Enrolment No/Seat No.: _____

R.N.G.PATEL INSTITUTE OF TECHNOLOGY-RNGPIT

(An Autonomous Institute U/s UGC Act 1956)

B.Tech. SEMESTER-III, SEMESTER END EXAMINATION – WINTER 2025

SUBJECT CODE: 1EL301 **DATE: 16-12-2025**

SUBJECT NAME: ELECTRICAL MACHINES - I

TIME: 11:00 AM to 01:30 PM **TOTAL MARKS: 70**

Instructions

1. It is **compulsory** for students to write **Enrolment No. /Seat No.** on the question paper.
2. Write answers of **Section A** and **Section B** in **separate answer books**.
3. Attempt all questions from both **Section A** and **Section B**.
4. Each section carries **35 marks**, with a total of **70 marks** for the examination.
5. The figures to the right of each question indicate full marks, make suitable assumptions with justification.
6. BL - Cognitive Level (As per Revised Bloom's Taxonomy) (R-Remember, U-Understanding, A – Application, N –Analyze, E – Evaluate, C -Create), CO - Course Outcomes.

SECTION A

			Marks	BL	CO
Q.1	**(a)**	Write short note on electromechanical energy conversion.	**03**	**U**	**3**
	(b)	Explain singly excited magnetic field system in detail.	**04**	**U**	**3**
Q.2	**(a)**	State and explain working principle of transformer.	**03**	**R**	**1**
	(b)	Derive EMF equation of transformer.	**04**	**U**	**1**
	(c)	The iron loss and full load copper loss of 100 KVA single phase transformer are 3 KW & 4 KW resp. Calculate the efficiency at (a) full load 0.8 p.f.(b) half load, at 0.707 pf (c) ¼ load unity p,f.	**07**	**U**	**1**
		OR			
Q.2	**(a)**	Explain different types of losses in transformer.	**03**	**R**	**1**
	(b)	Explain OC and SC test of single phase transformer.	**04**	**U**	**1**
	(c)	In a 100 kVA transformer, the iron loss is 450 W and full-load copper loss is 900 W. Find the transformer efficiency at full load and the maximum efficiency of the transformer, where the load power factor is 0.8 lagging.	**07**	**U**	**1**

Q.3	**(a)**	Explain Scott-connection of transformer in detail.	**03**	**R**	**2**
	(b)	State the condition for parallel operation of three phase transformer.	**04**	**R**	**2**
	(c)	Draw the vector diagrams and winding connections for the following transformer connections. (1) Yd1 (2) Dz0.	**07**	**U**	**2**

OR

Q.3	**(a)**	Explain On Load Tap Changer for transformer.	**03**	**R**	**2**
	(b)	Explain with diagram different cooling methods used for transformer.	**04**	**R**	**2**
	(c)	Draw the vector diagrams and winding connections for the following transformer connections. (1)Dy11 (2) Yz1	**07**	**U**	**2**

SECTION B

			Marks	BL	CO
Q.4	**(a)**	Explain working principle of repulsion motor.	**03**	**U**	**6**
	(b)	Discuss operation of universal motor.	**04**	**U**	**6**
Q.5	**(a)**	Draw Slip Torque characteristic of 3 phase Induction motor. Clearly show stable and instable region, full load operation point, starting torque and maximum torque.	**03**	**R**	**4**
	(b)	List methods of speed control of three phase induction motor. Explain any one.	**04**	**U**	**4**
	(c)	A 3-phase, 5hp, 220V, 50 Hz 4-pole induction motor has the following test results: No load Test : 220V, 5A, 350W Blocked rotor Test : 110V, 26A, 1700W Draw the circle diagram and determine full load current, full load power factor and efficiency of the machine. Assume The rotor cu loss at standstill is half the total cu loss.	**07**	**E**	**4**
		OR			
Q.5	**(a)**	Compare squirrel cage and slip ring Induction Motors.	**03**	**R**	**4**
	(b)	State different types of starters used and explain any one of them in 3- ø induction motor.	**04**	**U**	**4**
	(c)	A 415 V, 3 phase, 50 HZ,4 pole star connected Induction motor takes a line current of 11 A with 0.85 p.f. lagging. Its total stator losses are 6% of the input. Rotor copper losses are 4% of the input to the rotor; mechanical losses are 3 % of the rotor input. Calculate (i) slip and rotor speed (ii) torque developed in the rotor and (iii) shaft torque.	**07**	**E**	**4**
Q.6	**(a)**	List the applications of single phase induction motor.	**03**	**R**	**5**
	(b)	Discuss working of capacitor start induction motor.	**04**	**U**	**5**
	(c)	Explain in detail the double field revolving theory for single phase Induction Motor.	**07**	**U**	**5**
		OR			
Q.6	**(a)**	Why single phase induction motor is not self-starting?	**03**	**U**	**5**
	(b)	Discuss working of capacitor start capacitor run induction motor.	**04**	**U**	**5**
	(c)	Explain construction and working of shaded pole single phase motor	**07**	**U**	**5**

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