FACULTY OF ENGINEERING
B.E. 3/4 (E & EE) II Semester (Main) Examination, May/June 2012
ELECTRICAL MACHINERY – III

Time : 3 Hours] [Max. Marks : 75

Note : Answer all questions from Part A, Answer any five Questions from Part B.

PART – A
(25 Marks)

1. What do you understand by fractional slot winding ? 2
2. Why synchronous impedance varies with excitation ? 2
3. Why mmf method of finding voltage regulation is optimistic ? 3
4. Why the armature flux and armature mmf of salient pole alternators are not in phase ? 2
5. What are the conditions of parallel operation of alternators ? 3
6. What are the methods of starting a synchronous motor ? 2
7. How synchronous motor can be used for p.f. improvement ? 3
8. What do you understand by “x_d and x_q” ? 3
9. What is the effect of short circuit ratio on synchronous generator ? 3
10. What are the problems faced in Linear Induction motors ? 2

PART – B
(50 Marks)

11. A 480 V, 4 pole, delta connected, 50 Hz cylindrical rotor alternator has 0.015 Ω/phase of armature resistance and 0.1 Ω/phase of synchronous reactance. The rated current and p.f. are 1200 A and 0.8 lagging respectively. At full-load, mechanical losses are 40 kW and con losses are 30 kW. The resistance of field winding is 500 Ω. The OCC of the alternator is as follows.

<table>
<thead>
<tr>
<th>I_r</th>
<th>1</th>
<th>2</th>
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<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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</thead>
<tbody>
<tr>
<td>OC Voltage</td>
<td>120</td>
<td>250</td>
<td>360</td>
<td>451</td>
<td>505</td>
<td>532</td>
<td>550</td>
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</tbody>
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(This paper contains 2 pages)
a) What is the field current of no-load if terminal voltage is 480 V?

b) What is the field current if the alternator is delimiting rated load at rated p.f. and rated voltage? What is power output, proved angle and efficiency.

c) What is the field current for load current of 1200 A at 480 V on 0.8 p.f. loading.

12. a) Explain static excitation system for a salient alternator.

b) Explain mmf method of finding voltage regulation of alternator.

13. a) Derive the power angle characteristic of salient pole alternator from fundamentals.

b) Explain how \( x_d \) and \( x_q \) are determined experimentally.

14. A 10 MVA, 3 phase, star connected, 11 kV, 16 pole, 50 Hz, salient pole synchronous motor has \( x_d = 6 \, \Omega \) and \( x_q = 4 \, \Omega \) per phase. The motor is working at full load unity p.f. and rated voltage. Find:

a) current

b) power angle

c) synchronizing power and torque per electrical degree.

15. a) Explain V-curves and inverted v-curves for synchronous motor.

b) Explain the operation of synchronous-induction motor.

16. Explain in detail double revolving field theory of single phase motors with their equivalent Ckts and characteristics.

17. With short notes on:

a) Repulsion motor

b) Split phase motor.