

Printed Pages: 02

Sub Code: EEE401

Paper Id:

120409

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B. TECH.
(SEM IV) THEORY EXAMINATION 2017-18
ELECTRO-MECHANICAL ENERGY CONVERSION-II

Time: 3 Hours

Total Marks: 100

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt all questions in brief. 2 x 10 = 20

- a) Explain the armature winding of alternator.
- b) Define the pitch factor of alternator.
- c) Define the slip of 3-phase induction motor.
- d) Explain the rotor current of 3-phase induction motor.
- e) Describe the main features of synchronous motor.
- f) Define different torques in a synchronous motor.
- g) Compare the 1-phase and 3-phase induction motor.
- h) Write a short note on universal motor.
- i) Write a short note on shaded-pole motor.
- j) Write a short note on capacitor motor.

SECTION B

2. Attempt any three of the following: 10 x 3 = 30

- a) Explain the different methods of excitation system of alternators.
- b) A 3-phase, 400 V synchronous motor takes 52.5 A at a power factor of 0.8 leading. Determine the induced emf and the power supplied. The motor impedance per phase is $(0.25 + j3.2) \Omega$.
- c) A 3-phase, 50 Hz, 4-pole induction motor has a slip of 4%. Calculate: (i) speed of the motor (ii) frequency of rotor emf. If the rotor has a resistance of 1Ω and standstill reactance of 4Ω , calculate the power factor (i) at standstill (ii) at a speed of 1400 rpm.
- d) The standstill impedance of the outer cage of a double-cage induction motor is $(0.3 + j0.4) \Omega$ and that of the inner cage is $(0.1 + j1.5) \Omega$. Compare the relative currents and torques of the two cages (i) at standstill (ii) at a slip of 5%. Neglect stator impedance.
- e) Describe the construction and working of a shaded-pole motor.

SECTION C

3. Attempt any one part of the following: 10 x 1 = 10

- a) A 3-phase, 50 Hz, 8-pole alternator has a star-connected winding with 120 slots and 8 conductors per slot. The flux per pole is 0.05 Wb, sinusoidally distributed. Determine the phase and line voltages.
- b) A 3-phase, 10 kVA, 400 V, 50 Hz star-connected alternator supplies the rated load at 0.8 power factor lagging. If the armature resistance is 0.5Ω and synchronous reactance is 10Ω , find the torque angle and voltage regulation.

4. Attempt any one part of the following: 10 x 1 = 10

- a) Explain the principle of operation of a 3-phase synchronous motor.

- b) Explain hunting of a synchronous machine. What is the purpose of damper windings in a synchronous machine?

5. Attempt any one part of the following: 10 x 1 = 10

- a) Describe with neat sketches the construction of a 3-phase cage-type induction motor.
b) Why starters are necessary for starting induction motors? Name different starting methods for 3-phase induction-motors.

6. Attempt any one part of the following: 10 x 1 = 10

- a) Draw and explain the complete torque-speed characteristic of a 3-phase induction machine for all ranges of speed.
b) What is meant by slip-energy recovery? How this principle is used to control the speed of 3-phase induction motors?

7. Attempt any one part of the following: 10 x 1 = 10

- a) Draw and explain the phasor diagram of an AC series motor.
b) Explain the double-revolving field theory for single-phase induction motors.

In NEE 401 (Paper ID: 120409) the code EEE 401 has been wrongly written inside the question paper. It should be read as NEE 401