4E4175

Roll No.

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B. Tech. IV-Sem. (Main) Exam; April-May 2017

Electrical Engg.

4EE5A Electrical Machines - II

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks : 24

Instructions to Candidates :-

*Attempt any **five questions**, selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*
Units of quantities used / calculated must be stated clearly.
Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)

1. NIL 2. NIL

UNIT - I

1 (a) Show that a 3-phase distributed winding excited by balanced 3-phase currents will produce a sinusoidally distributed rotating magnetic field of constant magnitude when the phase windings are wound 120° electrical degrees apart in space.

(b) Explain the term "distribution factor" in connection with alternator armature winding and derive the equation of it, when the armature winding is uniformly distributed.

8+8

OR

1 (a) Explain clearly the meaning of coil-pitch factor. Give equation for coil-pitch factor of armature winding of alternator.

(b) A 3-phase, 50 Hz, 2-pole, star connected alternator has 54 slots with 4 conductors per slot. The pitch of the coil is 2 slots less than pole-pitch. If the machine is given 3300 volts between lines on open circuit, determine useful flux per pole.

6+10

UNIT - II

2 (a) Starting from first principles, develop the equivalent circuit of a 3-phase induction motor. Also draw phasor diagram of 3-phase induction motor.

(b) Derive the equation for torque developed under running conditions, by a 3-phase induction motor. Find the condition for maximum running torque.

8+8

OR

2 (a) Draw and explain the circuit diagrams for performing no-load and block rotor tests on a 3-phase induction motor. How the parameters of equivalent circuit are determined with the results of these tests ?

(b) Why starters are necessary for starting the 3-phase induction motor. Explain star-delta starter.

(c) Explain phenomenon of crawling and logging in a 3-phase induction motor.

6+5+5

UNIT - III

3 (a) Explain, why single-phase induction motor is not self starting.

(b) Explain double-revolving field theory of single-phase induction motor and derive the equation for net torque developed.

(c) Draw and explain the equivalent circuit of single-phase induction motor, based upon double-field revolving theory.

(d) Draw circuit diagram and phasor diagram of a capacitor start and run single-phase induction motor.

2+6+4+4

OR

3 (a) Describe construction and working of a shaded pole motor.

(b) Briefly explain construction and working of single-phase series motor. Also draw its phasor diagram.

(c) Write short note on "Universal Motor."

5+6+5

UNIT - IV

4 (a) Why a rotating field system used in synchronous machines is preferable to a stationary field ?

(b) Draw phasor diagrams of a loaded alternator (cylindrical type) for following conditions :

(i) Lagging power factor

(ii) Leading power factor and

(iii) Unity power factor

(c) Sketch and explain the open-circuit and short-circuit characteristics of a synchronous generator. Briefly explain, how the voltage regulation of an alternator is found by synchronous impedance method.

4+4+8

OR

4 (a) Explain the two reaction theory applicable to salient pole synchronous machines and draw its phasor diagram.

(b) Derive the equation for power developed by the salient pole synchronous machines and draw its power-angle characteristics.

(c) Why salient pole synchronous machines are more stable than cylindrical rotor machine, explain.

6+6+4

UNIT - V

5 (a) Explain why the synchronous motor is not self-starting. Explain the procedure of starting a synchronous motor in brief.

(b) What are V-curves and inverted V-curves of a 3-phase synchronous motor? How these curves are obtained experimentally ?

(c) Explain hunting of a synchronous machine. How it can be avoided ?

5+7+4

OR

5 (a) Explain with neat sketches, the principle of operation of a 3-phase synchronous motor. Explain why it will not run at other than synchronous speed.

(b) A 3-phase, star-connected synchronous motor has effective armature resistance and synchronous reactance of 0.2 Ω and 2.0 Ω per phase respectively. It takes 20 amps to drive a certain load. Calculate the excitation emf induced in the motor if its works with (i) 0.8 power factor Lagg. (ii) 0.8 P.F. leading (iii) Unity P.F. conditions.

8+8