

Enrollment No.....



Faculty of Engineering  
End Sem Examination May-2023  
EE3CO37 / EE3CO13 / EX3CO13  
Electrical Machines -II

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 Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

- Q.1 i. Which axis undergoes shifting as a result of armature reaction? **1**  
 (a) GNA (b) MNA  
 (c) Both (a) and (b) (d) Remain fixed
- ii. Which of the following part is used in construction of DC machine but not in AC machine? **1**  
 (a) Armature Winding (b) Field Winding  
 (c) Commutator (d) Shaft
- iii. What happens to DC motor speed, if accidentally the field circuit is open circuited, it becomes- **1**  
 (a) 50% of rated (b) 70% of rated  
 (c) Dangerously high (d) 10% of rated
- iv. The speed of DC motor below rated speed is obtained by- **1**  
 (a) Field control (b) Armature control  
 (c) Both (a) and (b) (d) Leakage flux control
- v. A leading power factor load on an alternator implies that its voltage regulation shall be **1**  
 (a) Positive (b) Zero (c) Infinite (d) Negative
- vi. An under excited alternator always supplies **1**  
 (a) Unity power factor current  
 (b) Leading power factor current  
 (c) Lagging power factor current  
 (d) None of these

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- vii. Damper windings are used in synchronous machine to **1**  
 (a) Reduce vibrations (b) Increase voltage fluctuations  
 (c) Damped out oscillations (d) Both (a) and (c)
- viii. What are the probable causes of hunting? **1**  
 (a) Sudden change in load  
 (b) Constant supply  
 (c) Sudden change in field current  
 (d) Both (a) and (c)
- ix. Synchronous motors are **1**  
 (a) Not self-starting (b) Self-starting  
 (c) Single excited (d) None of these
- x. The V-curves of a synchronous motor show relationship between **1**  
 (a) Armature current and supply voltage  
 (b) AC armature current and DC field current  
 (c) Excitation current and back EMF  
 (d) Back EMF and AC armature current
- Q.2 i. Describe the working principle of DC generator. **2**  
 ii. Differentiate the single and double layer winding with suitable diagrams. **3**  
 iii. Illustrate in detail any two methods of commutation improvements in DC machines. **5**
- OR iv. Illustrate in detail any two methods of excitation of DC generators and their characteristics. **5**
- Q.3 i. Classify DC motor speed control methods. Explain one of them in detail with suitable diagram and equations. **4**  
 ii. A 230 Volts DC motor no load current is 2 amps, and no load speed is 1200 RPM. If full load current is 40 amps, find the following: **6**  
 (a) Speed on full load  
 (b) Percentage speed regulation.  
 Assume flux remain constant. Resistance of armature is 0.25 ohm.
- OR iii. Explain in detail the Swinburne's test for estimation of DC motor efficiency. Support your answer with suitable diagram and equations. **6**
- Q.4 i. Discuss the excitation system in synchronous generator. Explain brushless excitation system in detail. **4**

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- ii. Illustrate the synchronous impedance method for finding the voltage regulation of alternator with suitable diagram and equations. **6**
- OR iii. A three phase 4 pole, 24 slots alternator has its armature coils short circuited by one slot. Find distribution factor and pitch factor. **6**
- Q.5 i. Classify the effect of varying excitation on synchronous generator with suitable phasor diagrams. **3**  
 ii. Explain in detail slip test for determination of  $X_d$  and  $X_q$  for salient pole synchronous machine. Illustrate your answer with suitable diagrams and equations. **7**
- OR iii. Explain in detail the parallel operation and load sharing of two alternators with suitable diagram and equations. **7**
- Q.6 Attempt any two:  
 i. Elaborate any two starting methods of synchronous motor. **5**  
 ii. Draw and explain V curves and inverted V curves. **5**  
 iii. Illustrate synchronous motor as power factor correcting device. **5**

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### Marking Scheme

#### EE3CO37-EE3CO13-EX3CO13 (T) Electrical Machine-II

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Q.1	i)	(b) MNA	1
	ii)	(c) Commutator	1
	iii)	(c) Dangerously high	1
	iv)	(b) Armature control	1
	v)	(d) Negative	1
	vi)	(b) Leading power factor current	1
	vii)	(d) Both (a) and (c)	1
	viii)	(d) Both (a) and (c)	1
	ix)	(a) not self-starting	1
	x)	(b) AC armature current and DC field current	1
Q.2	i.	working principle	2
	ii.	single- and double-layer winding	1.5X2
	iii.	two methods of commutation improvements	2.5X2
OR	iv.	two methods of excitation	2.5X2
Q.3	i.	DC motor speed control methods. Explain on of them	2,2
	ii.	find (a) speed on full load, (b) percentage speed regulation	3,3
OR	iii.	Explanation, suitable diagram and equations.	1.5,3,1.5
Q.4	i.	Excitation system. Explain brushless excitation system	2,2
	ii.	Explanation, suitable diagram and equations.	3,1.5X2
OR	iii.	Distribution factor and pitch factor.	3,3
Q.5	i.	effect of varying excitation	3
	ii.	Explanation, suitable diagram and equations.	3,2X2
OR	iii.	Explanation, suitable diagram and equations.	3,2X2
Q.6			
	i.	Elaborate any two starting methods of synchronous motor.	2X2.5
	ii.	Draw and explain V curves and inverted V curves.	2X2.5
	iii.	Illustrate synchronous motor as power factor correcting device.	5