Total No. of Questions: 6

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Enrollment No.....



Faculty of Engineering End Sem (Even) Examination May-2018 EE3CO04/EX3CO04 Electrical Machines-I

Programme: B.Tech. Branch/Specialisation: EE/EX

Duration: 3 Hrs. Maximum Marks: 60

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of

	-	should be writte	. •		c or d.	weis (
Q.1	i.	For electromechanical energy conversion process, it is essential that coupling magnetic field reacts on (a) Electrical system						
		(b) Mechanical system						
		(c) Electrical a						
		(d) Electrical o	(d) Electrical or mechanical system					
	ii.	ii. Electromagnetic energy is developed in the following windin						
		(a) Resistive w	rinding	(b) Inductive	winding			
		(c) Capacitive	winding	(d) All of thes	se			
	iii.	The rating of tr	ransformer is	given by		1		
		(a) KW	(b) KVAr	(c) cosø	(d) KVA			
	iv.							
		working comp	onent may be	:				
		` '	(b) 0.6A	(c) 0A	(d) 2A			
	v.	1 1						
		(a) Single phas	-					
	(b) Two phase to three phase conversion(c) Three phase to two phase conversion							
		(d) Both (b) an	` '			1		
	vi. Percentage increase in load on each transformer when o							
		transformer is removed in the V-V connection:						
		` '	(b) 73%	(c) 50%	(d) 25%	_		
	vii.		•	hronous motor:		1		
		(a) Induction n		(b) Synchrono				
		(c) Both (a) an	d (b)	(d) None of the				
					P	$T \cap$		

P. I.O.

	viii.	Which motor is called rotating transformer:	1	Q.4	i.	Explain the concept of pulse transformer with the help of
		(a) Induction motor(b) Synchronous motor(c) Both (a) and (b)(d) None of these			ii.	equivalent circuit and also write its application and advantages. A three phase 4 wire supply system has a line voltage of 400V.
	ix.	Rotor bars of a squirrel cage motor are made slightly skewed in	1		11.	Three non-inductive loads of 16KW, 8KW and 12KW are
		order to reduce	-			connected between R, Y and B phases and the neutral
		(a) Cogging (b) Crawling				respectively. Calculate the current flowing through the neutral
		(c) Ohmic losses (d) Core losses				wire.
	х.	Induction machine operates as generator when slip(s) is	1	OR	iii.	A 400kVA load at 0.7 p.f. lagging is supplied by three single
		(a) Less than zero (b) One				phase transformer connected in Δ - Δ . Each of the Δ - Δ
		(c) More than one (d) 0.5				transformer is rated at 200kVA, 2300/230V. If one defective
Q.2	i	State the advantages of analysing energy conversion devices by	2			transformer is removed from service, calculate for the V-V connection:
Q.2	1.	field energy concept?	2			(a) The kVA load carried by each transformer
	ii.	Draw and explain the general block diagram of an	3			(b) Percentage rated load carried by each transformer
	111.	electromechanical energy conversion device.				(c) Total KVA ratings of the transformer bank in V-V
	iii.	A toroid is excited by a single coil. Discuss the conditions under	5			(d) Ratio of V-V bank to Δ - Δ bank transformer ratings
		which this toroid can extract energy from the supply system.				(e) Percentage increase in load on each transformer when one
OR	iv.	For a singly excited magnetic system derive the relation for the magnetic stored energy in terms of reluctance.	5			transformer is removed
				Q.5	i.	Explain working principle of induction motor with the help of
Q.3	i.	Draw the phasor diagram of ideal and no load single phase	2			construction diagram.
		transformer.			ii.	An induction motor has an efficiency of 90% when the shaft
	ii.	A transformer is designed to have hot rolled steel lamination	8			load is 45kW. At this load, stator ohmic loss and rotor ohmic
		with a flux density of 1.2T and the weight of core and wire is				loss each is equal to the iron loss. The mechanical loss is one
		found to be 100kg and 80kg respectively. If the transformer is				third of the no load losses. Neglect ohmic loss at no load.
		redesigned with CRGO steel laminations, which permit a higher				Calculate the slip.
		flux density of 1.6T; find the saving in core and wire material.		OR	iii.	Explain the production of torque in a 3 phase slip ring induction
		The two types of core material have the same densities and total				motor through the interaction of flux and mmf waves, when the
		flux remain same.				rotor is running at a speed less than synchronous speed.
OR	iii.	A transformer has its maximum efficiency of 98% at 15kVA at	8			
		unity P.F., During the day it is loaded as under:		Q.6		Write short note on any two of the following:
		12 hours: 2KW at 0.5 p.f. lagging			i. 	Cogging and Crawling of Induction motor
		6 hours: 12KW at 0.8 p.f. lagging			11.	Starting of squirrel cage Induction motor
		6 hours: 18KW at 0.9 p.f. lagging Find the all-day efficiency.			iii.	Speed control of Induction motor

Marking Scheme

EE3CO04/EX3CO04 Electrical Machines-I

Q.1	i.	For electromechanical energy conversion process, it is essential that coupling magnetic field reacts on (d) Electrical or mechanical system					
	ii.	Electromagnetic energy is developed in the following winding					
		(b) Inductive winding					
	iii.	The rating of transformer is given by		1			
		(d) KVA	d) KVA				
	iv.	The no load current of a certain transformer is 2A	A at 0.3 P.F Its	1			
		working component may be:					
		(b) 0.6A					
	v.	v. Scott connection is used for the purpose of					
		(d) Both (b) and (c)					
	vi. Percentage increase in load on each transformer when						
		transformer is removed in the V-V connection:					
		(b) 73%					
	vii. Which motor is called asynchronous motor:			1			
		(a) Induction motor					
	viii.		1				
		(a) Induction motor					
	ix. Rotor bars of a squirrel cage motor are made slightly ske						
		order to reduce					
		(a) Cogging					
	х.	Induction machine operates as generator when sl	ip(s) is	1			
		(a) Less than zero					
Q.2	i.	Advantages of analysing energy conversion devi-	ces	2			
		1 mark for each	(1 mark * 2)				
	ii.	Electromechanical energy conversion device.	2 marks	3			
		Diagram	1 mark				
	iii.	Diagram	2 marks	5			
		Explanation	2 marks				
		Equation	1 mark				
OR	iv.	Diagram	2 marks	5			
		Explanation	2 marks				
		Equation	1 mark				
		Equation	1 Illalk				

Q.3	i.	Phasor diagram of ideal single phase transformer	1 mark	2		
		Phasor diagram of no load single phase transformer	. 1 mark			
	ii.	The weight of core and wire 2 mark each	4 marks	8		
		The saving in core and wire material. 2 mark each	4 marks			
OR	iii.	12 hours: 2KW at 0.5 p.f. lagging	2 marks	8		
		6 hours: 12KW at 0.8 p.f. lagging	2 marks			
		6 hours: 18KW at 0.9 p.f. lagging	2 marks			
		All-day efficiency.	2 marks			
Q.4	i.	Equivalent circuit	1 mark	3		
Q.T	1.	Its application	1 mark	3		
			1 mark			
	::	Advantages.		7		
	ii.	2 marks for each phase current (2 marks * 3)	6 marks	7		
OD		Neutral wire.	1 mark	_		
OR	iii.	A 400kVA load at 0.7 p.f. lagging is supplied by	•	7		
		phase transformer connected in Δ - Δ . Each				
		transformer is rated at 200kVA, 2300/230V. If of				
transformer is removed from service, calculate for the V-V connection:						
		(a) The kVA load carried by each transformer	2 marks			
		(b) Percentage rated load carried by each transformed	er			
		•	2 marks			
		(c) Total KVA ratings of the transformer bank in V-	-V			
		· ·	1 mark			
		(d) Ratio of V-V bank to Δ - Δ bank transformer ratings				
			1 mark			
		(e) Percentage increase in load on each transform	ner when one			
		transformer is removed	1 mark			
Q.5	i.	Working principle of induction motor	2 marks	4		
Q.5	1.		2 marks	4		
	::	Diagram.		,		
	ii.	Stator ohmic loss	2 marks	6		
		Rotor ohmic loss	2 marks			
OB		Calculate the slip.	2 marks	_		
OR	iii.	Diagram	2 marks	6		
		Explanation	2 marks			
		Formula (equation)	2 marks			

Q.6		Write short note on any two of the following:				
	i.	Cogging of Induction motor	2.5 marks	5		
		Crawling of Induction motor	2.5 marks			
	ii.	Starting of squirrel cage Induction motor		5		
		Diagram	2 marks			
		Explanation	3 marks			
	iii.	Speed control of Induction motor (two methods)		5		
		Diagram 1 mark each (1 mark * 2)	2 marks			
		Explanation 1.5 mark each (1.5 mark * 2)	3 marks			
