Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

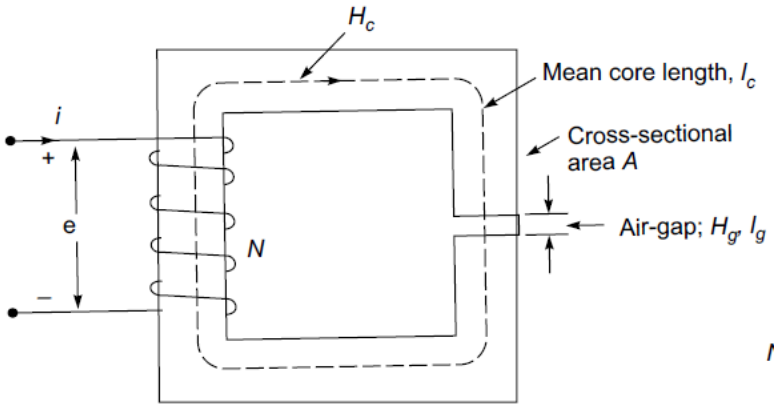
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2022

Course: Electrical machines - I **Semester: III**
Program: B Tech EL **Time : 03 hrs.**
Course Code: EPEG 2010 **Max. Marks: 100**

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Give the practical applications of DC series and shunt motor.	**4**	**CO2**
Q 2	Which test on a 1-phase transformer gives the iron losses, also justify your answer.	**4**	**CO1**
Q 3	What is the condition of maximum efficiency for a 1-phase transformer?	**4**	**CO1**
Q 4	Draw the charateristic of DC series motor and also state the practical limitation.	**4**	**CO2**
Q 5	Give the classification of speed control methods for shunt and series motor.	**4**	**CO3**

SECTION B
(4Qx10M= 40 Marks)

Q.6	The magnetic circuit of Fig. below has dimensions: Ac = 4 * 4 cm2, lg = 0.06 cm, lc = 40 cm; N = 600 turns. Assume the value of μr = 6000 for iron. Find the exciting current for Bc = 1.2 T and the corresponding flux and flux linkages.  	**10**	**CO1**
Q.7	A 500 kVA transformer has an efficiency of 95% at full load and also at 60% of full load; both at unity power factor. (a) Separate out the losses of the transformer.	**10**	**CO4**

	(b) Determine the efficiency of the transformer at 3/4th full load.		
Q.8	A 250 V, shunt motor with an armature resistance of 0.5 ohm and a shunt field resistance of 250 ohm drives a load the torque of which remain constant. The motor draws from the supply a line current of 21 A when the speed is 600 rpm. If the speed to be raised to 800 rpm, what change must be affected in the shunt field resistance?	**10**	**CO3**
Q.9	Draw the complete equivalent circuit of a transformer. Also derive the equivalent circuit referred to the primary side.	**10**	**CO4**
	SECTION-C **(2Qx20M=40 Marks)**		
Q. 10	The following test results were obtained for a 20 kVA, 50 Hz, 2400/240 V distribution transformer: 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. **OR** A 20 kVA, 2000/200 V, single-phase transformer has the following parameters: HV winding: R1 = 3 W X1 = 5.3 W L V winding: R2 = 0.05 W X2 = 0.05 W (a) Find the voltage regulation at (i) 0.8 pf lagging (ii) upf (iii) 0.707 pf leading. (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.	**20**	**CO4**
Q. 11	A 250-V dc shunt motor has Rf = 150 ohm and Ra = 0.6 ohm. The motor operates on no load with a full field flux at its base speed of 1000 rpm with Ia = 5 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 kW at 1200 rpm, what is the required value of the external series resistance in the field circuit? Neglect saturation and armature reaction.	**20**	**CO2**