Reg. No.																

Question Paper Code	14640

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

Third Semester

Electrical and Electronics Engineering

24EEPC302 - ELECTRICAL MACHINES - I

Regulations - 2024

Duration: 3 Hours | Max. Marks: 100

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

		Marks	K – Level	CO
1.	_____ is the example of singly excited system. a) Relay b) D.C.Shunt Motor c) Synchronous Motor d) Induction Motor	1	K1	CO1
2.	An electro-mechanical energy conversion device is one which converts _____ a) Electrical energy to mechanical energy only b) Mechanical energy to electrical energy only c) Both electrical to mechanical and mechanical to electrical d) Electrical and mechanical energy into heat energy	1	K2	CO1
3.	The developed electromagnetic force and/or torque in electromechanical energy conversion system, acts in such a direction that tends to _____ a) increase the stored energy at constant mmf b) decrease the stored energy at constant mmf c) decrease the co-energy at constant mmf d) increase the stored energy at constant flux	1	K3	CO1
4.	In a d.c. generator, the effect of armature reaction on the main pole flux is to _____ a) Reduce it b) Distort it c) Both reduce and distort it d) Reverse it	1	K1	CO2
5.	The purpose of commutator in dc generator is to _____ a) increase output voltage b) reduce sparking at brushes c) provide smooth output d) convert ac to dc	1	K2	CO2
6.	The efficiency of a dc machine when running as a generator is given by _____. a) Ouput / losses b) input / losses c) Ouput / (Output + losses) d) (Ouput + losses)/ Output	1	K3	CO2
7.	The back emf in a dc motor _____ a) Opposes the applied voltage b) Aids the applied voltage c) Aids the armature current d) Opposes the armature current	1	K2	CO3
8.	The current drawn by a 120 V dc motor has armature resistance 0.5Ω and back emf 110V is _____A. a) 20 b) 240 c) 220 d) 5	1	K3	CO3
9.	If load on a dc shunt motor is increased , its speed is decreased due to _____ a) Increase in its flux b) Decrease in back emf c) Increase in armature current d) Increase in brush drop	1	K2	CO3

10.	A transformer having 1000 primary turns is connected to a 250V ac supply. For a secondary voltage of 400V, the number of secondary turns should be _____.	1	K3	CO4
	a) 1600 b) 250			
	c) 400 d) 1250			
11.	In a two winding transformer, the emf per turn in secondary winding is always _____ the induced emf per turn in primary.	1	K3	CO4
	a) equal to K times b) equal to 1/K times			
	c) equal to d) greater than			
12.	Transformer cores are laminated in order to _____	1	K1	CO4
	a) simplify its construction b) minimize eddy current loss			
	c) reduce cost d) reduce hysteresis loss			
13.	While carrying out Swinburne's test at rated armature voltage motor will run at _____	1	K3	CO5
	a) Speed equal to rated speed b) Speed greater than rated speed			
	c) Speed less than rated speed d) Can run anywhere			
14.	The all day efficiency of a transformer depends primarily on _____	1	K1	CO5
	a) its copper loss b) the amount of load			
	c) the duration of load d) both amount and duration of load			
15.	_____ is an application of DC machines in industries.	1	K2	CO6
	a) Electric traction b) Refrigeration cycle control			
	c) Nuclear reaction control d) Hydraulic braking			
16.	A smart transformer in modern power systems primarily helps in: _____	1	K1	CO6
	a) Fuel combustion b) Intelligent monitoring and control			
	c) Mechanical speed reduction d) Cooling water circulation			

PART – A (ii) (Short Answer Questions)
(6 × 3 = 18 Marks)
Answer ALL Questions

17.	Show the field energy and co energy curve of linear systems.	3	K3	CO1
18.	Examine the causes of failure to excite in a self excited generator.	3	K4	CO2
19.	Distinguish between three point and four point starters.	3	K4	CO3
20.	The emf per turn for a single-phase 2200/220 V, 50 Hz transformer is 11 V. Calculate the number of primary and secondary turns.	3	K3	CO4
21.	Swinburne's test cannot be performed on DC Series Motor. Justify.	3	K4	CO5
22.	Choose an appropriate transformer system for a smart grid application and explain the reasons for your choice.	3	K3	CO6

PART - B (Descriptive Answer Questions)
(6 × 11 = 66 Marks)
Answer ALL Questions

23.	a)	Analyze Faraday's law of electromagnetic induction and explain its significance in electrical machines with suitable examples.	11	K4	CO1
		OR			
	b)	Derive the field energy and co energy of attracted type armature relay.	11	K4	CO1

24.	a) (i)	Compute the equation for the generated voltage in a DC generator.	*6*	*K3*	*CO2*
	(ii)	A short shunt dc compound generator supplies 200A at 100V. The resistance of armature, series field, shunt field windings are 0.04, 0.03, and 60 ohms respectively. Find the emf generated.	*5*	*K3*	*CO2*
		OR			
	b) (i)	Assess the no load and load characteristics of dc shunt generator.	*6*	*K3*	*CO2*
	(ii)	A 4 pole generator supplies a current of 143A. It has 492 conductors wave connected. When delivering full load, the brushes are given an actual lead of 10°. Calculate the demagnetizing ampere-turns/pole. The field winding is shunt connected and takes 10A. Calculate the number of extra shunt field turns to neutralize this demagnetism.	*5*	*K3*	*CO2*
25.	a)	Analyze the construction and working principle of DC Motor and its characteristics with neat diagram.	*11*	*K4*	*CO3*
		OR			
	b)	Examine the various methods of controlling the speed of a DC Shunt Motor and bring out their merits and demerits.	*11*	*K4*	*CO3*
26.	a)	Develop the equivalent circuit of a single phase transformer referred to primary and secondary.	*11*	*K3*	*CO4*
		OR			
	b)	Construct an autotransformer and prove that when transformation ratio approaches unity, the amount of Cu used approaches smaller value.	*11*	*K3*	*CO4*
27.	a)	In a Hopkinson's test on a pair of 500V, 100kW shunt generators, the following data was obtained: Auxiliary supply, 30 A at 500V: Generator output current, 200A Field Currents, 3.5 A and 1.8 A Armature Circuit resistance, 0.075 Ω each machine. Voltage drop at brushes, 2V (each machine). Calculate the efficiency of the machine acting as a generator.	*11*	*K3*	*CO5*
		OR			
	b)	Demonstrate how the back-to-back test is performed on two identical single-phase transformers, and apply this method to determine their efficiency and temperature rise under full-load conditions.	*11*	*K3*	*CO5*
28.	a)	Select a suitable DC machine for an industrial hoisting application and justify your selection based on operating characteristics.	*11*	*K3*	*CO6*
		OR			
	b)	Assess the role of smart transformers in integrating renewable energy sources into modern power systems.	*11*	*K3*	*CO6*