Exam. Code: 0934
Sub. Code: 33751

2056

B.E. (Electrical and Electronics Engineering)
Fourth Semester
PC-EE-4401: Electrical Machine - II

Time allowed: 3 Hours | Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit. All questions carry 10 marks.

x-x-x

1. Answer the following:

   a) Explain why Short Circuit Ratio (SCR) is an important parameter for synchronous generators.

   b) A synchronous generator operates at constant excitation but increasing load. Explain the variation of power factor.

   c) Why does hunting occur in synchronous machines? Mention two methods to suppress it.

   d) Distinguish between V-curve and inverted V-curve of a synchronous motor.

   e) Explain the physical significance of direct axis reactance (Xd) and quadrature axis reactance (Xq).

   f) Why are damper windings provided in synchronous machines?

   g) Explain the working principle of a reluctance motor.

   h) Why is a single phase induction motor not self starting?

   i) What is the function of a synchronoscope?

   j) Explain the concept of double revolving field theory.

UNIT - I

2. a) Derive the power transfer equation of a cylindrical rotor synchronous machine and explain the significance of power angle.

   b) A 3-phase, 11 kV, star connected synchronous generator has:

      i) Armature resistance = negligible

      ii) Synchronous reactance = 15 Ω/phase

Contd.....P/2

iii) Line current = 200 A

iv) Power factor = 0.8 lagging

Using synchronous impedance method, calculate:

i) Induced EMF per phase

ii) Voltage regulation

3. a) Explain the Potier Triangle Method for determination of leakage reactance an armature reaction.

b) The following data is obtained from tests on a synchronous generator:

Field Current (A)	Open Circuit Voltage (kV)
10	4
20	7
30	9
40	10.5

Short circuit current at 30 A field current = rated current

Calculate:

i) Synchronous reactance

ii) Short Circuit Ratio

Explain the physical interpretation of the result.

4. a) Derive the power equation for salient pole synchronous machine and explain reluctance power.

b) A salient pole synchronous machine has:

Xd = 1.2 pu

Xq = 0.7 pu

Terminal voltage = 1 pu

Internal emf = 1.3 pu

Determine:

i) Maximum power developed

ii) Power angle at maximum power.

UNIT - II

5. a) Explain the conditions required for synchronization of an alternator with an infinite bus.

b) Two alternators operate in parallel:

Alternator A:Rating = 10 MW & Frequency regulation = 4%

Alternator B:Rating = 15 MW & Frequency regulation = 5%

Total load = 18 MW

Determine the load shared by each alternator.

c) Explain the effect of excitation change on reactive power sharing.

6. a) Explain the construction and working of a Brushless DC Motor (BLDC) with suitable diagrams.

b) Compare the following motors on the basis of torque production mechanism and applications:

i) Stepper Motor

ii) Reluctance Motor

iii) Hysteresis Motor

c) A stepper motor has 8 stator poles and 6 rotor poles. Determine:

i) Step angle

ii) Steps per revolution.

7. a) Explain Double Revolving Field Theory and derive the torque expression for a single phase induction motor.

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b) Compare the following motors in terms of starting torque, efficiency and applications:

i) Capacitor start motor

ii) Capacitor start capacitor run motor

iii) Permanent split capacitor motor

c) A single phase induction motor has:

i) No load current = 4 A

ii) Blocked rotor current = 18 A

iii) Supply voltage = 230 V

Explain how no-load and blocked rotor tests help determine motor parameters.

x-x-x