Paper Code: EE-702	Roll No.									

B.Tech
SEVENTH SEMESTER EXAMINATION, 2016-17
ELECTRICAL DRIVES

[Time: 3hrs]   [Max. Marks: 100]

Note: Attempt *ALL* questions. Assume suitable data, if required. All question carry equal marks.

1. Attempt any *four* parts of the following: -   **(5x4=20)**

   (a) Explain the constant power operation of electrical drive.
   (b) Give the classification of the load torque with the help of diagram and briefly explain them?
   (c) Draw the speed torque curve and briefly explain the following---
      i) High speed hoist
      ii) Traction load
      iii) Constant power load
      iv) Ccolumb friction (Tc)
      v) Viscous friction (Tv)
   (d) What are drives? What are electric drives? Explain the parts of electrical drive?
   (e) What are advantages of electrical drives. What is the main factor which decide choice of electrical drive for given application?
   (f) With the help of torque speed convention explain the multiquadrant operation with the help of example?

2. Attempt any two parts of the following: -   **(10x2=20)**

   (a) What do you understand by steady state stability derive the expression with the help of diagram showing stable and unstable points. What are the main assumptions?

   (b) List the classes of motor duty with waveforms under IS: 4722-1968 and derive the expression for short time duty?
   (c) Explain the thermal model of heating and cooling and derive its expression. A motor with periodic duty cycle in which it is clutched to its load for 10 min and declutched to run on no load for 20 min. minimum temperature rise is 40 degree Celsius. Heating and cooling time constant are equal and have a value of 60 min. when the load is declutched continuously the temperature rise is 15 degree Celsius. Determine.
      i) Maximum temperature during duty cycle
      ii) Temperature when the load is clutched continuously

3. Attempt any two parts of the following: -   **(10x2=20)**

   (a) Calculate the energy loss during starting for dc shunt induction motor with derivation. State some methods of reducing energy loss during starting.

   (b) (i) With its types, area of application and speed torque characteristics explain braking of Three phase induction motor explaining the advantages and disadvantages of each type.

      (ii) What are important feature of dc dynamic braking of in relation to other methods of braking of induction motor. During plugging of wound rotor induction motor usually an external resistance is inserted into rotor, why? And why it is necessary to disconnect the supply when speed reaches close to zero.

(c) (A) Give some methods to reducing energy loss during starting. Why regenerative braking cannot be used for stopping or decelerating a load in synchronous motor and explain When operating in regenerative braking the induction motor slip should not be allowed to exceed the Breakdown slip. Why?

(B) A constant speed drive has following duty cycle.

(i) Load rising from 0 to 400 KW:5 min

(ii)Uniform load of 500 KW: 5min

(iii)   Regenerative power of 400 KW returned to supply: 4min

(iv)   Remain idle for :2 min

Estimate the power rating of the motor.

4. Attempt any two parts of the following: -   **(10x2=20)**

(a) A 230V, 960 rpm and 200A separately excited dc motor has an armature resistance of .02 ohm. The motor is fed from a chopper which provides both motoring and braking operations. The source has a voltage of 230v. Assuming the continuous conduction.

(i) Calculate the duty ratio of chopper for motoring operation at rated torque and 350 rpm.

(ii) Calculate the duty ratio of chopper for braking operation at rated torque and 350 rpm.

(iii) if the maximum duty ratio of chopper is limited to .95 and maximum permissible motor current is twice the rated, calculate maximum permissible motor speed obtainable without field weakening and power fed to the source.

(b) Explain with derivation of rectifier control of dc series motor. Give the application area of single phase controlled rectifier fed dc series motor are employed.

(c) (i) What are dual converter and explain the merits and demerits of four quadrant drive employing non circulating and circulating current dual converters.

(ii) With expression (for continuous conduction only), draw the speed torque curve showing appropriate region for three phase controlled converter fed separately excited dc motor drive

5. Attempt any two parts of the following: -   **(10x2=20)**

(a) Describe the principle of operation of brushless DC motor? Why it is known as brushless DC motor? What are the advantages of brushless DC motor over other ac motor drive? And state its applications.

(b) (i) Why is slip power scheme is suitable for is suitable mainly for drives for low speed range? Explain the static scherbius drive?

(ii)What is rotor resistance control and explain how does it help during counter torque
   braking?

(c) What is static frequency control scheme explain any one scheme in detail.