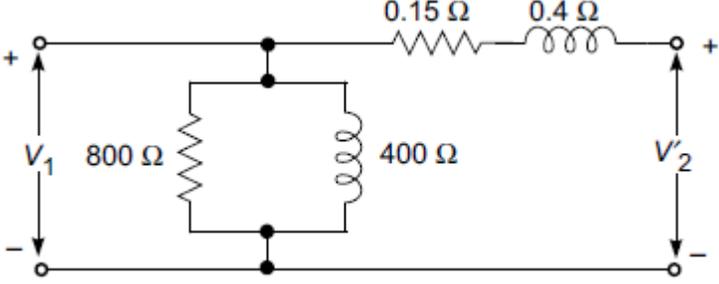


Name:			
Enrolment No:			
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES End Semester Examination, December 2023			
Course: Electrical machines Program: B Tech Mechatronics Course Code: EPEG 2013		Semester: III Time : 03 hrs. Max. Marks: 100	
SECTION A (5Qx4M=20Marks)			
S. No.		Marks	CO
Q 1	A 440 V, 50-Hz, 4-pole 3-phase squirrel cage induction motor develops a torque of 100 N-m at a speed of 1200 rpm. If the stator supply frequency reduced by half, calculate (a) Stator supply voltage required for maintaining the same flux in the machine. (b) The new speed at a torque of 100 N-m	4	CO2
Q 2	Justify that a synchronous motor is not self-start motor.	4	CO2
Q 3	Write the adverse effects of armature reaction in a DC machine.	4	CO1
Q 4	Define the voltage regulation of a transformer.	4	CO1
Q 5	Give the classification of speed control methods for shunt and series motor.	4	CO1
SECTION B (4Qx10M= 40 Marks)			
Q.6	Sketch the torque – slip characteristic of an induction machine and brief all the operating modes.	10	CO4
Q.7	The approximate equivalent circuit of a 4 kVA, 200/400 V single-phase transformer, referred to the LV side, is shown in figure. (a) An open-circuit test is conducted by applying 200 V to the LV side, keeping the HV side open. Calculate the power input, power factor and current drawn by the transformer. (b) A short-circuit test is conducted by passing full-load current from the HV side keeping the LV side shorted. Calculate the voltage required to be applied to the transformer and the power input and power factor.	10	CO5

			
Q.8	<p>A 4-pole, 50-Hz. 7.46 kW motor has, at rated voltage and frequency, a starting torque of 160 percent and a maximum torque of 200 percent of full load torque. Determine (i) full load speed (ii) speed at maximum torque.</p>	10	CO4
Q.9	<p>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 resistance of 15 ohm is added in series to the armature. Find the motor speed with load torque as above. Also determine the speed regulation. Rotational loss torque is negligible. The armature reaction effect is to be ignored.</p> <p style="text-align: center;">OR</p> <p>With the help of neat sketch explain the construction, working principle of a DC machine.</p>	10	CO3
<p>SECTION-C (2Qx20M=40 Marks)</p>			
Q. 10	<p>A 50 kVA, 2200/110 V transformer when tested gave the following results: OC test, measurements on the LV side: 400 W, 10 A, 110 V SC test, measurements on the HV side; 808 W, 20.5 A, 90 V Compute all the parameters of the equivalent circuit referred to the HV and LV sides of the transformer. Also calculate % voltage regulation and efficiency at full load and 0.8 pf lagging.</p> <p style="text-align: center;">OR</p> <p>A 20 kVA, 2000/200 V, single-phase transformer has the following parameters: HV winding: $R_1 = 3 \text{ ohm}$ $X_1 = 5.3 \text{ ohm}$ L V winding: $R_2 = 0.05 \text{ ohm}$ $X_2 = 0.05 \text{ ohm}$</p> <p>(a) Find the voltage regulation at (i) 0.8 pf lagging (ii) upf (iii) 0.707 pf leading.</p> <p>(b) Calculate the secondary terminal voltage at (i) 0.8 pf lagging (ii) upf (iii) 0.707 pf leading when delivering full-load current with the primary voltage held fixed at 2 kV.</p>	20	CO5
Q. 11	<p>A 250-V dc shunt motor has $R_f = 150 \text{ ohm}$ and $R_a = 0.6 \text{ ohm}$. The motor operates on no load with a full field flux at its base speed of 1000 rpm with $I_a = 5 \text{ A}$. If the machine drives a load requiring a torque of 100 Nm, calculate armature current and speed of motor. If the motor is required to develop 10</p>	20	CO4

	kW at 1200 rpm, what is the required value of the external series resistance in the field circuit? Neglect saturation and armature reaction.		
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