TED (21) 4033 (Revision - 2021)

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/ COMMERCIAL PRACTICE, APRIL - 2025

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INDUCTION MACHINES

[Maximum marks: 75]

PART A

I. Answer all the following questions in one word or one sentence. Each question carries 1 mark.

		(9 x 1 = 9 Marks)	
		Module	Cognitive
		outcome	level
1	Define voltage transformation ratio of a transformer.	M1.02	R
2	The component of primary current which is in quadrature with V_1	M1.03	R
	is		
3	Give reason for laminating the core transformer.	M1.01	R
4	List any two types of cooling used in transformers.	M2.04	R
5	Write the name of the test conducted on a transformer to find copper	M2.01	R
	loss.		
6	If "s' is the slip and 'f' is the supply frequency, the rotor frequency	M3.01	R
	is given by		
7	Name the electrical machine to which an induction motor is	M3.04	R
	analogous to		
8	Name any two methods of speed control of induction motor.	M4.03	R
9	List any two applications of an induction motor.	M4.04	R

PART B

II. Answer any eight questions from the following. Each question carries 3 marks.

		$(8 \times 3 = 24 \text{ Marks})$	
		Module	Cognitive
		outcome	level
1	Derive the emf equation of a transformer.	M1.02	U
2	Explain the phasor diagram of a practical transformer on no load.	M1.03	U
3	List any three differences between core type and shell type	M1.01	R
	transformer.		

[Time: 3 Hours]

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4	Derive the condition for maximum efficiency of a transformer.	M2.01	U
5	State the conditions to be fulfilled for parallel operation of three	M2.04	R
	phase transformers.		
6	A 3-phase induction motor is wound for 4 poles and is supplied	M3.01	А
	from 50 Hz system. Find the synchronous speed and speed of rotor		
	at a slip of 4%.		
7	List any 3 differences between squirrel cage and wound rotor	M3.01	R
	constructions of induction motor.		
8	Explain the phenomenon of crawling in an induction motor.	M3.02	U
9	Write the equation for torque of an induction motor at standstill and	M3.02	R
	running conditions.		
10	Name any three starters used for starting a 3- ϕ induction motor.	M4.02	R

PART C Answer all questions. Each question carries seven marks.

		(6 x 7 = 42 Marks)	
		Module	Cognitive
		outcome	level
III	A 50 kVA, 4400/220 V transformer has $R_1 = 3.45 \Omega$, $R_2 = 0.009 \Omega$,	M1.04	А
	$X_1 = 5.2 \Omega$, $X_2 = 0.015 \Omega$. Calculate the equivalent resistance,		
	reactance and impedance referred to both primary and secondary.		
	OR		
IV	The no load current of a transformer is 5A at 0.25 p.f. when supplied	M1.02	А
	with 235 V, 50 Hz supply. The number of turns in primary winding		
	is 200. Calculate		
	(i) Maximum flux in the core		
	(ii) Core loss		
	(iii) Magnetizing component		
V	Show that the saving of copper in an autotransformer is $(1-K)W_2$	M2.03	U
	where K is the voltage transformation ratio and W_2 is the weight of a		
	two winding transformer of same rating.		

	OR		
VI	Explain SC and OC test conducted on a transformer.	M2.01	U
VII	Obtain the equivalent circuit of a 200/400 V, 50 Hz, 1 \u03c6 transformer,	M2.01	А
	referred to primary, from the following data:		
	O.C.test: 200 V, 0.7 A, 70 W – on L.V. side		
	S.C.test: 15 V, 10 A, 85 W – on H.V. side		
	OR		
VIII	A 11000/230 V, 150 kVA, 1 phase, 50 Hz transformer has core loss	M2.01	А
	of 1.4 kW and full load copper loss of 1.6 kW. Determine		
	(i) kVA load for maximum efficiency and value of		
	maximum efficiency at unity p.f		
	(ii) The efficiency at half full load and 0.8 p.f leading		
IX	Derive the relation between rotor input, rotor copper losses and	M3.03	U
	mechanical power developed in terms of slip of a three-phase		
	induction motor.		
	OR		
Х	Derive the condition for the maximum torque in a $3-\phi$ induction	M3.02	U
	motor and obtain the expression for the maximum torque.		
XI	Explain a star delta starter for starting a 3-ph induction motor.	M4.02	U
	OR		
XII	Explain the constructional features and equivalent circuit of double	M4.04	U
	cage induction motor.		
XIII	Describe any two methods of braking of an induction motor.	M4.03	U
	OR		
XIV	Explain the different steps involved in constructing a circle diagram	M4.01	U
	of a 3-ph induction motor with necessary figures.		
