

\*  
7646

BOARD DIPLOMA EXAMINATION, (C-20)

MAY/JUNE—2023

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. Write three differences between squirrel cage and slip-ring type induction motors.
2. What are the different ways of speed control of 3-phase Induction motor?
3. List the types of Stepper motors.
4. List the applications of single-phase capacitor-start type induction motors.
- \* 5. Draw the vector diagram of synchronous motor for under excitation state.
6. Define V-curves and inverted V-curves of synchronous motors.
7. State how HUNTING is prevented in synchronous motor.
8. Draw the block diagram of an electric drive.
9. Compare AC drive and DC drive in any three aspects.
10. State the various systems of braking of electric motors.

\*

- 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.

**11.** (a) Explain the principle of production of rotating magnetic field in 3-phase system.

**(OR)**

(b) Explain the working of manually operated Star/Delta starter used for starting of 3-phase induction motor with the help of a neat sketch.

**12.** (a) A 440 V, 3-phase, 50 Hz, 4-pole, star connected Induction motor has a full load speed of 1425 rpm. The rotor has an impedance of  $(0.4 + j5)$  ohm and rotor/stator turn ratio of 0.8. Calculate (a) slip, (b) full load torque, (c) rotor current and (d) full load rotor copper loss. Assume any missing data.

**(OR)**

(b) Draw the circle diagram for a 3.73 kW, 200 V, 50 Hz, 4-pole, 3-phase star connected induction motor from the following test data.

No. load test : 200 V (Line voltage), Line current 5 A,  
Total input 350 W

Blocked rotor test : 100 V (Line voltage), Line current 26 A,  
Total input 1650 W

Take the rotor copper loss at standstill is 50% of the total copper loss.

\*

From the circle diagram estimate

(i) Line current at full load and

(ii) Maximum torque in terms of full load torque.

Assume any missing data.

**13.** (a) Explain why a single-phase induction motor is not self-starting.

**(OR)**

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

\*

- 14.** (a) A motor has the following duty cycle :  
Load rising uniformly from 100 to 400 HP in 3 seconds  
Constant load 300 HP for 2 seconds  
Regenerative braking power returned to supply from 50 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 for the following applications with valid reasons :
- (i) Sugar mills
  - (ii) Lifts and Hoists
  - (iii) Drilling machines
  - (iv) Wood working machines

- 15.** (a) A 50 H.P. 440 V DC shunt motor is braked by plugging. Calculate the value of resistance to be placed in series with the armature circuit to limit the initial braking current to 100 A. Calculate the braking torque so obtained. The armature resistance is  $0.1 \Omega$ , full load armature current 80 A, full load speed is 750 rpm. Assume any missing data.

**(OR)**

- (b) Explain how Rheostatic braking 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.** Derive the condition for maximum torque under running condition for 3-phase induction motor and also find the relationship between full load torque and maximum torque.

★★★

\*