



MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PC-EE 701 Electric Drive

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[1 x 10 = 10]

- (i) Why stator voltage control is suitable for speed control of induction motors in fan and pump drive?
- (ii) The magnetization current drawn from an AC supply a synchronous motor is used to _____
- (iii) What is a multi motor electric drive? Give some examples.
- (iv) What are the types of electric drives?
- (v) What is commutation in thyristor power converter?
- (vi) Slip power recovery scheme can be applied to _____ motor.
- (vii) How a motor rating is determined in a continuous duty and Variable load?
- (viii) Regenerative braking is not possible in _____ motor.
- (ix) Mention two drawbacks of cycloconverter.
- (x) Why is 3-phase half-controlled rectifier not generally employed in the industrial application?
- (xi) What is the torque expression of switched reluctance motor?
- (xii) what is the relationship of V_{dc} and V_{ac} in terms of firing angle α for a full controlled converter drive?

Group-B (Short Answer Type Question)

Answer any three of the following

[5 x 3 = 15]

2. The temperature rise of motor when operating for 25 min on full load is 25°C and becomes 40°C when the motor operates for another 25 min on same load. Determine heating time constant and steady state temperature. [5]
3. A drive has the following parameter : [5]
 $T = 150 - 0.1N$, N-M, where N is the speed in rpm.
 Load torque $T_L = 100$ N-M
 Initially drive is operating at steady state. The characteristics of the load torque are changed to $T_L = -100$ N-M. calculate the initial & final equilibrium speeds.
4. Deduce the torque speed relationship of a d.c series motor and draw the curve and explain critically the effect of saturation. [5]
5. Show that during starting, if the slip of induction machine running under no load friction torque changes from 1 to 0, the energy lost in the rotor circuit is given as [5]
 $W_{st} = 1/2 J \omega_s^2$ Joules. The symbols have their usual notation.
6. Show that for induction motor [5]
 $T = \frac{2 T_m}{\frac{s_m}{s} + \frac{s}{s_m}}$
 The symbols have usual meaning.

Group-C (Long Answer Type Question)

Answer any three of the following

[15 x 3 = 45]

7. (a) Deduce an expression of the output voltage of a 3-phase full wave phase controlled converter. [7]
 Hence show how this converter can be used to control the speed of a dc shunt motor. Draw relevant diagrams.

- (b) A three-phase full converter is used to control the speed of a 220V, 3.73 KW, 1200 rpm, dc shunt motor. The ac supply is 1.5Ω. For $\alpha = 60^\circ$ the motor speed is 800 rpm, determine
 i) the average value of motor current. Assuming it to be ripple free.
 ii) The RMS value of the SCR current. [8]
8. (a) Deduce the relationships necessary to obtain the heating & cooling curve of an electric motor [7]
 (b) A motor has a thermal heating time constant of 50 minutes. When the motor runs continuously on full load, its final temperature rise is 80°C .
 i) what would be the temperature rise after 1 hour? if the motor runs continuously on full load?
 ii) How long will the motor take for its temperature to rise from 50°C to 80°C ? if it is working at its 1-hour rating. <https://www.makaut.com> [8]
9. (a) A 230V, 960 rpm, and 200 amp separately excited dc motor has an armature resistance of 0.02 ohm. The motor is fed from a chopper which provides both motoring and braking operations. The source has a voltage of 230V. Assuming continuous conduction
 i) Calculate the duty ratio of the chopper for motoring operation at rated torque and 350 rpm.
 ii) Calculate the duty ratio of the chopper for braking operation at rated torque and 350 rpm
 (b) Explain the operation step up chopper drive with relevant diagram in DC motor drive. [7]
10. (a) advantages of electric vehicle (EV) over internal combustion Vehicle [5]
 (b) State the operation and characteristics curve of the solar power pump Drive. [5]
 (c) write short notes on solar power electric vehicles and boats. [5]
11. (a) Drive for textile mills [5]
 (b) V/f control of induction motor. [5]
 (c) Stepper motor [5]

*** END OF PAPER ***

<https://www.makaut.com>
 Whatsapp @ 9300930012
 Send your old paper & get 10/-
 अपने पुराने पेपर्स भेजे और 10 रुपये पायें,
 Paytm or Google Pay से