**B.TECH**
**(SEM VII) THEORY EXAMINATION 2019-20**
**ELECTRICAL DRIVES**

*Time: 3 Hours*                                          *Total Marks: 70*

**Note:  1.** Attempt all Sections. If require any missing data; then choose suitably.

## SECTION A

**1.**     **Attempt *all* questions in brief.**                    **2 x 7 = 14**

| a. | What are the basic elements of Electric Drives? |
|----|---|
| b. | What is meant by classes of duty of motor? |
| c. | Classify various mechanical loads on the basis of their torque-speed characteristics. |
| d. | What do you mean by acceleration time of three phase induction motor? |
| e. | How you can change speed of separately excited dc motor. |
| f. | What is meant by heating time constant of motor? |
| g. | What do you understand by the steady state stability? |

## SECTION B

**2.**     **Attempt any *three* of the following:**                **7 x 3 = 21**

| a. | Write short notes on classes of duty in detail with examples. |
|----|---|
| b. | Explain the loading of an electric motor and its duty cycle with a simple diagram. |
| c. | A 230 V,500 rpm, 100 A, separately excited dc motor has an armature resistance 0.1 $\Omega$ is now coupled to an overhauling load with a torque of 800 N.m. Determine the speed at which the motor can hold the load by regenerative braking .Neglect the motor's rotational losses. |
| d. | Explain three phase fully controlled rectifier controlled of DC separately excited motor. |
| e. | Describe in detail about speed control of self-controlled synchronous motor drives. |

## SECTION C

**3.**     **Attempt any *one* part of the following:**             **7 x 1 = 7**

| (a) | Discuss the dynamics of motor load system and also derive the relations for motor- load torque system. |
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| (b) | Combine the speed torque characteristics of various load and motor and comment on steady state stability of them. |

**4.**     **Attempt any *one* part of the following:**             **7 x 1 = 7**

| (a) | Draw the typical temperature rise time curve and derive the equation for temperature rise in an electric drive. |
|----|---|
| (b) | A thyristor converter fed dc motor has following specifications: rated armature current = 500 A, armature resistance = 0.01 ohm. The drive operates on following duty cycle: (i) Acceleration at twice the rated armature current for 10 sec(ii) Running at full load for 10 sec (iii) Deceleration at twice the rated armature current for 10 sec (iv) Idling interval. The core loss is constant at 1 KW. If β has a value of 0.5, determine the maximum frequency of drive operation. |

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**5.** **Attempt any *one* part of the following:** 7 x 1 = 7

| (a) | Derive, the expression to calculate the energy loss during starting of Induction motor and also state the various methods used to reduce the energy loss during starting. |
|-----|------------------------------------------------------------------------------------------------|
| (b) | Explain the various methods of braking can be applied to induction motor. What kind of braking is more effective, give reason |

**6.** **Attempt any *one* part of the following:** 7 x 1 = 7

| (a) | For variable frequency control of induction motor, explain the following: (i) For speeds below base speed (V/f) ratio is maintained constant, Why? (ii) For speeds above base speed, terminal voltage is maintained constant, why? |
|-----|------------------------------------------------------------------------------------------------|
| (b) | A 440 V, 3 phase, 50 Hz, 6 pole 945 rpm, delta connected induction motor has following parameters referred to stator: $R_S$ = 2.0, $R^I_r$ = 2.0, $X_S$ = 3 Ω, $X^I_r$ = 4 Ω. When driving a fan load at rated voltage it runs at rated speed. The motor speed is controlled by stator voltage control. Determine (i) Motor terminal voltage, current and torque at 800 rpm (ii) Motor speed, Current and torque for terminal voltage of 280 V. |

**7.** **Attempt any *one* part of the following:** 7 x 1 = 7

| (a) | Explain how the Static Scherbius drive is used in slip power recovery scheme. |
|-----|------------------------------------------------------------------------------------------------|
| (b) | Elucidate the operation of Brushless dc motor drive in detail. |