QP Code: R264A009 | Reg. No | | | | | | | | | | | AY 23

Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET University)

B. Tech (Fourth Semester – Regular/Supplementary) Examinations, April 2026

23BELPC24001/23BEEPC24001 - Electrical Machines-II
(EE, EEE)

Time: 3 hrs | Maximum: 60 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions		CO #	Blooms Level
a.	Define voltage regulation of a synchronous generator.	CO1	K1
b.	Describe synchronous impedance.	CO2	K2
c.	What are d-axis and q-axis in salient pole machines?	CO3	K1
d.	List any two types of single-phase induction motors.	CO2	K2
e.	Outline the working principle of magnetic levitation systems.	CO6	K3

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions		Marks	CO #	Blooms Level
2. a.	Describe the constructional features of a three-phase synchronous generator and compare its rotor types.	5	CO1	K3
b.	A three-phase, 50 Hz synchronous generator with 8 poles has 72 slots, each containing 10 conductors. The flux per pole is 0.06 Wb. The winding is star-connected and full pitched with a distribution factor of 0.95. Determine: • Generated EMF per phase • Line voltage	5	CO1	K4
	(OR)			
c.	Explain the process of EMF generation in a three-phase AC system of a synchronous generator. Also derive the EMF equation.	5	CO1	K2
d.	During an open circuit test on a three-phase alternator, a field current of 5 A produces a rated voltage of 400 V. In a short circuit test, a field current of 4 A produces a rated current of 50 A. The armature resistance per phase is 0.2 Ω. Calculate: • Synchronous impedance per phase • Synchronous reactance per phase	5	CO1	K4
3.a.	Explain the significance of V-curves and Λ-curves of a synchronous motor and analyze how excitation affects its power factor and armature current.	5	CO2	K2
b.	A salient pole synchronous generator has direct-axis reactance Xd=14 Ω and quadrature-axis reactance Xq=9 Ω. It is connected to a 3-phase supply of 415 V (line voltage). If the excitation EMF is 550 V per phase, calculate the maximum power developed per phase neglecting armature resistance.	5	CO2	K4
	(OR)			

c.	Describe the phasor representation of a salient pole synchronous machine and explain its significance.	5	CO2	K3
d.	A three-phase, star-connected synchronous generator delivers a current of 10 A at a lagging power factor angle of 20° with a terminal voltage of 400 V. Given that Xd=10 Ω and Xq=6.5 Ω, neglect armature resistance and calculate: • Load angle • Direct-axis current (Id) and quadrature-axis current (Iq)	5	CO2	K4
4.a.	Discuss the power flow in a three-phase induction motor with the help of a detailed power flow diagram and explain various losses involved.	5	CO3	K2
b.	A three-phase induction motor having a star-connected rotor develops an induced EMF of 100 V across the slip rings at standstill (open-circuit condition). The rotor resistance and reactance per phase are 1.5 Ω and 5 Ω respectively. Calculate the current per phase and power factor when: (a) Slip rings are short-circuited (b) Slip rings are connected to an external star-connected resistance of 4 Ω per phase	5	CO3	K4
	(OR)			
c.	Discuss the various methods employed for starting a three-phase induction motor.	5	CO3	K3
d.	A three-phase induction motor with 6 poles is connected to a 60 Hz supply. Determine: (i) Synchronous speed of the rotating magnetic field (ii) Rotor speed when the slip is 0.05 (iii) Rotor current frequency at a slip of 0.02 (iv) Rotor current frequency at standstill	5	CO4	K4
5.a.	Explain the constructional features of a three-phase induction machine and discuss how different rotor types influence its performance characteristics.	5	CO4	K2
b.	Explain how a single-phase induction motor can be started using an auxiliary winding.	5	CO4	K2
	(OR)			
c.	Describe the cascade control method of speed control in induction motors and evaluate its advantages and limitations.	5	CO5	K3
d.	Develop the equivalent circuit of a single-phase induction motor and explain the significance of each parameter in its operation.	5	CO5	K4
6.a.	Explain the basic principle of operation of a three-phase induction generator and discuss its applications.	5	CO5	K2
b.	Explain the working principle of a stepper motor and classify its types with suitable examples.	5	CO6	K2
	(OR)			
c.	Describe the construction and working of a servo motor. Also explain its advantages and typical applications.	5	CO6	K3
d.	Discuss various types of electrical pumps and compare their performance characteristics and applications.	5	CO6	K3

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