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B.Tech DEGREE EXAMINATION, DECEMBER 2023

Third Semester

18MHC102T - ELECTRICAL MACHINES AND ACTUATORS

(For the candidates admitted during the academic year (2020-2021 & 2021-20222))

Note:

i. **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

ii. **Part - B** and **Part - C** should be answered in answer booklet.

Time: 3 Hours **Max. Marks: 100**

PART - A (20 × 1 = 20 Marks)

Answer **all** Questions

		Marks	BL	CO
1.	If a D.C. motor is to be selected for conveyors, which motor would be preferred ? (A) Series motor (B) Shunt motor (C) Differentially compound motor (D) Cumulative compound motor	1	2	1
2.	If the field of a D.C. shunts motor gets opened while motor is running (A) the speed of motor will be reduced (B) the armature current will reduce (C) the motor will attain dangerously high speed (D) the motor will continue to work constant speed	1	1	1
3.	In a dc machine 4 pole lap winding is used. The number of parallel paths are (A) 2 (B) 4 (C) 1 (D) 8	1	1	1
4.	The armature of DC motor is laminated (A) To reduce the mass (B) To reduce the inductance (C) To reduce the eddy current losses (D) To reduce the hysteresis losses	1	1	1
5.	In a Transformer,EMF per turn in (A) HV winding is more than EMF per turn in LV winding (B) HV winding is less than EMF per turn in LV winding (C) both the windings are equal (D) both the windings are zero	1	2	2
6.	The path of a magnetic flux in a transformer should have (A) high resistance (B) high reluctance (C) low resistance (D) low reluctance	1	2	2
7.	The frequency of rotor current in an induction motor is (A) same as the frequency of stator current (B) slip times the frequency of supply (C) One by slip times the frequency of stator current (D) One by slip times the frequency of supply	1	2	2
8.	Slip ring induction motors are employed for (A) Speed control (B) High starting torque (C) both speed control and higher starting torque (D) Power factor correction	1	2	2
9.	The damping winding in a synchronous motor is generally used (A) to provide starting torque only (B) to reduce noise level (C) to reduce eddy currents (D) to prevent hunting and provide the starting torque.	1	1	3

10.	The speed regulation of a synchronous motor is (A) 100% (B) 50% (C) 25% (D) 0%	1	2	3
11.	A stepping motor is a ..... device. (A) Mechanical (B) Electrical (C) Analogue (D) Incremental	1	2	3
12.	Which of the following motor runs from a low dc supply and has permanently magnetized salient poles on its rotor ? (A) Permanent-magnet d.c. motor (B) disk d.c. motor (C) permanent-magnet synchronous motor (D) brushless d.c. motor.	1	1	3
13.	Choppers convert (A) AC to DC (B) DC to AC (C) DC to DC (D) AC to AC	1	1	4
14.	Gate circuit or triggering circuit of a thyristor is (A) low power circuit (B) high power circuit (C) magnetic circuit (D) may be low power or high power circuit.	1	2	4
15.	Protective relays (A) Provide additional safety to the circuit breaker in its operation. (B) Close the contacts when the actuating quantity attains a certain predetermined value. (C) Limit the arcing current during the circuit breaker operation. (D) Earth or ground any stray voltage.	1	2	4
16.	By using a freewheeling diode (FD) in a rectifier with RL load, the power consumed by the load (A) increases (B) decreases (C) is not affected (D) decreases to zero	1	1	4
17.	Grippers are used to (A) Hold the objects (B) Sense the objects (C) Move the objects (D) Both hold and move the objects	1	1	5
18.	The magnetic field strength of a solenoid can be increased by inserting which of the following materials as the core? (A) Copper (B) Silver (C) Iron (D) Aluminium	1	1	5
19.	Long distance railways use which of the following Voltages? (A) 200 V D.C. (B) 25 kV single phase A.C. (C) 25 kV two phase A.C. (D) 25 kV three phase A.C.	1	1	5
20.	The wheels of a train, engine as well as bogies, are slightly tapered to (A) reduce friction (B) increase friction (C) facilitate braking (D) facilitate in taking turns	1	2	5

PART - B (5 × 4 = 20 Marks) — Marks | BL | CO

Answer **any 5** Questions

21.	A 250V, 4 pole, wave wound dc series motor has 782 conductors on its armature. It has armature and series field resistance of 0.75Ω. The motor takes a current of 40A. Estimate its speed and gross torque developed if it has a flux per pole of 25mWb.	4	3	1
22.	Summarize the characteristics of DC shunt motor with neat sketches.	4	2	1
23.	State the analogy between induction motor and a transformer	4	3	2

24.	Draw torque-slip characteristic of three-phase induction motor.	4	1	2
25.	Why are synchronous motors not self starting?	4	2	3
26.	Explain the operation of a Single phase Half bridge Inverter	4	2	4
27.	State the advantages and disadvantages of a Magnetic gripper	4	1	5

PART - C (5 × 12 = 60 Marks)

Answer **all** Questions

		Marks	BL	CO
28.	(a) What is the necessity of starter? Describe in detail about the construction and working principle of three-point starter	12	2	1
	(OR)			
	(b) Explain the different speed control methods available for DC motors.			
29.	(a) How is a rotating magnetic field produced in a three phase induction motor? With the aid of vector diagrams and equations derive the expression for the maximum value of flux produced in the three phase induction motor.	12	2	2
	(OR)			
	(b) Explain the operation of a single phase capacitor start capacitor run induction motor			
30.	(a) Explain the different methods by which synchronous motors can be started.	12	1	3
	(OR)			
	(b) Explain the (i) one phase ON mode(ii) two Phase ON mode (iii) Half Stepping and (iv) microstepping operation of a variable reluctance stepper motor with relevant diagrams			
31.	(a) Explain the operation of thyristorised speed control of a DC shunt motor.	12	2	4
	(OR)			
	(b) Explain the operation of (i)Step down Choppers [6 marks] and (ii)Step up choppers [6 marks]			
32.	(a) Explain the different types of MEMS actuators.	12	1	5
	(OR)			
	(b) Write short notes on (i)Vacuum grippers[6 marks] (ii)Magnetic grippers[6marks].			

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