Enrollment l	No:	Exam Seat No:	
	C.U.SHAH	UNIVERSITY	•
	Winter Exa	amination-2022	
Subject Nam	ne: Electrical Machine Design -	- I	
Subject Cod	e : 4TE07EMD1	Branch: B.Tech (Elect	rical)
Semester: 7	Date: 22/11/2022	Time: 11:00 To 02:00	Marks: 70
(2) Instr (3) Draw	of Programmable calculator & a uctions written on main answer w neat diagrams and figures (if rame suitable data if needed.	book are strictly to be obeyed.	s prohibited.
Q-1	Attempt the following questi	ons:	(14)
b) c) d)	around	gnetic loading ce factor n case of cold rolled grain ories m ² (C) 3.7 Wb/m ² (D) 4.7	
f)	(A) +1 $(B) +1$ or -1 (C)	or -1 (D) +2 or -2 armature winding is that it musp winding	st be
g)	The maximum efficiency of a (A) at no load (B) (C) at 80% of full load (D)		
	Helical windings are used in (A) distribution transformers (C) shell type transformers	(B) power transformers (D) none of above	
i)	Cylindrical windings using transformers, are (A) Single layered (B) Double layered (C)Multi layered (D) None of the above	g circular conductors, em	ployed in
j)	In D.C. machines the usual lim (A) between 5 to 10 mm (C) between 15 to 20 mm (C)	B) between 10 to 15 mm	
k)	Losses in a machine increadimensions of the machine. (A) inverse (B) inverse (C) cube (D) square	square	the linear



	1)	The distance between the stars of two consecutive coils is measured in		
		terms of coil sides is called (A) Front pitch (B) Winding pitch		
		(C) Commutator pitch (D)Back pitch		
	n	a) The Pole shoes of a DC machine		
		(A)Are always laminated		
		(B) Are never laminated		
		(C) Are sometimes laminated		
		(D)Are partially laminated		
	n) Disc windings are primarily used in		
		(A) Short capacity transformers		
		(B) Medium capacity transformers		
		(C) High capacity transformers		
		(D) Any of the above		
Atter	npt ar	y four questions from Q-2 to Q-8		
Q-2		Attempt all questions	(14)	
	(a)	What are the factors which limit the design of an electrical machine?	(07)	
	(b)	Determine the main dimensions of the core, the number of turns and the	(07)	
		cross-section of the conductor for a 5 kVA, 11000/400 V, 50 Hz, single		
		phase core type distribution transformer. The net conductor are in the		
		window is 0.6 times the net cross-section of iron in the core. Assume a		
		square cross-section for the core. Maximum flux density is 1 Wb/m2,		
		current density is 1.4 A/mm2 and a window space factor is 0.2. The		
		height of window is 3 times its width.		
Q-3		Attempt all questions	(14)	
	(a)	Derive the KVA rating of the three phase transformer and show the	(07)	
		emf per turn Et= $K\sqrt{KVA}$.		
	(b)	Explain conducting and magnetic materials.	(07)	
Q-4		Attempt all questions	(14)	
	(a)	A design is required for a 50 kW, 4 pole, 600 r.p.m. d.c. shunt generator,	(07)	
		the full load terminal voltage being 220 V. If the maximum gap density is		
		0.83 Wb/m ² and the armature ampere conductors per metre are 30,000,		
		calculate suitable dimensions of armature core to give a square pole face.		
		Assume that the full load armature voltage drop is 3 per cent of the		
		rated terminal voltage, and that the field current is 1 percent of rated full		
	(b)	load current. Ratio of pole arc to pole pitch is 0.67.	(07)	
	(b)	Define the term: (a) Front pitch (b) Back pitch (c) Commutator pitch (d) Dummy coil (e)	(07)	
		Equalizer connection (f) Average pitch (g) Pole pitch		
0.5		Attempt all questions	(1.1)	
Q-5	(a)	Attempt all questions Explain the design procedure in the design of field windings for a D.C.	(14) (07)	
	(a)	shunt machine.	(07)	
	(b)	Derive the condition for the optimum design of transformer for the	(07)	
	(~)	minimum cost and minimum losses.	(01)	



Q-6		Attempt all questions	(14)
	(a)	Explain the design of Commutator of DC machine.	(07)
	(b)	A single phase, 400 V, 50 Hz, transformer is built from stampings having a relative permeability of 1000. The length of the flux path is 2.5 m, the area of cross section of the core is $2.5 \times 10^{-3} \text{ m}^2$ and the primary winding has 800 turns. Estimate the maximum flux and the load current of the transformer. The iron loss at the working flux density is 2.6 W/kg . Iron weighs $5.8 \times 10^3 \text{ kg/m}^3$. Stacking factor is 0.9 .	(07)
Q-7		Attempt all questions	(14)
	(a)	Define specific electric loading and magnetic loading and derive the output equation of D.C. machine.	(07)
	(b)	What are the types of windings commonly used in transformer and on what basis they are selected?	(07)
Q-8		Attempt all questions	(14)
	(a)	Explain various factors affecting selection of numbers of armature slots for D.C. machine.	(07)
	(b)	Explain different methods of cooling of transformers.	(07)

