

**ENGINEERING & MANAGEMENT EXAMINATIONS, DECEMBER - 2008****ELECTRIC DRIVES****SEMESTER - 7**

Time : 3 Hours]

[Full Marks : 70

GROUP - A**(Multiple Choice Type Questions)**1. Choose the correct alternatives for any ten of the following : 10 × 1 = 10

i) To get speed higher than the base speed of a D.C. shunt motor

- a) armature voltage control is used
- b) field control is used
- c) armature resistance control is used
- d) frequency control is used.

ii) A typical passive load is

- a) Hoist
- b) Friction
- c) Blower
- d) Pump.

iii) Intermittent duty rating of an electric motor

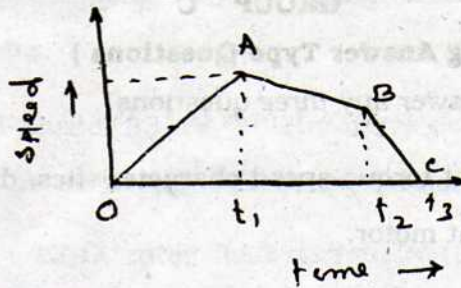
- a) is equal to name plate rating
- b) is less than name plate rating
- c) is greater than name plate rating
- d) has no bearing to its name plate rating.

iv) In constant torque drive

- a) power is proportional to the speed
- b) power is proportional to the square of speed
- c) power is inversely proportional to the speed
- d) power is independent of speed.



xi) The speed time curve for a local train is shown in figure below.



In this AB represents

- | | |
|-------------|------------------|
| a) coasting | b) acceleration |
| c) braking | d) regeneration. |

xii) The common method of speed control used in 25 kV, 50 Hz, 1-phase traction system is

- | | |
|---------------------------|----------------------------|
| a) tap changing control | b) reducing current method |
| c) series parallel method | d) none of these. |

GROUP - B

(Short Answer Type Questions)

Answer any three of the following.

3 × 5 = 15

- What do you mean by group, individual & multimotor drives ?
- Deduce the condition for steady state stability of a motor load combination. Can this condition be applied for synchronous motor ? 4 + 1
- A drive has the following parameters :
 $T = 150 - 0.1 N$, N-m, where N is the speed in rpm.
 Load torque $T_L = 100$ N-m.
 Initially the 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.
- Deduce the expression of loss of energy during stator of a separately excited D.C. motor.
- Explain the principle of operation of chopper fed drives.

**GROUP - C****(Long Answer Type Questions)**

Answer any three questions.

 $3 \times 15 = 45$

7. a) With the help of relevant torque-speed characteristics, discuss different methods of braking of D.C. shunt motor.
- b) A 500 V D.C. shunt motor taking an armature current of 240 A, while running at 800 rpm, is braked by disconnecting the armature from the supply & closing it on a resistance of 2.02Ω , the field excitation remaining constant. The armature has a resistance of 0.5Ω . Calculate the initial braking current. $12 + 3$
8. a) Deduce the relation necessary to obtain the heating & cooling curve of an electric motor.
- 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) If the temperature rise on 1 hour rating is 80°C , find the maximum steady state temperature at this rating.
- iii) 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 ? $6 + 9$
9. a) State the advantages & disadvantages of Ward-Leonard drive system.
- b) Discuss with relevant diagrams, the principle, of speed control of induction motor, above & below synchronous speed by feeding energy to the source.
- c) The rotor of an 8-pole, 50 Hz, 3-phase induction motor has a resistance of 0.2Ω per phase & runs at 730 rpm. If the load torque remains unchanged, calculate the additional rotor resistance that will reduce its speed by 10%. Neglect stator impedance. $3 + 7 + 5$



10 a) Explain the principle of Variable voltage variable frequency (VVVF) control of induction motor.

b) A 400 kW, 3-phase, 33 kV, 50 Hz, unity power factor, 4-pole, star connected synchronous motor has the following parameters :

$\Omega_a = 0$, $X_s = 13 \Omega$, rated field current = 10 A. The machine is controlled by variable frequency control at a constant $\frac{V}{f}$ ratio.

Calculate the torque & field current for rated armature current, 900 rpm & 0.8 leading power factor.

8 + 7

11. Write short notes on any three of the following :

3 × 5 = 15

- a) Series parallel control of D.C. motor
- b) Self-controlled synchronous motor drive
- c) 3-phase fully controlled rectifier fed D.C. motor
- d) EMU.

END