Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering
End Sem Examination Dec-2023
RA3CO37 Electrical Machines & Power Systems

Programme: B.Tech. Branch/Specialisation: RA

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. What is the working principle of a Transformer? **1**
(a) Transformer works on the principle of self-induction
(b) Transformer works on the principle of mutual induction
(c) Transformer works on the principle of ampere law
(d) Transformer works on the principle of coulomb law

ii. Primary winding of a transformer _____. **1**
(a) Could either be a low voltage or high voltage winding
(b) Is always a high voltage winding
(c) Cannot be determined
(d) Is always a low voltage winding

iii. If A is the number of parallel paths and P is the number of poles, then the number of parallel paths in lap winding and in wave winding is- **1**
(a) A = P, A = 2 (b) A = 2P, A = P
(c) A = 2, A = P (d) A = P, A = 2P

iv. If field flux decreases then speed of dc motor will be- **1**
(a) Decreases (b) Increases (c) No effect (d) None of these

v. An 8-pole, 3-phase, 50 Hz induction motor is operating at a speed of 720 rpm. The frequency of the rotor current of the motor in Hz is _____. **1**
(a) 2 (b) 4 (c) 3 (d) 1

vi. The rotor speed of induction motor is always _____ synchronous speed. **1**
(a) Smaller than (b) Greater than
(c) Equal to (d) None of these

vii. Which of the following motor rotates in discrete angular steps? **1**
(a) Servo motor (b) DC motor
(c) Stepper motor (d) Linear Induction Motor (LIM)

viii. Servo motor is a- **1**
(a) A motor that uses a feedback loop to control its position.
(b) A motor that uses a variable reluctance to control its speed.
(c) A motor that uses a permanent magnet to control its torque.
(d) A motor that uses a stepper motor to control its position.

ix. Which of the following is usually not the generating voltage? **1**
(a) 6.6 kV (b) 9.9 kV (c) 11 kV (d) 13.2 kV

x. Hydroelectric power plant is _____. **1**
(a) Non-renewable source of energy
(b) Conventional source of energy
(c) Non-conventional source of energy
(d) Continuous source of energy

Q.2 i. Explain Principle of operation of single-phase transformer. Also write its application. **2**

ii. Draw and explain no load phasor diagram of single-phase transformer. **3**

iii. A 10-kVA, 200-V/400-V, 50-Hz, single-phase transformer gave the following test results. **5**
OC test (HV winding open): 200 V, 1.3 A, 120 W.
SC test (LV winding shorted): 22 V, 30 A, 200 W.
Calculate (a) the magnetizing current, and (b) the equivalent resistance and leakage reactance as referred to the low voltage side.

OR iv. Discuss the various three phase groups and connection also mention its significance. **5**

Q.3 i. Write principle of operation of DC motor. **2**

ii. Derived the emf equation of DC machine. **3**

iii. Plot and explain the Torque-Speed characteristics of dc shunt and series motor. **5**

OR iv. Explain different types of DC motors with suitable circuit diagram and equation. **5**

Q.4 i. Explain why single-phase induction motor is not self-starting. **2**

ii. Differentiate squirrel cage and slip ring type of three phase induction motor. **3**

iii. Discuss with help of phasor diagram how rotating magnetic field produced in air gap of three phase induction motor. **5**

OR iv. Draw and explain Torque- slip characteristics of three phase induction motor. **5**

Q.5 i. Write principle of operation of stepper motors. **2**

ii. Write application of permanent magnet brushless DC Motors. **3**

iii. Write principle of operation, applications and types of servo motor. **5**

OR iv. Explain modes of excitation of stepper motors also write its applications. **5**

Q.6 Attempt any two:

i. Explain working of thermal power plant with suitable diagram. **5**

ii. Explain Structure of electric power systems with single line diagram. **5**

iii. Differentiate between conventional and nonconventional energy sources. **5**

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Marking Scheme
Electrical Machines & Power System (T) - RA3CO37 (T)

Q.1	i)	b) Transformer works on the principle of mutual induction		**1**
	ii)	a) Could either be a low voltage or high voltage winding		**1**
	iii)	a) A = P, A = 2		**1**
	iv)	b) increases		**1**
	v)	a) 2		**1**
	vi)	a) Smaller than		**1**
	vii)	c) Stepper motor		**1**
	viii)	a) A motor that uses a feedback loop to control its position.		**1**
	ix)	b) B9.9 kV		**1**
	x)	b) Conventional source of energy		**1**
Q.2	i.	Principle of …….application	(As per explanation)	**2**
	ii.	Draw: Explain:	2 Marks 1 Mark	**3**
	iii.	(*a*) the magnetizing current: (*b*) the equivalent …….	2.5 Marks 2.5 marks	**5**
OR	iv.	groups and connection: significance:	4 Marks 1 Mark	**5**
Q.3	i.	Principle of operation of DC motor	2 Marks	**2**
	ii.	The emf equation of DC machine	3 Marks	**3**
	iii.	Plot: Explain:	3 Marks 2 Marks	**5**
OR	iv.	Types of DC motors with …….equation: Equation :	3 Marks 2 marks	**5**
Q.4	i.	Explanation	2 Marks	**2**
	ii.	Each differentiation:	1 Marks	**3**
	iii.	Phasor diagram and equation Explanation:	3 Marks 2 Marks	**5**
OR	iv.	Draw: Explain:	3 Marks 2 Marks	**5**
Q.5	i.	Principle of operation	2 Marks	**2**
	ii.	Each 1 marks	(1 Mark*3)	**3**
	iii.	Principle of operation applications: Types of servo motor	2 Marks 2 Marks 1 Marks	**5**
OR	iv.	Modes of excitation: Applications	3 Marks 2 Marks	**5**
Q.6	i.	Explain working: suitable diagram:	2.5 Marks 2.5 Marks	**5**
	ii.	Explanation: single line diagram:	2.5 Marks 2.5 Marks	**5**
	iii.	Each 1 marks	(1 Mark*5)	**5**

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