

Total No. of Questions: 6

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Enrollment No.....



Faculty of Engineering
End Sem (Odd) Examination Dec-2022
EE3CO25 / EX3CO25

Fundamentals of Industrial Electrical Drives

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.

- Q.1
- i. In case of travelling cranes, the motor preferred for boom hoist- **1**
(a) AC Slip Ring Motor (b) DC Shunt Motor
(c) Synchronous Motor (d) Single Phase Motor
 - ii. What type of force handles for active torques? **1**
(a) Strong nuclear forces (b) Weak nuclear forces
(c) Gravitational forces (d) Electrostatic forces
 - iii. Speed of DC motors are controlled by- **1**
(a) Flux control method (b) Rheostatic control method
(c) Voltage control method (d) All of these
 - iv. Type-A chopper is used for obtaining which type of mode- **1**
(a) Motoring (b) Regenerative braking
(c) Reverse motoring (d) Reverse regenerative braking
 - v. Regenerative braking is possible with- **1**
(a) Static Scherbius drive (b) Pole changing
(c) Rotor resistance control (d) Stator voltage control
 - vi. In motoring mode, the phase angle between the stator phase voltage and stator phase current will be- **1**
(a) $< 90^\circ$ (b) $> 90^\circ$ (c) $< 40^\circ$ (d) $> 120^\circ$
 - vii. In closed loop self-control of synchronous motor drive, the feedback signal is taken from- **1**
(a) Stator induced EMF (b) Rotor voltage
(c) Stator current (d) Supply voltage

P.T.O.

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- viii. No. of thyristors required in load-commutated inverter synchronous motor drive- **1**
 (a) 3 (b) 6 (c) 12 (d) 24
- ix. The acronym PLC stands for- **1**
 (a) Pressure Load Control
 (b) Programmable Logic Controller
 (c) Pneumatic Logic Capstan
 (d) PID Loop Controller
- x. Rung in a PLC program is- **1**
 (a) Horizontal connection (b) Vertical connections
 (c) A buffer device (d) A transformer
- Q.2 i. Explain electric drives in brief with the help of fundamental block diagram. **2**
 ii. Clarify the multi-quadrant operation of electric drive using example of a lift. **3**
 iii. Derive and explain the steady state stability criterion for the electric drives. Support your answer through graphical representations. **5**
- OR iv. Derive the fundamental torque equation for electric drives. Also, classify the load torque. **5**
- Q.3 i. Illustrate the rheostatic braking operation for separately excited DC motor drive with suitable diagram. **3**
 ii. A 220 V, 1500 rpm, 10 A separately excited motor has an armature resistance of 2 Ohms. The motor is driven from a single-phase fully-controlled rectifier operating in continuous conduction mode. The input is rated at 230V, 50Hz. Calculate the firing angle of the controlled rectifier, if the motor runs at 600 rpm developing rated torque. **7**
- OR iii. Describe the operation of three phase fully controlled separately excited DC motor drive. Illustrate the operation with required waveforms. **7**
- Q.4 i. Explain the control of three phase induction motor by ac voltage controllers in short. **4**

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- ii. With suitable schematic diagram, explain the static Kramer drive method of controlling the speed of three phase induction motors. **6**
- OR iii. Describe the operation of static rotor resistance control of three phase induction motors with suitable diagram and equations. **6**
- Q.5 i. Write four differences between separate and self-control of synchronous motors. **4**
 ii. Explain the load commutated CSI fed synchronous motor, operation with suitable waveforms. **6**
- OR iii. Explain in detail the closed loop operation of synchronous motor with suitable diagram. **6**
- Q.6 Short note on any two:
- i. PLC systems basic configuration **5**
 ii. PLC applications in ac drive control **5**
 iii. Internal architecture of PLC **5**

Marking Scheme

EE-EX3CO03 Electrical Measurement & Instrumentation

Q.1	i)	d) permanent magnet and dynamometer type	1
	ii)	b) Eddy current	1
	iii)	c) dynamometer type	1
	iv)	a) ampere hour meter	1
	v)	a) ac ammeter and ac voltmeter respectively	1
	vi)	d) Both sensitivity of detector and applied voltage	1
	vii)	c) Wheatstone bridge	1
	viii)	c) greater than 1 but less than 10	1
	ix)	b) Inductive	1
	x)	b) Bipolar	1
Q.2	i.	Classification of errors that occurs in the measuring instruments.	3
	ii.	Working, construction, advantages & disadvantages of MI instrument.	2,2, 1.5,1.5
OR	iii.	Explanation of D' Arsonval galvanometer, Diagram	5,2
Q.3	i.	Measurement of reactive power by single wattmeter.	3
	ii.	Diagram, Derivation and method of calculation	2,5
OR	iii.	Explanation of single-phase power factor meter. Advantages & disadvantages.	4, 1.5,1.5
Q.4	i.	Compare potential and current transformers.	3
	ii.	Diagram	2
		Explain loss of charge methods for resistance measurement.	3
		How it is different from other methods?	2
OR	iii.	Discuss following methods for measurement of earth resistance: (a) Fall of potential method (b) Earth tester	3.5*2=7
Q.5	i.	What are different sources of errors in Bridge circuit.	3
	ii.	Discuss Andersons bridge in details.	5
		How this bridge is the advanced form of Maxwell's inductance capacitance bridge.	2
OR	iii.	Discuss Schering bridge in details.	5
		What are the advantages of this bridge?	2

Q.6

Attempt any two:

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|------|--|----------------|
| i. | Write short note on: (a) Piezo-electric transducer (b) Hall-effect transducer | 2.5*2=5 |
| ii. | What is LVDT? Explain its working with necessary diagram and applications of LVDT. | 1,4 |
| iii. | Explain with neat diagram various parts and working of CRO. | 2,3 |
