B.Tech. – VIEP – ELECTRICAL ENGINEERING (BTELVI)

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□□124   December, ~

BIEEE-003 : SPECIAL ELECTRICAL MACHINES

Time : 3 hours   *Maximum Marks : 70*

Note : *Answer any five questions. All questions carry equal marks. Use of scientific calculator is allowed.*

1. (a)   Explain how the skin effect phenomenon is helpful in obtaining the desirable features of high starting torque and low operating slip in deep bar rotor polyphase induction motors. Assume rectangular cross-section of the bar.   9

    (b)   Also explain how the equivalent circuit of an ordinary polyphase induction motor is applicable to a deep bar induction motor.   5

2. (a)   Explain double revolving field theory for a single-phase induction motor.   7

    (b)   Describe the construction and working of a shaded pole induction motor.   7

3. (a) Explain the principle of operation of a DC servomotor.

   (b) Explain the requirement of negative slope for the torque – speed curve of an AC servomotor. What would happen if the slope were positive ?

   (c) Describe the construction and working of a drag-cup servomotor.

   (d) State the advantages of servomotors over large industrial motors. $4 \times 3\frac{1}{2} = 14$

4. (a) What is the need of a drive circuit in a stepper motor ? Which circuit is applicable for a variable reluctance motor ? 4

   (b) Differentiate between a switched reluctance motor and a variable reluctance stepper motor. 4

   (c) A three-phase permanent magnet stepper motor for a particular application must be capable of controlling the position of a shaft in steps of 7·5° and running at speeds of up to 300 r.p.m.

   (i) How many poles must this motor have ?

   (ii) At what rate must control pulses be received in the motor's control unit if it is to be driven at 300 r.p.m. ? 6

5. Explain the working of a reluctance motor. Draw and discuss the typical torque – speed characteristics of a reluctance motor. Make a comparison of a reluctance motor with an equivalent induction motor. $5+5+4=14$

6. Discuss in detail, the construction, operating principle and characteristics of a hysteresis motor. Mention its applications. *10+4=14*

7. Describe the constructional features and principle of operation of a linear induction motor. Draw its characteristics and state its important applications. *8+3+3=14*

8. (a) Explain the constant power drive scheme. Give the power distribution between the main induction motor and auxilliary equipment. *7*

    (b) Explain PCB motor. Mention its advantages. *7*

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