Name: **Enrolment No:**	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2022

Course: Electrical machines **Semester: III**
Program: B Tech Mechatronics **Time : 03 hrs.**
Course Code: EPEG 2013 **Max. Marks: 100**

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	What are the essential parts of a transformer?	**4**	**CO1**
Q 2	Which test on a 1-phase transformer gives the iron losses, also justify your answer.	**4**	**CO1**
Q 3	Sketch the characteristics of a DC shunt motor and give the practical applications.	**4**	**CO2**
Q 4	Why core of a transfomer is laminated and insulated?	**4**	**CO1**
Q 5	State the types of dc motors. What is the basis of the classification?	**4**	**CO2**
	SECTION B **(4Qx10M= 40 Marks)**		
Q.6	A 220 V, 50 Hz, 6-pole, single-phase induction motor has the following circuit model parameters: R1m = 3.6 ohm (X1m + X2) = 15.6 ohm R2 = 6.8 ohm X = 96 ohm The rotational losses of the motor are estimated to be 75 W. At a motor speed of 940 rpm, determine the line current, power factor, shaft power and efficiency.	**10**	**CO4**
Q.7	Develop the phasor diagram of a single-phase transformer under load condition. Assume lagging power factor load.	**10**	**CO4**
Q.8	With the help of neat sketch explain the construction, working principle of a DC machine.	**10**	**CO3**
Q.9	Derive the expression for air gap power, torque and power output for an induction machine.	**10**	**CO5**
	SECTION-C **(2Qx20M=40 Marks)**		
Q. 10	The following test results were obtained for a 20 kVA, 50 Hz, 2400/240 V distribution transformer:	**20**	**CO4**

	Open-circuit test (LV): 240 V, 1.066 A, 126.6 W Short-circuit test (HV): 57.5 V, 8.34 A, 284 W (a) When the transformer is operated as a stepdown transformer with the output voltage equal to 240 V, supplying a load at unity power factor, determine the maximum efficiency and the unity power factor load at which it occurs. (b) Determine the power-factor of the rated load, supplied at 240 V, such that the terminal voltage observed on reducing the load to zero is still 240 V.		
Q. 11	A 4-pole series-wound fan motor draws an armature current of 50 A, when running at 2000 rpm on a 230 V dc supply with four field coil connected in series. The four field coils are now connected in two parallel groups of two coils in series. Assuming the flux/pole to be proportional to the exciting current and load torque proportional to the square of speed, find the new speed and armature current. Neglect losses. Given: armature resistance = 0.2 ohm, resistance of each field coil = 0.05 ohm. **OR** A 230 V dc shunt motor having armature resistance of 2 ohm draws an armature current of 5 A to drive a constant torque load at 1250 rpm. At no load it draws a current of 1 A. (a) A resistance of 15 ohm is added in series to the armature. Find the motor speed with load torque as above. (b) A resistance of 15 ohm is shunted across the armature and 10 ohm in series with the supply line. Calculate the load speed.	**20**	**CO5**