Question Paper Code : X 60842

B.E./B.Tech. DEGREE EXAMINATIONS, NOV./DEC. 2020

Third Semester

Mechanical Engineering

ME 2205/10122 ME 306/EE 1205 A/080120013/ME 36 – ELECTRICAL DRIVES AND CONTROL

(Common to Mechanical Engineering (Sandwich)/Production Engineering/ Petrochemical Engineering/Chemical Engineering/Petrochemical Technology and Textile Technology)

(Regulations 2008/2010)

(Also Common to PTME 2205 – Electrical Drives and Control for B.E. (Part-Time) Third Semester – Mechanical Engineering – Regulations 2009)

Time : Three Hours   Maximum : 100 Marks

Answer ALL questions.

PART – A   **(10×2=20 Marks)**

1. Draw the block diagram of an electrical drive.

2. Give the examples where continuous duty at constant load is required.

3. Draw speed-torque characteristics of constant torque and constant power type load.

4. Draw torque-armature current characteristics of D.C. shunt motor.

5. State the basic principle in DOL for 3-phase induction motor.

6. What is the basic principle in starting 3-phase induction motor using rotor resistance starter ?

7. What is meant by a d.e. to d.c. converter drive ?

8. List the applications of d. c. choppers.

9. What are the advantages of V/f control of three-phase induction motors ?

10. Mention the advantages of slip power recovery scheme of controlling the speed of induction motor.

11. a) Explain various classes of motor drives.   **(16)**

    (OR)

    b) Describe the selection of motor rating for continuous duty load.   **(16)**

12. a) i) Explain, with necessary circuit diagram, the reverse current braking and the braking characteristics of the following.

       1) DC shunt motor.   **(5)**

       2) DC series motor.   **(5)**

    ii) A 250 V, DC shunt motor has an armature resistance of 0.05 Ω and with rated field excitation has a back emf of 245 V at a speed of 1200 rpm. It is coupled to an overhauling load with a torque of 200 N-m. Determine the lowest speed at which the motor can hold the load by regenerative braking.   **(6)**

    (OR)

    b) i) Sketch the speed-torque characteristics of a three phase induction motor and explain its motoring mode, generating mode and braking mode of operation.   **(8)**

    ii) A 15 kW, 415 V, three-phase, 4 pole, 50 Hz induction motor has a speed of 1455 r.p.m. at full load. At this load, the mechanical losses are 600 watt and the stator losses are 750 watt. Find

       1) Full load slip

       2) Total input power to the motor

       3) Current drawn at full load, if the power factor is 0.8 lagging

       4) Net torque developed at output at full load.   **(8)**

13. a) Draw and explain working of four- point starter.   **(16)**

    (OR)

    b) Explain with a diagram the rotor resistance starter type for 3-phase slip ring induction motor.   **(16)**

14. a) Explain the operation of single phase full converter fed separately excited dc motor drive. **(16)**

(OR)

   b) With neat circuit diagrams, explain chopper fed four quadrant dc drive. **(16)**

15. a) Explain how the speed of SRIM is controlled by feeding back its slip power to the mains. Derive the expression between the slip and delay angle.

(OR)

   b) i) Draw the circuit for the stator voltage control scheme for 3-phase induction motor, employing thyristors. **(10)**

   ii) Draw and explain the torque characteristics of induction motor for variable frequency operation of constant v/f ratio **(6)**

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