Code No: 115AE

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, November/December - 2016
ELECTRICAL MACHINES – III
(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

(25 Marks)

1.a) Describe a salient pole synchronous machine. [2]
b) What are the differences between concentrated and distributed windings? [3]
c) What is meant by voltage regulation of synchronous generator? [2]
d) Write short notes on slip test. [3]
e) What is meant by parallel operation? [2]
f) Discuss about synchronizing power. [3]
g) What is an excitation circle? [2]
h) What are the applications of synchronous condenser? [3]
i) What is a capacitor start and run? [2]
j) What are the applications of shaded pole motor? [3]

PART - B

(50 Marks)

2.a) Explain in detail about the constructional features of round rotor synchronous machines.
b) A 150 kVA, 500V, 3 phase star connected alternator has the following test results:
OCC: Line to line voltage is 500V
Field current is 4A
Air-gap line: Line to line voltage is 400V
Field current is 3A
SCC: Field current is 3A
Armature current is 173.21 A
The armature resistance is negligible. Find unsaturated reactance in ohms and per unit. [5+5]

OR

3.a) Explain how the harmonics in the generated EMF can be suppressed in synchronous machines.
b) A three phase star connected alternator has an open circuit voltage of 6000V. The armature resistance and synchronous resistance are 0.4Ω and 4Ω per phase respectively. Find the terminal voltage and the phase difference between terminal voltage and open circuit EMF at a power factor of 0.9 leading. Given load current is 140A. [5+5]

4.a) Explain in detail about finding the regulation of synchronous generators using ASA method.

b) Find the voltage regulation at full load, 0.9 power factor lagging for a three phase, 1000 kVA, 5000 V, star connected alternator having an armature resistance of 0.08Ω per phase and a synchronous reactance of 7Ω per phase. [5+5]

OR

5.a) Explain in detail about two reaction analysis

b) The OCC of a 6-pole, 440V, 50Hz, three phase star connected alternator is as below

Field current (A)	2	4	6	7	8	10	12	14
Open circuit Voltage (V)	155	280	390	440	475	525	565	590

A field current of 7A is needed to circulate the full load rated current of 35A under short circuit conditions. The field current for rated terminal voltage under full load zero power conditions is 15A. The armature resistance is 0.3Ω per phase. Find the regulation at full load current of 35A at 0.9 lagging power factor using MMF method. [5+5]

6.a) Discuss in detail about sub-transient, transient and steady state reactances.

b) Two similar 3000 kVA alternators operate in parallel. The governor of the first machine is such that frequency drops from 50 Hz at no load to 48 Hz on full load. The corresponding drop for the second machine is 50 Hz to 48.5 Hz. (i) how will they share a load of 4000 kW? (ii) How much maximum unity power factor load can they carry without any one of them getting overloaded? [5+5]

OR

7.a) Explain in detail about Synchronizing alternators with infinite bus bars.

b) A 3 MVA, 6 kV, 1500 rpm, three phase 50 Hz alternator is operating on infinite bus bar. Find synchronizing power per mechanical degree of angular displacement at no load. Also find synchronizing torque for a 0.5^0 mechanical displacement. Given the synchronous reactance is 30%. [5+5]

8.a) Draw the phasor diagram of synchronous motor and explain.

b) A 2kV, three phase star connected synchronous motor has a synchronous reactance of 9Ω per phase . When the motor delivers 120 kW, the efficiency is 95% (exclusive of field loss). The power angle is 15°. Calculate (i) E per phase (ii) Power factor. Neglect resistance. [5+5]

OR

9.a) Explain in detail about hunting and its suppression.

b) A 3 kV delta connected synchronous motor has synchronous reactance of 15Ω per phase. It operates at a leading power factor of 0.8 when drawing 700 kW from mains. Find excitation EMF? [5+5]

10.a) Explain the principle of operation of single phase induction motor.

b) Explain the operating principle of universal motor. [5+5]

OR

11.a) Discuss in detail about the working principle of split phase motors.

b) Explain in detail about double revolving field theory. [5+5]

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