

Printed pages: 02

Sub Code: NEN014

Paper Id: 

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**B.TECH**  
**(SEM VI) THEORY EXAMINATION 2017-18**  
**SPECIAL ELECTRICAL MACHINE**

Time: 3 Hours

Total Marks: 100

- Note:** 1. Attempt all Sections. If require any missing data; then choose suitably.  
 2. Any special paper specific instruction.

**SECTION A**

- 1. Attempt all questions in brief. 2 x 10 = 20**
- a. Why low speed machine are preferable when frequent starting and stopping is required?
  - b. Explain how the operation of 3 phase induction motor is effected when single phasing occurs.
  - c. Explain the function of two stator winding in a single phase induction motor.
  - d. What are the advantages of having low rotor inertia for a 2 phase servo motor?
  - e. What is slew range of stepping motor?
  - f. Discuss the single mode working of VRM.
  - g. Write the application of PMDC motor.
  - h. Explain single phase hysteresis motor.
  - i. A 200 volt 50 hz single phase series motor has a total reactance of 15 ohm and motor current of 3.1 amp . Calculate the power factor.
  - j. Explain graphically the torque speed characteristic of repulsion motor.

**SECTION B**

- 2. Attempt any three of the following: 10 x 3 = 30**
- a) A slip power converter is directly connected to a 3- phase 50 hz wound rotor induction motor having 6 pole. Induction motor is used to control the speed of a load requiring torque proportional to the cube of its speed. if the speed is vary between 60 to 600 rpm and load needs a power of 5KW at 600 rpm then determine the power handled by the slip power converter in terms of slip when slip power returned to the supply. Also determine the value of slip power and motor in put at 60 and 600 rpm and amount of maximum power that the slip power convertor can carry. Neglect losses.
  - b) Derive the equivalent circuit of a single phase induction motor with the help of double revolving field theory.
  - c) Describe with appropriate sketch, a 2phase 8/4 pole permanent magnet stepping motor. For this motor determine the step angle and the excitation sequence of the 2 phase winding for clockwise an anticlockwise rotation of the rotor.
  - d) Explain a three pulse three phase brushless dc motor. Discuss how torque is developed in this motor.
  - e) A 220 volt 50 hz, 400 W , 2500 rpm , single phase series motor has total resistance of 15 ohm . For a stray power loss of 30 W find current and power factor when machine works under rated conditions.

## SECTION C

3. **Attempt any one part of the following:** **10 x 1 = 10**
- (a) Explain static slip power recovery scheme for the speed control of a wound rotor induction motor. Why it is more popular for adjustable speed drive?
  - (b) Explain equivalent circuit of double cage induction motor. A 3 phase, 8 pole 50 hz, 440 volt induction motor develop maximum torque at a slip of 8 %. In a particular application, it runs at 3% slip at rated voltage, driving a load to stop demand is proportional to square of speed. What is the maximum value to which the supply voltage can drop, if the speed of the motor is not to decrease below 950 rpm? Neglect stator impedance drop.
4. **Attempt any one part of the following:** **10 x 1 = 10**
- (a) Why single phase motor is not self start? Explain capacitor start capacitor run motor with its torque slip characteristic in detail. Which capacitor has higher value, the start or run capacitor ? give reason.
  - (b) Explain construction and working of 2 phase AC servomotor, and draw its torque slip characteristic with different rotor resistance. Also give its advantages.
5. **Attempt any one part of the following:** **10 x 1 = 10**
- (a) Enumerate the features that the drive circuit for a stepping motor should possess for optimum torque output. also describe the drive circuit used for VR and hybrid stepping motors.
  - (b) Describe the inverter drive circuit used for switched reluctance motors. A three phase 6/8 VRM is running at a speed of 1000 rpm. Calculate the time between pulses required to excite the phase winding.
6. **Attempt any one part of the following:** **10 x 1 = 10**
- (a) Explain construction and principle of operation of a PMAC motor.
  - (b) Explain in detail construction and working principle of reluctance motor. Also show its characteristic.
7. **Attempt any one part of the following:** **10 x 1 = 10**
- (a) Explain construction and working of linear induction motor briefly with its applications.
  - (b) A universal series motor operates on 200 volts d.c. , draws a current of 10 amp and runs at 1440 rpm. Find the new speed and power factor when machine connected to 200 volt 25 hz supply . The motor has a resistance of 1 ohm and total inductance of 0.1 H.