1. Why is the air gap between the stator and rotor of a three phase induction motor kept as short as possible?
2. Enumerate the advantages of skewed slots in the rotor of a squirrel cage motor.
3. What happens when an electric train driven by an induction motor begins to move down hill?
4. Explain briefly the phenomenon of crawling in an induction motor.
5. Explain the necessity of starters for induction motors.
7. State why small fractional kilowatt ac series motors are called universal motors.
8. Explain the main advantage of using a dc servo motor.
9. What happens to a stepper motor if pulse duration is very short?
10. How end effects effect the performance of a linear induction motor and how its effects can be minimized?

PART B

MODULE I

11. a) Compare squirrel cage and wound rotor induction motor with reference to construction, performance and application. (6)

b) Draw the complete torque-slip characteristics of an induction motor and show starting torque and breakdown torque. Mark the stable and unstable regions. (6)

c) A 3φ, 60Hz, 15HP, 460V, 4 pole, 1728rpm induction motor delivers full output power to a load connected to its shaft. The windage and friction loss of the motor is 750W. Determine (i) mechanical power developed (ii) air-gap power (iii) rotor copper loss. (8)

OR

12. Draw the circle diagram for a 5HP, 200V, 50Hz, 4 pole, 3φ, star connected induction motor from the following test data

<table>
<thead>
<tr>
<th>NO LOAD TEST</th>
<th>200V</th>
<th>5A</th>
<th>350W</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHORT CIRCUIT TEST</td>
<td>100V</td>
<td>26A</td>
<td>1700W</td>
</tr>
</tbody>
</table>

From the circle diagram, find
(i) line current, power factor, slip, torque and efficiency at full load
(ii) Maximum torque and starting torque in terms of full load torque. (20)
MODULE II

13. a) Justify the suitability of induction generator in windmills. (5)
b) Calculate the steps in a 5 step rotor resistance starter for a three phase induction motor. The slip at maximum starting current is 2% with slip rings short circuited and the resistance per rotor phase is 0.02Ω. (10)
c) Compare an induction generator with an alternator. (5)

OR

14. a) Discuss with neat sketches the different electric braking methods used in three phase induction motor. (12)
b) Enumerate the advantages of synchronous induction motor over an ordinary synchronous motor. (8)

MODULE III

15. a) Explain double field revolving theory. Based on double field revolving theory, prove that a single phase induction motor is not self starting. (10)
b) Explain the construction, principle of operation and application of AC Servomotor. (10)

OR

16. a) Explain the working principle and applications of single phase shaded-pole motor. (10)
b) Explain the principle of operation of a universal motor. How can it be developed from a DC series motor? (10)

MODULE IV

17. a) Briefly explain the working of different types of Linear Induction Motor and its applications (10)
b) Explain the construction, principle of operation and applications of stepper motor. (10)

OR

18. a) Explain the principle of operation of (i) brushless dc motor (ii) switched reluctance motor. (8)
b) Derive the torque equation of a reluctance motor and draw the torque slip characteristics. Mention its applications. (12)