT-I	
2		Explain the constructional features of both Squirrel cage and Slip ring Induction motor. Discuss the merits of one over the other.	10 M
		OR	
3		A 3 phase, 415V, 50Hz, 4 pole star connected stator winding. The rotor resistance and reactance per phase are 0.2Ω and 2 Ω respectively. The full load speed is 1440 rpm. Calculate the torque developed on full load by the motor. Assume stator to rotor turns ratio as 2:1.	10 M
		UNIT-II	
4		Derive the Torque equation of three phase Induction Motor and obtain the condition for maximum torque.	10 M
		OR	
5		Draw the circle diagram for 5.6kw, 400V,4 pole,50Hz slip ring induction motor from the following data: No load Test :400V,6A, power factor cosϕ = 0.087 Blocked Rotor test:100V,12A, 720W Ratio of primary to secondary turns is 2.62, Stator resistance per phase=0.67Ω, Rotor resistance per phase=0.185 Ω. Calculate i) Full load current, ii)Maximum output power, iii)Full load slip, iv)Full load Power factor, v)Full load slip	10 M

		UNIT-III	
6		Describe the construction and working principle of Capacitor start Induction motor and Capacitor start - run Induction motor. Draw its speed –Torque Characteristics and list its applications.	10 M
		OR	
7	a)	Explain the double revolving theory and infer its significance in single phase induction motor operation.	5 M
	b)	Infer the construction of AC series motor and its applications.	5 M
		UNIT-IV	
8	a)	Derive the EMF equation of Alternator.	5 M
	b)	Explain the effect of armature reaction at different power factors on Synchronous machines.	5 M
		OR	
9		A 100 KVA, 3000 V,50 Hz ,3 phase star connected alternator has an effective armature resistance of 0.2 ohm. The field current of 40 A produces a short circuit current of 200A and open circuit voltage of 1040 V(Line value).Using EMF method calculate the full load regulation of at 0.8 pf lagging and 0.8 pf leading. Draw the phasor diagrams.	10 M
		UNIT-V	
10	a)	Explain the construction and working principle of Synchronous Motor.	5 M

	b)	Discuss the various methods of starting and procedure for starting synchronous motor.	5 M
OR			
11		Illustrate with the phasor diagram and obtain the operation of mechanical power developed by a synchronous motor.	10 M