Enrollment No.: _____

NAVRACHANA UNIVERSITY
a UGC recognized University

School: School of Engineering and Technology
Program: B. Tech. Electrical Engineering
Year: 4th **Semester:** 7th
Examination: End Semester Examination
Examination year: December - 2021

Course Code: EE 420 **Course Name:** Electrical Machine Design - I
Date: 01/12/2021 **Total Marks:** 40
Time: 02:30 PM TO 04:30 PM **Total Pages:** 02

Instructions:

- *Write each answer on a new page.*
- *Use of a calculator is permitted.*
- *Figures to the right indicate full marks*
- *Assume the data wherever necessary by giving proper justification.*
- *Write answers as per the requirement and point wise only.*
- ** COs=Course Outcome mapping. # BTL=Bloom's Taxonomy Level mapping*

Q. 1	**(a)**	As the number of core stampings increases, diameter of the core in the transformer _____ . (a) increases (b) decreases (c) remains same (d) can't say anything	**[01]**	**CO2**	**BTL 4, 6**
	(b)	Which statement/s is/are right for the transformer, if frequency increases, _____ . I. Hysteresis losses decreases with constant voltage II. Rating of the transformer increases III. Copper losses increases IV. Total iron losses decreases (a) only I (b) I and II (c) I, II and III (d) I, II, III and IV	**[01]**	**CO2**	**BTL 3, 4**
	(c)	What should be the yoke area of the transformer if its core area is 0.0357 m^2? (a) 0.0403 m^2 (b) 0.0464 m^2 (c) 0.0431 m^2 (d) 0.0449 m^2	**[01]**	**CO2**	**BTL 3, 6**
Q. 2	List out insulating materials used in rotating AC and DC machines and in transformers.		**[02]**	**CO1**	**BTL 2**

Q. 3	**(a)**	How current transformer behaves under short circuit conditions? – Explain.	**[03]**	**CO3**	**BTL 2**
	(b)	Explain the construction of current transformer in detail.	**[04]**	**CO3**	**BTL 1, 6**
Q. 4		Explain the factors affecting to select number of stator slots in three phase induction motors in detail.	**[07]**	**CO4**	**BTL 4, 6**
Q.5		Explain the criteria to select specific magnetic loadings and specific electric loadings for the design of single phase and three phase induction motors in detail.	**[07]**	**CO4**	**BTL 4, 6**
		OR			
Q. 5		Explain the design of rotor turns, rotor conductors, rotor teeth and rotor core for slip ring induction motors along with necessary derivations.	**[07]**	**CO4**	**BTL 3, 6**
Q. 6		Why end-rings are required in squirrel cage induction motors? Derive the equations of end-ring currents and area of end-rings for squirrel cage induction motors.	**[07]**	**CO4**	**BTL 3, 4, 6**
Q. 7		Find the main dimensions and number of stator turns per phase of a 3.7 kW, 400 V, 3 phase, 4 pole, 50 Hz squirrel cage induction motor to be started by star-delta starter. Assume average flux density in the gap is 0.45 Wb/m^2, ampere conductors per meter is 23000, efficiency is 85 % and power factors is 0.84. This machine is sold at a competitive price and therefore choose the main dimensions to give a cheap design.	**[07]**	**CO4**	**BTL 4**
		OR			
Q. 7		The losses in a 11 kW, 3 phase, 4 kV, 50 Hz, 1000 rpm induction motor are: Copper losses = 950 W, Iron losses = 500 W, Friction and Windage losses = 110 W. Find the output, losses and efficiency of a similar motor designed with each linear dimension 2 times the linear dimensions of the given motor.	**[07]**	**CO4**	**BTL 4**

**************End of Question Paper**************