R13

Code No: 115AE

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, July/August - 2023

ELECTRICAL MACHINES – III

(Electrical and Electronics Engineering)

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

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART - A

(25 Marks)

1.a)	Define pitch factor and winding factor.	[2]
b)	Compare concentrated and distributed windings.	[3]
c)	List the different tests to be conducted on an alternator to determine regulation using Potier triangle method.	[2]
d)	Differentiate between MMF and EMF methods of finding regulation of an alternator.	[3]
e)	A machine with large air-gap has a higher synchronizing power, why?	[2]
f)	What are the conditions required for parallel operation of alternators?	[3]
g)	What is synchronous condenser?	[2]
h)	What could be the reasons if a 3-phase synchronous motor fails to start?	[3]
i)	What is universal motor?	[2]
j)	What are the applications of stepper motor?	[3]

PART - B

(50 Marks)

2.a) Describe the main parts of an alternator and their functions with a neat sketch.

b) A 3-phase, 16-pole alternator has a star-connected winding with 144 slots and 10 conductors per slot. The flux per pole is 30 mWb sinusoidally distributed. Find the frequency, the phase and line voltage if the speed is 375 rpm. [5+5]

OR

3.a) Explain the effect of armature reaction at different power factors in an alternator.

b) Explain why harmonics are there in the induced EMF of Alternators. [5+5]

4.a) Define voltage regulation of an alternator. Explain the various factors which may affect the regulation of an alternator.

b) A 3-phase 50-Hz star-connected 2000-kVA, 2300V alternator gives a short circuit current of 600 A for a certain field excitation. With the same excitation, the open circuit voltage was 900 V. The resistance between a pair of terminals was 0.12 Ω. Find full load regulation at (i) UPF (ii) 0.8 p.f. lagging. [5+5]

OR

5.a) Describe the slip test method for the measurement of Xd and Xq of synchronous machines.

b) Deduce the relation for voltage regulation of salient pole alternator. [6+4]

6.a) Discuss briefly about the effect of change of excitation in alternators.

b) The governors on the prime movers of two 1000KW alternators running in parallel are so adjusted that the frequency of one of the alternators drops from 51Hz to 48.5Hz, and that of other drops from 51Hz to 49Hz. Calculate (i) the load on each machine when the total load is 1200kW and (ii) the frequency at this load. [5+5]

OR

7 Explain briefly the analysis of a short circuit current waveform of an alternator with the help of neat wave form. [10]

8.a) Discuss the principle of operation of a synchronous motor. Also list their applications.

b) Show that the locus of stator current for a constant output of 3-phase synchronous motor connected to a constant voltage, constant frequency bus-bars is a circle? [5+5]

OR

9.a) Derive an expression for power developed in a cylindrical rotor synchronous motor in terms of load angle and synchronous impedance.

b) What is a synchronous induction motor? Explain its working. [5+5]

10. Using double field revolving theory, explain the torque-slip characteristics of a single phase induction motor and prove that it cannot produce any starting torque. [10]

OR

11. What is a shaded pole induction motor? Explain its working. Also mention their advantages. [10]

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