K. K. Wagh Institute of Engineering Education & Research, Nashik

(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:III
Class:SY	Program:B.Tech
Branch Code:ELE	Pattern:2023
Name of Course:Transformers and Induction Machines	Course Code:2306203
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 03 page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

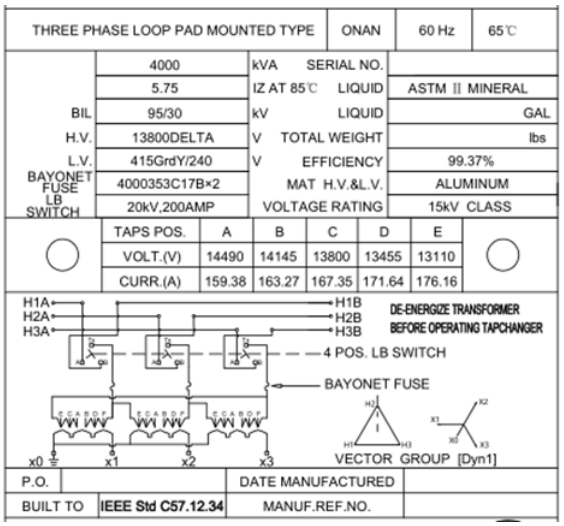
Marks CO

Question No. 1

1a) Describe how a single phase transformer operates both under load and without it. (6) CO1

Question No. 2

2a) Answer the following questions based on the transformer name plate given below. (6) CO2



1) Rated primary current of the transformer: _____

2) Nominal tap position: _____

3) Cooling method: _____

4) LV/HV winding material:_____

Question No. 3

3a) Discuss power flow in 3 phase induction motor. (8) CO2

OR

3b)	Discuss the effect of rotor resistance and supply voltage on starting torque.	(8)	CO2
3c)	A 4-pole, 50 Hz three-phase induction motor operates at 1,450 RPM and delivers an output power of 11 kW. The stator losses amount to 725 W, while the friction and windage losses total 225 W. Calculate the following: 1) Mechanical power developed (gross power output)/motor output 2) Rotor input 3) Motor input power 4) Efficiency/motor efficiency	(8)	CO4

OR

3d)	A 4-pole, three-phase induction motor delivers a rated power of 10 kW when supplied from a 415 V, 50 Hz AC source. The full-load speed is 1440 rpm. Rotor induced emf is 160 V per phase at standstill and the rotor resistance and reactance are 0.3 Ω and 2.5 Ω per phase, respectively. Determine the following parameters at standstill and at full load speed: (i) The frequency of rotor-induced emf. (ii) The rotor impedance per phase. (iii) The rotor current per phase. (iv) The rotor power factor.	(8)	CO4

Question No. 4

4a)	List out various starters used for 3 phase induction motor. Explain any one of them in detail.	(8)	CO2

OR

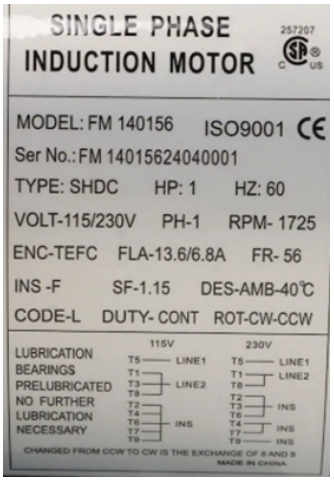
4b)	List the various speed control methods used for three phase induction motor. Explain any one method in detail.	(8)	CO2
4c)	A 3-phase, 4 pole, 50Hz, cage induction motor has a short circuit current equal to 8 times the full load current. The full load speed of motor is 1460 rpm. Find the ratio of starting torque to full load torque if motor is started by 1)Direct Online starter (2M) 2)Star delta starter (3M) 3)Auto-transformer starter with 75% tapping. (3M)	(8)	CO4

OR

4d)	A three phase 420V, 4 pole, 50 Hz induction motor has a rotor resistance of 0.03 ohm/phase & rotor reactance of 0.22 ohm /phase at standstill. The motor develops full load torque of 160 N-m at 1450 rpm. Calculate 1) The max torque and speed at which max torque occurs 2) The resistance to be inserted in each phase wining of rotor in order to obtain maximum torque at starting.	(8)	CO4

Question No. 5

5a) As an engineer in motor manufacturing company. The name plate of one induction motor is given below. Answer the following questions (8) CO1



1) kW rating of motor:_____

2)Type of motor:_____

3) Rated speed of motor: _____

4) Rated current at 115V: _____

5) Rated current at 230V: _____

6) Insulation class: _____

7) Enclosure type:_____

8) Whether this motor is used for intermittent duty or continuous duty?

OR

5b) Draw the circuit diagram and characteristic of capacitor start single phase induction motor. Explain working of the same. Give the applications of the same. (8) CO1

5c) No load & blocked rotor test is carried out on a capacitor start single phase induction motor. Test results are; (8) CO3

Blocked Rotor Test: 100V, 8.9A, 400W

No Load Test: 210V, 4.0A, 150W

The stator winding resistance is 1.32Ω, and during the blocked rotor test, the starting winding is open. Determine the equivalent circuit parameters and indicate them on the equivalent circuit diagram.

OR

5d) A 220V, 50Hz, 4 pole single phase induction motor has the following equivalent circuit parameters at slip of 0.04 pu, R1m = 2.0 ohm, R2' = 4.4 ohm, X1m = 3.0 ohm, X2' = 2.4 ohm, Xm = 65 ohm. Calculate (8) CO3

1)Impedance of forward field (2M)

2)Impedance of backward field (2M)

3)Total impedance of the circuit (2M)

4)Input current (2M)

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