

**B.Tech. (Sem. - 5<sup>th</sup>)**  
**ASYNCHRONOUS MACHINES**  
**SUBJECT CODE : EE - 301**  
**Paper ID : [A0413]**

[Note : Please fill subject code and paper ID on OMR]

Time : 03 Hours

Maximum Marks : 60

**Instruction to Candidates:**

- 1) Section - A is **Compulsory**.
- 2) Attempt any **Four** questions from Section - B.
- 3) Attempt any **Two** questions from Section - C.

**Section - A**

**Q1)**

**(10 x 2 = 20)**

- a) Why does an induction motor never run on synchronous speed?
- b) What will the effect on torque developed by an induction motor if applied voltage is reduced to half with frequency unchanged?
- c) Give some applications of stepper motor and repulsion motor.
- d) Distinguish between double cage and deep bar construction.
- e) A 6 pole, 50 Hz, 3-phase induction motor has a full load speed of 950 rpm, and has rotor copper loss of 5 kW. Calculate rotor input.
- f) Calculate pitch factor of an AC machine having 6 poles and 96 slots. The coils are wound with  $13/6$  fractional pitch.
- g) What is the effect of skewing the rotor slots of an induction motor rotor?
- h) What is meant by split-phase method of motor starting?
- i) State working principle of Repulsion motor.
- j) Mention few applications of AC series motors.

## Section - B

(4 x 5 = 20)

- Q2) Discuss the production of rotating field in 3-phase induction motor.
- Q3) Prove that in 3-phase induction motor the ratio of maximum torque to starting torque is  $(1+k^2)/2k$ , where  $k$  is the ratio of rotor resistance to rotor reactance. Neglect stator impedance.
- Q4) Explain the torque-slip characteristics of 3-phase induction motor.
- Q5) Discuss effect of voltage injection in rotor circuit of a slip ring induction motor.
- Q6) Explain the salient features of Linear Induction Motor.

## Section - C

(2 x 10 = 20)

- Q7) Describe with the help of diagrams the constructional details and action of a double cage induction motor.  
Determine the parameters of the equivalent circuit of a three-phase, 400V, 50Hz, 4-pole, delta connected, squirrel-cage induction motor with the following Data:  
No-Load: 400V, 3.0A, 300W.  
Blocked Rotor: 120V, 7.0A, 500W.  
Draw the equivalent circuit and calculate the output and input when the motor works with a slip of 5%. The stator effective resistance per phase is equal to 4?
- Q8) (a) State and explain double revolving field theory of single phase induction motor. Deduce its equivalent circuit.  
(b) Derive an expression for the torque developed in repulsion motor. Draw its phasor diagram.
- Q9) Write short notes on the following:  
(a) Stepper Motor.  
(b) Starting methods of 3-phase induction motor.

