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## **Question Paper Code: U3302**

B.E./B.Tech. DEGREE EXAMINATION, NOV 2024

Third Semester

Electrical and Electronics Engineering

21UEE302 - Electrical Machines - I

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

## PART A - (10 x 1 = 10 Marks)

1. According to Fleming's left-hand rule if the forefinger points in the direction of the CO2-U field than the middle finger will point in the direction of

(a) Current in the conductor	(b) Resultant force on the conductor
(c) Movement of the conductor	(d) None of the above

2. While comparing magnetic and electric circuits, the flux of magnetic circuit is CO2- U compared with which parameter of electrical circuit?

(a) E.m.f. (b) Current (c) Current density (d) Conductivity

- 3. The armature reaction in d.c. machine causes distortion in the main field CO1- U flux. This effect of armature reaction can be reduced by
  - (a) Increasing the length of air gap (b) Decreasing the length of air gap
  - (c) Increasing the number of poles (d) Decreasing the number of poles
- 4. In D.C. generators, current to the external circuit from armature is given CO1-U through
  - (a) commutator (b) solid connection (c) slip rings (d) none of above
- 5. Which of the following application requires high starting torque? CO4- U

(a) Air blower(b) Elevator(c) Locomotive(d) Centrifugal Pump

- 6. A 4 pole wave wound dc motor having flux per pole of  $9.56 \times 10-3$  wb contains CO4- App 460 armature conductors. Calculate the back emf produced when it is running at a speed of 1500 rpm.
  - (a) 220 volt (b) 230 volt (c) 240 volt (d) 440 volt

7.	A tr wine	ansformer has 50 dings. The transf	00 turns in the primary primation ratio is	and 1,000 turns in the	e secondary	CO5- App	
	(a) 2	2	(b) 4	(c) 5	(d) 6		
8.	The	Transformer rati	ngs are usually express	ed in terms of		CO5- U	
	(a) <b>v</b>	Volts	(b) Amps	(c) KW	(d) KV4	A	
9.	An A	Auto-transformer	makes effective saving	g on copper, when its tr	ransformation	CO5- U	
	(a) <i>A</i>	Approximately ec	ual to one	(b) less than one			
	(c) Greater than one (d) None of the above						
10.	The det	e efficiency of tw ermined by	o identical transformer	s under load conditions	s can be	CO5- U	
	(a) S	SC Test	(b) Back to Back Test	(c) OC Test	(d) BDV T	`est	
			PART – B (5	x 2= 10Marks)			
11.	. State Faraday's law of electromagnetic induction						
12.	How is the inter pole winding in dc machine excited? CO1- U						
13.	<sup>3.</sup> DC series motor is used to start heavy loads - Identify?						
14.	4. What is an ideal transformer?						
15.	Defi com	ine all day effi mercial efficienc	ciency. Explain why y.	all day efficiency is	lower than	CO6- U	
			PART – C (	5 x 16= 80 Marks)			
16.	(a)	Use the electro the expression with neat diagra	mechanical energy con for mechanical force of m.	nversion principle to de developed by magnetic	evelop CO2-A c field	App (16)	
			Or				
	(b)	Apply the conce expression for the machines.	epts of co-energy and find the electromagnetic torc	leld energy to develop t que for the singly –exci	ted	Арр (16)	
17.	(a)	Explain the effect of armature reaction in a dc generator. How are its CO1- U demagnetizing and cross magnetizing calculated.					
	(b)	Derive an expre	ssion for the EMF gene	erated in the DC maching	ne. CO1-	U (16)	

18. (a) Analyze various methods of speed control technique and choose CO4- Ana (16) the appropriate method to obtain below and above rated speed in dc shunt motors.

## Or

- (b) Analyze the operation of different types of starters and Select CO4- Ana (16) suitable starter for the motor used in high starting torque and constant speed applications. Discuss why starting current is high at the moment of starting a DC Motor?
- 19. (a) Explain the constructional details and working of core type and CO5-U (16) shell type transformers with neat sketches.

## Or

- (b) A 40 KVA transformer has iron loss of 450W and full load copper CO6- App (16) loss of 850W. If the power factor of the load is 0.8 lagging, Calculate (i) full load efficiency (ii) the load at which maximum efficiency occurs and (iii) the maximum efficiency
- 20. (a) Explain the parallel operation of three phase transformers. CO5-U (16) Or (b) Interpret in detail about the content operator of the prime of the prime of the content of the conte
  - (b) Interpret in detail about the autotransformer, their principle. Arrive CO5-U (16) at the expression for saving of copper.