

Name:

Enrolment No:



**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**

**Online End Semester Examination, May 2021**

**Course: Electrical Machines-II**

**Program: B Tech Electrical**

**Course Code: EPEG 2011**

**Semester: IV**

**Time : 03 hrs**

**Max. Marks: 100**

**SECTION A**

**1. Each Question will carry 5 Marks**

**2. Instruction: Complete the statement / Select the correct answer(s)**

S. No.	Question	CO
Q 1	(a) A 3-phase induction motor is running at 2% slip. If the input to rotor is 1000 W, then mechanical power developed by the motor is ----- (b) What is the approximate efficiency of a 60 Hz, 6- pole, 3-phase induction motor running at 1050 rpm. -----	CO 2
Q 2	The speed of slip ring induction motor can be changed by -----, ----- and -----	CO 1
Q 3	(a) In the operating range of an induction motor, the relation between torque (T) and slip (s) is approximately ----- (b) the speed of a synchronous motor can be changed by varying -----	CO 1
Q 4	Write down three advantages of parallel operation of Alternators -----, ----- and -----	CO 1
Q 5	Write down three disadvantages of closed type slots -----, ----- and -----	CO 2
Q 6	(a) an over excited synchronous motor behaves as ----- (b) an under excited synchronous motor behaves as -----	CO 1

**SECTION B**

**1. Each question will carry 10 marks**

**2. Instruction: Write short / brief notes**

Q 7	A 3-phase induction motor having star connected rotor has an induced EMF of 50 V between the slip rings at standstill on open circuit. The rotor has a resistance and reactance per phase of 0.5 ohms and 4.5 ohms respectively. Find the current per phase and the power factor at starting when (i) the slip rings are short circuited (ii) the slip rings are connected to a star connected rheostat of 4 ohms per phase.	CO 3
Q 8	Draw and explain the Torque- Slip characteristics of three-phase induction motor for (i) different rotor leakage reactance (ii) different rotor resistance (iii) different voltages keeping frequency constant.	CO 3

Q 9	A 3-phase, 16-pole synchronous generator 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 rpm. Calculate (i) the frequency (ii) line induced EMF	CO 3
Q 10	In a 6-pole, 3-phase 50 Hz motor with star connected rotor, the rotor resistance per phase is 0.3 ohms/ph, the reactance at standstill is 1.5 ohms/ph and an EMF between the slip rings on open circuit is 175 V at standstill. Calculate (i) slip at a speed of 950-rpm (ii) rotor emf/ph (iii) rotor frequency & rotor reactance at 950-rpm (iv) rotor frequency & rotor reactance at 970 rpm and 920 rpm.	CO 3
Q 11	Derive the relation between Rotor Input power, Rotor copper losses and Gross mechanical power output of a Three-phase induction motor with the help of equivalent circuit.	CO 2

### Section C

**1. Each Question carries 20 Marks.**

**2. Instruction: Write long answer.**

**3. Answer any one question**

Q 12	(a) Derive the torque equation of three phase induction motor in terms of synchronous watts [7 M] (b) Write down the expression for starting torque and conditions required for maximum starting torque of three phase induction motor [5 M] (c) Derive the expression for maximum Torque under running conditions of three phase induction motor and write down the conclusion of relations [8 M]	CO 4
	(OR)	
	(a) Describe the armature reaction in alternator when power factor is unity, zero lagging and zero leading respectively [10 M] (b) Write down the expression for synchronous reactance with neat equivalent circuit diagram [5 M] (c) Draw and explain the phasor diagram of alternator on loaded (inductive load) condition [5 M]	CO 4