

R13

Code No: 115AE

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, January/February - 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) How can a DC generator be converted into an alternator? [2]
- b) Give an expression for pitch and distribution factors in an alternator. [3]
- c) Explain, why the field winding is placed on rotor, instead on stator of an alternator? [2]
- d) What are the advantages of ASA method? [3]
- e) List the factors that affect the load sharing in parallel operating generators. [2]
- f) Give the condition for presence of no dc decaying component in the fault current of an alternator. [3]
- g) Why Synchronous motors are not Self Starting? [2]
- h) Why it is necessary to increase the excitation of synchronous motor to obtain minimum current with application of load? [3]
- i) Give the applications of Stepper Motor. [2]
- j) Give classification of capacitor motors. [3]

PART - B

(50 Marks)

- 2.a) Explain the following terms related 3-phase a.c. windings.
 - i) Single-layer and double-layer windings
 - ii) Full-pitch and short-pitch windings
 - iii) Integral slot and fractional slot windings.
- b) A 4 pole 50hz, star connected alternator has 6 slots per pole per phase and a 2-layer winding with 4 conductors per slot. If the coil span is 150 find no load terminal emf if the flux per pole is 300mWb. [5+5]

OR

- 3.a) Explain why harmonics are there in the induced EMF of Alternators and give various methods to suppress the Harmonics in induced emf of Alternators.
- b) With a neat experimental set up explain how to find synchronous impedance of an alternator. [5+5]

- 4.a) Explain the two-reaction theory as applied to salient pole synchronous machine.
b) Explain the Poitier- triangle method of determining the voltage regulation of an alternator. [5+5]

OR

5. A 3-phase, y connected alternator is rated as 400 V and 20A on full load. It has armature and synchronous impedance of 2.5 ohms and 18 ohms respectively. Find the induced emf at: (a) 0.9 pf lead (b) 0.8 pf lag (c) at upf. [10]

- 6.a) Derive the expression for synchronizing power and synchronizing torque when two alternators are connected in parallel.
b) Explain the effect of change of excitation and mechanical power input of alternator when it is connected to Infinite bus bar. [5+5]

OR

- 7.a) Deduce the expressions for transient, sub-transient and steady state reactance's in alternators.
b) Derive an expression for load shared between two alternators with unequal KVA ratings. [5+5]

- 8.a) Explain how a synchronous motor can be operated as synchronous condenser.
b) A synchronous motor has an equivalent armature reactance of 3.3Ω . The exciting current is adjusted to such a value that the open circuit emf is 950V. Find the p.f. at which the motor would operate when it takes 80kW from 800V supply line. [5+5]

OR

- 9.a) What is hunting in a synchronous motor. What are its effects?
b) The input to an 11000V, 3-phase star connected synchronous motor is 60A. The effective resistance and synchronous reactance per phase are respectively 1Ω and 30Ω . Find the power supplied to the motor, and the induced electromotive force for a power factor of 0.8 i) lagging ii) leading. [5+5]

- 10.a) What is a universal motor explain its operation.
b) Draw the slip-torque characteristics of all types of single-phase induction motors and compare their merits and demerits. [5+5]

OR

- 11.a) Draw the circuit diagram of a capacitor-start capacitor-run single phase induction motor and explain its working. Where this type of motor is commonly used?
b) Explain double field revolving theory. [5+5]

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