R20 Regulation *Subject code: 3E5BA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech V Semester Regular/Supplementary Examinations, February 2024

ELECTRICAL MACHINE DESIGN

(EEE)

Maximum Marks: 70 Date:20.02.2024 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

	Part-A	CO	Bloom Tx
All the following questions carry equal marks (10x2M=20 Marks)			
1	List the factors to be considered for electrical machine design.	1	1
2	Define Space Factor.	1	1
3	Why the transformers output is rated in KVA?	2	1
4	State and brief the reason for laminating the core in a transformer	2	1
5	Why the no-load current of an induction motor is comparatively higher than a transformer?	3	1
6	Highlight the uses of Circle diagrams.	3	1
7	Compare Salient Pole Type and Cylindrical Type rotors of synchronous Machines.	4	1
8	Define the Short Circuit Ratio (SCR) of a Synchronous Machine.	4	1
9	List the assumptions of traditional electrical machine design	5	1
10	Differentiate between PMSM and BLDC..	5	1
	Part-B		
Answer All the following questions. (5X10M=50Marks)			Bloom Tx level
11	Discuss on choice of Specific Electrical and Magnetic Loadings in electrical machine design. [10m]	1	2
	OR		
12.a	Explain the factors contributing for the temperature rise in an Electrical Machine. [5m]	1	2
b	What is the role of engineering materials in efficient electrical machine design? Explain. [5m]	1	2
13	The current densities in the primary and secondary windings of a transformer are 2.2 and 2.1 A/mm^2 respectively. The ratio of transformation is 10:1 and the length of mean turn of the primary is 10 percent greater than that of the secondary. Calculate the resistance of the secondary winding given that the primary winding resistance is 10Ω. [10m]	2	4
	OR		

14.a	Briefly explain the procedure for designing the cooling tank of a transformer. [5m]	2	2
b	What is Voltage Regulation of a transformer? Explain the factors affecting it. [5m]	2	2
15	Find the main dimensions of a 12 kW, 3 phase, 400 V, 50 Hz, 2810 rpm, squirrel cage induction motor having efficiency of 0.95 and a full load power factor of 0.89.Assume: Specific magnetic loading = 0.3 Wb/m2; specific electric loading = 24000 A/m. Take the rotor peripheral speed as approximately 30 m/s at synchronous speed. [10m]	3	4
	OR		
16.a	Explain different rules for selecting the number of rotor slots in a Squirrel Cage Induction Motors. [5m]	3	2
b	Explain the design of Wound Rotor of induction motor. [5m]	3	2
17.a	Discuss on the design of Damper windings in Synchronous Machines. [5m]	4	3
b	Explain the design of stator of an synchronize machine[5m]	4	2
	OR		
18	Find the main dimensions of a 70 MVA, 11 kV, 50 Hz, 200 rpm, 3 phase water wheel generator. The average gap density is 0.55 Wb/m^2 and ampere conductors per meter are 32000. The peripheral speed should not exceed 40 m/s at normal running speed in order to limit the run-away peripheral speed. [10m]	4	4
19.a	Explain the construction and working of SRM. [5m]	5	2
b	Explain how the application of CAD makes the electrical machine analysis simple. [5m]	5	2
	OR		
20	What are the variables and constraints considered for electrical machine design optimization. [10m]	5	3