PAPER ID-311047

Roll No:

BTECH
(SEM V) THEORY EXAMINATION 2023-24
ELECTRICAL MACHINES-II

TIME: 3 HRS   **M.MARKS: 100**

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1.   Attempt *all* questions in brief.   **2 x 10 = 20**

Q no.	Question	Marks	CO
a.	A 6-pole alternator rotates at 1000rpm. What is the frequency of the generated voltage?	2	1
b.	Name the various methods for predetermining the voltage regulation of 3-phase Alternator.	2	1
c.	What are the V-curves of a synchronous motor?	2	2
d.	Enlist the conditions for parallel operation of two single-phase alternators.	2	2
e.	Why the slots in the rotor of an induction motor are usually skewed?	2	3
f.	What is the condition for producing maximum torque in a 3-phase induction motor?	2	3
g.	Define cogging in an induction motor.	2	4
h.	Why the power factor of an induction motor is low at starting?	2	4
i.	List the different types of single-phase induction motors.	2	5
j.	Suggest modifications to be made in a dc series motor to operate it satisfactorily on alternating current?	2	5

SECTION B

2.   Attempt any *three* of the following: **10 x 3 = 30**

a.	Why is rotating field system used in preference to a stationary field? Describe the difference in construction of rotors of alternators used in hydroelectric plants and steam plants. Draw neat sketches of the two types of rotor.	10	1
b.	Explain working principle of synchronous motor. Discuss how synchronous motor is started using damper winding.	10	2
c.	A 6-pole, 50 Hz, 3-phase induction motor has resistance and reactance of 0.5 Ω and 5 Ω per phase respectively. Calculate (i) at what speed the torque is maximum (ii) the ratio Maximum torque / starting torque. Determine the external resistance per phase to be inserted so that starting torque is half of the maximum torque.	10	3
d.	Describe star-delta and autotransformer method of starting of 3-phase induction motor.	10	4
e.	Explain the working and construction of (i) shaded pole motor and (ii) Permanent-split Capacitor motor.	10	5

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM V) THEORY EXAMINATION 2023-24
ELECTRICAL MACHINES-II

TIME: 3 HRS   M.MARKS: 100

SECTION C

3.   Attempt any *one* part of the following: **10x1 = 10**

a.	A 3-phase, 16 pole, star-connected alternator is running at 375 rpm. The stator has 2 slots per pole per phase and 4 conductors per slot accommodated in two layers. The coil span is 150 degrees-electrical. Determine useful flux per pole if the machine gives phase voltage of 795.3 V on open circuit.	10	1
b.	Derive emf equation for synchronous generator. Also, derive and incorporate pitch factor and distribution factor in the emf equation.	10	1

4.   Attempt any *one* part of the following: **10x1 = 10**

a.	Two identical 2 MVA synchronous generators are operating in parallel. The governor of the first machine is such that the frequency drops from 50 Hz on no-load to 48 Hz on full load and the corresponding uniform frequency drop of second machine from 50 Hz to 47.5 Hz (a) Determine how will the machine share a load of 3000 kW? (b) Determine what is the maximum load at unity power factor that can be delivered without overloading either machine	10	2
b.	Explain hunting in synchronous motor. What are its causes and remedy?	10	2

5.   Attempt any *one* part of the following: **10x1 = 10**

a.	Derive and draw the torque-slip characteristics of a 3-phase induction motor indicating starting, maximum torque and the operating region.	10	3
b.	A 4-pole, 440V 3-phase induction motor runs at 1450 rpm at 0.85 pf developing 11 kW power. The stator losses are 1100 W and mechanical losses are 400 W. Determine (i) slip (ii) rotor copper loss (iii) rotor frequency (iv) line current (v) efficiency.	10	3

6.   Attempt any *one* part of the following: **10x1 = 10**

a.	Explain (i) Consequent pole method and (ii) V/f method for speed control of 3-phase induction motor.	10	4
b.	Determine the maximum permissible full load kVA of the 3-phase induction motor if the supply current drawn from a 400 V, 50 Hz, 3-phase supply is 120A. The starting current is 6 times full load current, when (i) it is directly connected to the mains (ii) it is connected through an autotransformer with a tapping of 60% and (iii) it is designed for use with star delta starter.	10	4

7.   Attempt any *one* part of the following: **10x1 = 10**

a.	Discuss blocked rotor test and no-load test of single phase induction motor.	10	5
b.	Explain the working of double cage motor induction motor. Also, draw and describe its equivalent circuit diagram.	10	5