GALGOTIAS UNIVERSITY

ADMISSION NUMBER

School of Engineering

B.TECH Electrical Engineering
Summer/Backlog - Semester End Examination - Jul 2024

Duration : 180 Minutes
Max Marks : 100

Sem IV - G2UB402B - Electrical Machine I

General Instructions
Answer to the specific question asked
Draw neat, labelled diagrams wherever necessary
Approved data hand books are allowed subject to verification by the Invigilator

1)	Recall the advantage and disadvantage of auto-transformer.	K1(2)
2)	Derive the emf equation of dc generator.	K2(4)
3)	Illustrate O. C. & S.C. test on 1-Φ transformer with neat diagram.	K2(6)
4)	A transformer on no-load has a core-loss of 50 W, draws a current of 2 A (rms) and has an induced emf of 230 V (rms). Determine the no-load power factor, core-loss current and magnetizing current. Also calculate the no-load circuit parameters of the transformer. Neglect winding resistance and leakage flux.	K3(9)
5)	Explain the following: (a) high frequency transformer (b) converter transformer	K3(9)
6)	A 4-pole dc motor is lap-wound with 400 conductors. The pole shoe is 20 cm long and average flux density over one-pole-pitch is 0.4 T, the armature diameter being 30 cm. Find the torque and gross mechanical power developed when the motor is drawing 25 A and running at 1500 rpm.	K5(10)
7)	A dc shunt motor has speed control range of 1600 rpm to 400 rpm by rheostatic control. All losses and armature reaction effect may be neglected. (a) The motor drives a constant power load. It has a speed of 1600 rpm drawing 120 A armature current. What would be the armature current at 400 rpm? (b) Repeat part (a) if the load is constant torque. (c) Repeat parts (a) and (b) if speed is controlled by armature voltage.	K4(12)
8)	Draw the equivalent circuit and applications of a 3-winding transformer. Explain how the parameters can be determined experimentally.	K5(15)
9)	The magnetization characteristic of a 4-pole de series motor may be taken as proportional to current over a part of the working range; on this basis the flux per pole is 4.5 mWb/A. The load requires a gross torque proportional to the square of the speed equal to 30 Nm at 1000 rev/min. The armature is wave□wound and has 492 active conductors. Determine the speed at which the	K5(15)

motor will run and the current it will draw when connected to a 220 V supply, the total armature resistance of the motor being 2.0 W.

10) Explain the use of tertiary winding in a Y-Y transformer. The parameter of the equivalent circuit of a 150-KVA, 2400/240 V transformer are: R1 = 0.2 Ω, R2 = 2*10-3 Ω, X1 = 0.45 Ω, X2 = 4.5 Ω, X=10-3 Ω, Rc = 10 K Ω, Xm =1.6 kΩ (as seen from 2400 V side). Calculate: (a) Open-circuit current, power and pf when LV is excited at rated voltage (b) The voltage at which the HV should be excited to conduct a short-circuit test (LV shorted) with full load current flowing. Estimate the input power and its pf? K6(18)