

7646

BOARD DIPLOMA EXAMINATION, (C-20)

DECEMBER—2022

DEEE - FIFTH SEMESTER EXAMINATION

ELECTRICAL MACHINES—III (AC MOTORS AND DRIVES)

Time : 3 hours]

[Total Marks : 80

PART—A

3×10=30

- Instructions :** (1) Answer **all** questions.
(2) Each question carries **three** marks.
(3) Answers should be brief and straight to the point and shall not exceed five simple sentences.

1. List out any three advantages of three-phase induction motors.
2. What will be the frequency of rotor current of a 12-pole, 60 Hz, 3 ϕ induction motor which runs at 570 r.p.m?
3. State the function of centrifugal switch in a single-phase induction motor.
4. List out the applications of stepper motors.
5. Draw the vector diagram of synchronous motor working on over excitation and indicate the vectors and angles in it.
6. What is the use of damper winding in synchronous motor?
7. State any three applications of synchronous motor.
8. List out the factors which are to be considered for selection of electric drive.
9. What do you mean by load equalization?
10. What is plugging method of braking for DC shunt motor?

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- Instructions :** (1) Answer **all** questions.
(2) Each question carries **eight** marks.
(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.
(4) The graph sheet supplied with answer booklet for drawing the circle diagram.

11. (a) Explain the working principle of three-phase induction motor.

(OR)

(b) Explain the different methods of speed control as applied to three-phase induction motors.

12. (a) The power input to the rotor of a 440 V, 3-phase, 50 Hz, 6-pole induction motor is 75 kW. The rotor e.m.f. observed to make 100 complete alternations per minute. Calculate (i) the rotor speed, (ii) the mechanical power developed, (iii) rotor copper losses and (iv) rotor resistance per phase, if the rotor current is 65 A. Assume any missing data.

(OR)

(b) Draw the circle diagram for a 5 HP, 250 V, 50 Hz, 4-pole, 3-phase star-connected induction motor from the following test data :

No load test : 250 V (Line voltage), Line current 6 A, Total input 400 W

Blocked rotor test : 125 V (Line voltage), Line current 30 A, Total input 1800 W

Assume the rotor copper losses at standstill is equal to the stator copper losses.

From the circle diagram estimate (i) full load current (ii) full load power factor and (iii) maximum torque in terms of full load torque.

Assume any missing data.

13. (a) Explain the construction and working of a single-phase capacitor start induction motor with a neat diagram.

(OR)

(b) Explain the construction and working of single-phase AC series motor with neat diagram.

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- 14.** (a) A motor has the following duty cycle :
- (i) Load rising uniformly from 150 HP to 450 HP in 5 seconds
 - (ii) Constant load 350 HP for 2 seconds
 - (iii) Regenerative braking power returned to supply from 100 HP to 0 HP in 1 second. The interval for decking before the next load cycle start is 2 seconds.
- Draw the load cycle and suggest suitable continuous rated motor. Assume any missing data.

(OR)

- (b) Suggest suitable motors with reasons for the following applications :
- (i) Printing presses, (ii) belt conveyors, (iii) cranes and (iv) refrigeration and air-conditioning.

- 15.** (a) A 25 HP, 400 V, DC shunt motor is to be braked by plugging. Calculate the value of resistance to be placed in series with the armature circuit in order to limit the initial braking current is equal to twice the full-load current. If full load efficiency is 85%, armature and field resistances are 0.15Ω and 200Ω respectively. Also calculate the value of initial braking torque. Assume any missing data.

(OR)

- (b) Explain the method of dynamic braking as applied to DC shunt motor.

PART—C

10×1=10

- * **Instructions :** (1) Answer the following question.
(2) The question carries **ten** marks.
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

- 16.** Discuss how a three-phase synchronous motor is used to correct the power factor when it is operated in parallel with any existing load.

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