Reg. No.																

Question Paper Code	14457

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2026

Fourth Semester

Electronics and Instrumentation Engineering

(Common to Instrumentation and Control Engineering)

20EIPC401 – ELECTRICAL MACHINES

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART – A (i) (MCQ)
(16 × 1 = 16 Marks)
Answer ALL Questions

		Marks	*K – Level*	*CO*
1.	In which of the following case the maximum power is obtained? a) E_b = 4 x supply voltage b) E_b = supply voltage c) Supply voltage = 2 x E_b d) supply voltage = 4 x E_b	*1*	*K1*	*CO1*
2.	The speed of a DC shunt motor can be raised above its rated value by a) inserting an additional resistance in the armature circuit. b) inserting an additional resistance in the field circuit. c) reducing the applied voltage. d) using either of the above methods.	*1*	*K2*	*CO1*
3.	A three point starter is considered suitable for a) Shunt motors b) Shunt as well as compound motors c) Shunt, compound and series motors d) All D.C. motors	*1*	*K1*	*CO1*
4.	The frequency of the secondary voltage in a transformer is a) Higher than primary frequency b) Lower than primary frequency c) Equal to primary frequency d) zero	*1*	*K2*	*CO2*
5.	Copper loss in a transformer occurs due to a) Core resistance b) Winding resistance c) Mechanical friction d) Magnetic leakage	*1*	*K1*	*CO2*
6.	The primary winding of a transformer has a 230 V AC supply. What is the value of secondary voltage if the turn ratio is 10? a) 230 V b) 23 V c) 23000 V d) 2300 V	*1*	*K2*	*CO2*
7.	In an alternator, the field winding is usually placed on the a) Stator b) Rotor c) Frame d) Core	*1*	*K1*	*CO3*
8.	A synchronous motor is not self-starting because a) It has high losses b) Average starting torque is zero c) Rotor resistance is high d) Supply frequency is low	*1*	*K1*	*CO3*
9.	The frequency of voltage generated by an alternator having 8 poles and rotating at 240 rpm is a) 60 Hz b) 50 Hz c) 25 Hz d) 16 Hz	*1*	*K2*	*CO3*
10.	A 3-phase 440 V, 50 Hz induction motor has 8% slip. The frequency of rotor current will be a) 50 Hz b) 25 Hz c) 2 Hz d) 4 Hz	*1*	*K2*	*CO4*
11.	Which of the following motors is self-starting? a) Synchronous motor b) Single phase induction motor c) Three-phase induction motor d) Stepper motor	*1*	*K1*	*CO4*

12.	The direction of rotation of a three-phase induction motor can be reversed by a) Changing rotor resistance b) Interchanging any two supply lines c) Reducing frequency d) Increasing voltage	*1*	*K2*	*CO4*
13.	In a shaded-pole motor, the shaded portion of the pole is surrounded by a) Resistor b) Capacitor c) Copper Ring d) Inductor	*1*	*K1*	*CO5*
14.	The rotor of a repulsion motor is similar to that of a a) Synchronous motor b) DC motor c) Induction motor d) Stepper motor	*1*	*K1*	*CO5*
15.	The accuracy of a stepper motor depends on a) Rotor colour b) Step angle c) Supply frequency only d) Brush size	*1*	*K1*	*CO5*
16.	A stepper motor completes 100 steps in one revolution. What is the step angle? a) 15° b) 3.6° c) 5.1° d) 10°	*1*	*K2*	*CO5*

PART – A (ii) (Short Answer Questions)
(8 × 3 = 24 Marks)
Answer ALL Questions

17.	Identify the possible causes for the failure of a generator to build up voltage.	*3*	*K3*	*CO1*
18.	Differentiate the various types of DC motors based on their construction, characteristics, and applications.	*3*	*K2*	*CO1*
19.	Construct the no-load phasor diagram of a transformer and derive the expressions for no-load primary current and secondary current.	*3*	*K3*	*CO2*
20.	The output current corresponding to the maximum efficiency for a transformer having a core loss of 200 W and equivalent resistance referred to secondary of 0.45 ohm is ----------	*3*	*K3*	*CO2*
21.	A three phase 6 pole alternator has a star connected winding with 144 slots and 10 conductors per slot. The flux per pole is 0.06 weber which is sinusoidally distributed and the speed is 350 rpm. Determine the frequency, phase and line emf. Assume full pitched coil.	*3*	*K3*	*CO3*
22.	A 2 pole, 50 Hz, three phase induction motor is running at 1500 rpm. Calculate its synchronous speed and slip percentage. Discuss the effect of slip on the motor's performance.	*3*	*K3*	*CO4*
23.	Rotor resistance starting is preferred to reduced voltage starting of a wound rotor induction motor. Illustrate the reasons.	*3*	*K2*	*CO4*
24.	Explain the construction and working principle of a Hysteresis motor.	*3*	*K2*	*CO5*

PART - B (Descriptive Answer Questions)
(5 × 12 = 60 Marks)
Answer ALL Questions

25.	a)	Sketch the construction of a DC Generator and explain the functions of its major components.	*12*	*K3*	*CO1*
		OR			
	b)	Make use of the various starting methods of a DC Motor and explain their operation with applications.	*12*	*K3*	*CO1*
26.	a)	Construct the different types of single-phase transformer connections and derive the expressions for the EMFs induced in the primary and secondary windings.	*12*	*K3*	*CO2*
		OR			

	b)	The following results were obtained on a 20KVA, 450/120V, 50Hz transformer: **Open circuit test, instruments on LV side** Wattmeter reading=85W, Ammeter reading=4.2A, Voltmeter reading=120V **Short circuit test, instruments on HV side** Wattmeter reading=140W, Ammeter reading=22.2A, Voltmeter reading=9.65V Determine (a) Circuit constants (b) Efficiency and voltage regulation for an 80% lagging pf load (c) Efficiency at half full load and 80% lagging pf load (d) Equivalent circuit.	*12*	*K3*	*CO2*
27.	a)	Develop the expression for the open-circuit voltage of an alternator and explain the influence of distribution factor and coil span factor on the generated EMF.	*12*	*K3*	*CO3*
		OR			
	b)	Apply the principles of synchronous machine to explain its constructional features and classify the different types of synchronous rotors with neat diagrams.	*12*	*K3*	*CO3*
28.	a)	Develop the constructional model of a three-phase induction motor and explain its operation.	*12*	*K3*	*CO4*
		OR			
	b)	Select and explain appropriate stator-side speed control techniques for a three-phase induction motor.	*12*	*K3*	*CO4*
29.	a)	Identify the reasons why a single-phase induction motor is not self-starting and explain any one method used for starting the motor.	*12*	*K3*	*CO5*
		OR			
	b)	Apply the constructional features and operating principle of a repulsion motor to explain how high starting torque is produced in practical applications.	*12*	*K3*	*CO5*