GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Fourth Semester Regular) Examinations, May – 2024

22BELPC24001 / 22BEEPC24001 – Electrical Machines -II

(EE & EEE)

Time: 3 hrs   Maximum: 70 Marks

(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.	Explain the concept of "synchronous speed" in a synchronous motor.	CO2	K3
b.	How is the direction of rotation of a three-phase induction motor reversed?	CO3	K4
c.	How does a single-phase induction motor differ from a three-phase induction motor?	CO4	K3
d.	How does an alternator maintain voltage regulation?	CO1	K3
e.	What is the role of the rotor in an alternator?	CO1	K2

PART – B				**(15 x 4 = 60 Marks)**

Answer *ALL* questions

		Marks	CO #	Blooms Level
2. a.	A 3-phase, 16-pole alternator has a star-connected winding with 144 slots and 10 conductors per slot. The flux per pole is 0.03 Wb, Sinusoidally distributed and the speed is 375 r.p.m. Find the frequency rpm and the phase and line e.m.f. Assume full-pitched coil.	7	CO1	K3
b.	A motor generator set used for providing variable frequency a.c. supply consists of a three-phase, 10-pole synchronous motor and a 24-pole, three-phase synchronous generator. The motor-generator set is fed from a 25 Hz, three-phase a.c. supply. A 6-pole, three phase induction motor is electrically connected to the terminals of the synchronous generator and runs at a slip of 5%. Determine: (i) the frequency of the generated voltage of the synchronous generator. (ii) the speed at which the induction motor is running.	8	CO1	K3
	(OR)			
c.	In a 50-kVA, star-connected, 440-V, 3-phase, 50-Hz alternator, the effective armature resistance is 0.25 ohm per phase. The synchronous reactance is 3.2 ohm per phase and leakage reactance is 0.5 ohm per phase. Determine at rated load and unity power factor: (i) Internal e.m.f. E_a (ii) no-load e.m.f. E_0 (iii) percentage regulation on full-load (iv) value of synchronous reactance which replaces armature reaction.	8	CO1	K3
d.	3-phase, star-connected alternator is rated at 1600 kVA, 13,500 V. The armature resistance and synchronous reactance are 1.5 Ω and 30 Ω respectively per phase. Calculate the percentage regulation for a load of 1280 kW at 0.8 leading power factor.	7	CO1	K3
3.a.	Draw the phasor diagram of 3 phase salient pole type alternator.	7	CO2	K2

b.	Find the power angle when a 1500-kVA, 6.6 kV, 3-phase, Y-connected alternator having a resistance of 0.4 ohm and a reactance of 6 ohm per phase delivers full-load current at normal rated voltage and 0.8 p.f. lag. Draw the phasor diagram.	8	CO2 K3

<div align="center">(OR)</div>

c.	Explain the effect of changing excitation on constant load in synchronous motor.	7	CO2 K2
d.	Comparison Between Synchronous and Induction Motors with application of synchronous motor.	8	CO2 K4
4.a.	A 3-φ induction motor is wound for 4 poles and is supplied from 50-Hz system. Calculate (i) the synchronous speed (ii) the rotor speed, when slip is 4% and (iii) rotor frequency when rotor runs at 600 rpm.	7	CO3 K3
b.	Derive the expression for running torque of 3 phase induction motor and explain the condition for maximum torques.	8	CO3 K3

<div align="center">(OR)</div>

c.	A 3-phase, 400-V, star-connected induction motor has a star-connected rotor with a stator to rotor turn ratio of 6.5. The rotor resistance and standstill reactance per phase are 0.05 Ω and 0.25 Ω respectively. What should be the value of external resistance per phase to be inserted in the rotor circuit to obtain maximum torque at starting and what will be rotor starting current with this resistance?	8	CO3 K3
d.	Explain the parameters of 3 phase induction motor using no load and blocked rotor test.	7	CO3 K3
5.a.	Describe the Equivalent Circuit of a Single-phase Induction Moto with neat diagram	7	CO4 K2
b.	Explain the types of single-phase induction motors. Describe the function of CSCR induction motor.	8	CO4 K2

<div align="center">(OR)</div>

c.	Describe the function of the shaded pole induction motor.	7	CO4 K2
d.	Differentiate between 1 phase and 3 phase IM.	8	CO4 K4

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