

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

USN

--	--	--	--	--	--	--	--	--	--

Course Code

2	2	E	E	4	3
---	---	---	---	---	---

Fourth Semester B.E. Degree Examinations, July 2026

ELECTRICAL MACHINES-II

Duration: 3 hrs

Max. Marks: 100

Note: 1. Answer any FIVE full questions choosing ONE full Question from each Module.
2. Missing data, if any, may be suitably assumed

<u>Q. No</u>	<u>Question</u>	<u>Marks</u>	<u>(RBTL:CO: PI)</u>
<u>MODULE – 1</u>			
1.	a. What is back emf? What is its significance?	06	(2 :1: 1.3.1)
	b. Describe the power flow diagram of a DC motor. Derive the condition for maximum efficiency of a DC Machine.	06	(2 :1: 1.3.1)
	c. A 14.71kW, 4 pole, 250 V, lap connected DC shunt motor has 48 slots, each slot containing 20 conductors. It draws a current of 80 A from the supply. The field and armature resistances are 125 Ω and 0.2 Ω respectively. The flux per pole is 100 mWb. Calculate (i) Back emf (ii) Speed (iii) Gross Torque (iv) Useful Torque (v) Electrical, Mechanical and Overall Efficiency.	08	(3 :1: 1.3.1)
(OR)			
2.	a. What is the necessity of starter for a DC motor? Explain the construction and working of 3-point starter. What is the drawback of 3-point starter?	06	(2 :3: 1.3.1)
	b. Discuss the speed control methods of DC shunt motor. Also state the applications of DC series motor.	06	(2 :3: 1.3.1)
	c. A 250 V DC shunt motor runs at 800 rpm and takes an armature current of 50A. Find the resistance to be added to the field circuit to increase speed from 800 rpm to 1000 rpm at an armature current of 80 A. Assume flux proportional to the field current. $R_a = 0.15 \Omega$ and $R_{sh} = 250 \Omega$.	08	(3 :3: 1.3.1)
<u>MODULE – 2</u>			
3.	a. Explain Swinburne's test. State its merits and demerits.	06	(2 :1: 1.3.1)
	b. Explain the test conducted to determine the losses and efficiency of DC series motors.	06	(2 :1: 1.3.1)
	c. The results of Hopkinson's test on two similar d.c. machine are as follows: Line voltage 230 V; Line current excluding field currents 30 A; Motor armature current 230 A; Field currents are 5 A and 4 A; Armature resistance of each machine is 0.025 Ω Determine the efficiency of each machine.	08	(3 :1: 1.3.1)
(OR)			
4.	a. Derive an expression for starting torque. Also obtain the condition for maximum starting torque.	06	(2 :2: 1.3.1)

- b. Discuss the torque-slip characteristics of 3- ϕ induction motor indicating different operating regions. **06** (2 :2: 1.3.1)
- c. A 4 pole, 50 Hz induction motor at rated voltage and frequency has a starting torque of 160 % and a maximum torque of 200 % of full load torque. Determine (i) full load speed (ii) speed and maximum torque. **08** (3 :3: 1.3.1)

MODULE – 3

5. a. Explain the operation of 3- ϕ induction motor with phasor diagram. **06** (2 :2: 1.3.1)
- b. Develop the exact and approximate equivalent circuit diagrams referred to stator side. **06** (2 :2: 1.3.1)
- c. An 8-pole, 3- ϕ Induction motor running at a speed of 710 rpm with an input power of 35 kW. The stator losses total 1200 W and rotational losses 600 W. Determine (i) The rotor copper losses (ii) mechanical power developed (iii) Gross torque (iv) Mechanical power output (v) efficiency. **08** (3 :2: 1.3.1)

(OR)

6. a. Explain the phenomenon of crawling and cogging in an induction motor. **08** (2 :2: 1.3.1)
- b. A 400 V, 15 HP, 3- ϕ , 50 Hz, 4-pole delta connected Induction motor gave the following test data: **12** (3 :2: 1.3.1)
- No load test: 400 V, 8 A, 1000 W
Blocked rotor test: 100 V, 25 A, 1750 W
Construct the circle diagram and determine full load current and power factor, maximum torque, maximum output and efficiency.

MODULE – 4

7. a. Discuss the different speed control methods of 3- ϕ induction motor. **10** (2 :3: 1.3.1)
- b. Explain the construction, operation, characteristics and applications of 1- ϕ capacitor start induction run motor. **10** (2:4: 1.3.1)

(OR)

8. a. Why 1- ϕ induction motor is not self-starting? Explain double revolving field theory of 1-phase Induction motor with torque-speed characteristics. **10** (2 :4: 1.3.1)
- b. Explain the construction, operation, characteristics and applications of shaded pole motor. **10** (2 :4: 1.3.1)

MODULE – 5

9. a. Why synchronous motor is not self-starting? Explain the different starting methods of synchronous motor. **10** (2 :5: 1.3.1)
- b. Analyse the operation of synchronous motor under variable excitation at constant load with vector diagrams. Also draw V- and inverted –V curves. **10** (2 :5: 1.3.1)

(OR)

10. a. Describe the construction, operation, characteristics and applications of permanent magnet synchronous motor. **08** (2 :5: 1.3.1)
- b. Write a note on universal motor. **06** (2 :5: 1.3.1)
- c. Describe the construction and operation of BLDC motor. **06** (2 :5: 1.3.1)

** ** *