

Name:

Enrolment No:



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2021

Programme Name: B.Tech. Mechatronics
Course Name : Electrical Machines
Course Code : EPEG 2013
Nos. of page(s) : 03

Semester : III
Time : 03 Hrs
Max. Marks: 100

Instructions:

1. Attempt all the questions (Theory, Numerical, Case study etc.)
2. Attempt all questions serially as per Question paper.
3. Answer should be neat and clean. Draw a free hand sketch for circuits/tables/schematics wherever required.
4. You are expected to be honest about each attempt which you make to progress in life

SECTION A [20 marks]

S. No.		Marks	CO
Q 1.	Match the following: 1. Three Phase Transformer 2. DC Generator 3. DC motor 4. Single Phase Transformer	(a) Uni-directional emf (b) Wye-Delta connection (c) Hair drier (d) Voltage Regulation	4 CO4
Q 2.	A 4 – pole DC Shunt Generator running at 1,500 rpm has an armature with 90 slots having 6 conductors per slot. The flux per pole is 6×10^{-2} Wb. Determine the induced emf of the DC Generator if the coils are lap connected. If the current per conductor is 100 A, determine the electrical power output of the machine.	4	CO3
Q 3.	Explain with reference to three-phase, the terms ‘Phase sequence’ and ‘Balanced load’.	4	CO1
Q 4.	(I)Which of the following law/rule can be used to determine the direction of	4	CO1

	<p>rotation of D.C. motor?</p> <p>(a) Lenz's law (c) Faradays's Laws</p> <p>(b) Fleming's Right Hand Rule (d) Fleming's Left Hand Rule</p> <p>(II) The transformer ratings are usually expressed in terms of</p> <p>(a) volts (c) kW</p> <p>(b) amperes (d) kVA</p>		
Q5.	What are the essential conditions of Parallel operation of Three phase Transformers?	4	CO3
SECTION B [40 marks]			
Q 6.	<p>A 120 V shunt motor has the following parameters: $R_a = 0.4 \Omega$, $R_f = 120 \Omega$ and rotational (core, mechanical and stray) losses are 240 W. On full load, the line current is 19.5 A and the motor runs at 1200 rpm</p> <p>Estimate:</p> <p>(a) The developed power (b) The output power (c) The output torque.</p>	10	CO3
Q 7.	Discuss the various losses occurring in a Transformer. What information can be obtained by performing Short-circuit test & Open Circuit Test on a Transformer? Also draw phasor diagram of transformer when it is operating on No-Load	10	CO2
Q8.	Explain the principle of working of a DC generator .Explain why a commutator and brush arrangement is necessary for the operation of a dc machine.	10	CO3
Q9.	<p>(a) Enlist the advantages of Armature Controlled DC Shunt Motor and disadvantages of Field Rheostat Controlled DC Shunt Motor</p> <p>(b) A single phase, 50 Hz, 220/3000 V, Transformer has a net –sectional area of core 400 cm^2. If the peak value of flux density in the core is 1.239 Tesla. Compute the suitable values for the number of turns on the primary and secondary windings.</p>	6+4	CO4

SECTION-C [40 marks]

Q 10.			
	<p>Brief the following:</p> <ul style="list-style-type: none"> (i) Armature Reaction in DC machine (ii) Tap Changing Transformer (iii) Commutation (iv) DC Excitation (v) Transformer Cooling (vi) Dynamically induced emf (vii) Braking (viii) Rotating mmf (ix) Magnetic Saturation 	2x10	CO4
Q11.	<p>(I) Draw and abbreviate each parameter used in the phasor diagram of a single phase transformer subjected to the following loading conditions:</p> <ul style="list-style-type: none"> (i) Induction motors, Electric Heater, Choke operated Tube-light[all at a time are operating] (ii) Switch is open at secondary terminal of Transformer <p>(II) A shunt generator gives full-load output of 50 kW at a terminal voltage of 200 V . The armature and shunt – field resistances are 0.7 Ω and 70 Ω respectively . The iron and friction losses are 1000 W . Calculate:</p> <ul style="list-style-type: none"> a. the emf generated b. the copper losses c. the efficiency . 	<p>7+3</p> <p>10</p>	CO3