DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE – RAIGAD -402 103

Semester Winter Examination – Dec. - 2019

Branch: Electrical Engineering — Sem.:- V
Subject:- Electrical machines-II (BTEEC501) — Marks: 60
Date:-09/12/2019 — Time:- 3 Hrs.

==========

Instructions to the Students

1. Each question carries 12 marks.
2. Attempt **any five** questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly.

Q. No.1

a) Explain with neat sketch constructional features of Synchronous machine **(04)**

b) Show by mathematically and vectorially that in a three phase electrical machine a rotating magnetic field is produced when supplied with three phase supply. **(05)**

c) Calculate the synchronous speed of a 50 Hz a. c. machine having number of poles P = 2, 4, 6, 8. Plot the speed, Pole characteristic. **(03)**

Q. No.2

a) Develop a circuit model of an alternator and hence establish the relationship between various voltages. Draw vector diagram for different p.f **(04)**

b) Define voltage regulation; explain following method for determination of the same **(05)**

i) Synchronous Impedance method ii) Potier Triangle method

c) A three phase, 8 pole, 750 rpm synchronous alternator has 72 slots. Each slot has 12 conductors and winding is short pitched by 2 slots. Find pitch factor and breadth factor. If flux per pole is 0.06 Wb, find induced emf per phase. **(03)**

Q. No.3

a) Define the following terms, derive their suitable expressions and bring significance of each term. **(05)**

i) Synchronizing current ii) Synchronizing Power & iii) Synchronizing Torque

OR

b) Derive an expression for current shared by two alternators in parallel using
i) Impedance method and ii) Admittance method

c) Discuss following torques associated with Synchronous motor **(03)**

i) Starting Torque ii) Running Torque iii) Pull in Torque iv) Pull out Torque

d) Two three phase, 6.6 kW, star connected alternators supply a load of 3000 kW at 0.8 p. f. lagging. The synchronous impedance per phase of machine A is (0.5+j10) Ω, and of machine B is (0.4+j20) Ω, the excitation of machine A is adjusted so that it delivers 150 A at a lagging p. f. and the governors are so adjusted load is equally shared between the machines. Determine the current, power factor, induced emf, and load angle of each machine. **(04)**

Q. No.4

a) Explain the effect of changing excitation on armature current and power factor of a synchronous motor, draw relevant characteristics **(05)**

b) Obtain an expression for power delivered by synchronous motor and condition for its maximum. **(04)**

OR

c) Discuss the phenomenon of hunting and its effects on the operation of synchronous motor

d) A three phase 3300-V, star connected synchronous motor has an effective resistance and synchronous reactance of 2.0 Ω and 18.0 Ω per phase respectively. If the open circuit generated e.m.f. is 38800-V between lines , compute (i) the maximum total mechanical power that the motor can develop and (ii) the current and power factor at maximum mechanical power. **(03)**

Q. No.5

a) Discuss following speed control methods of an induction motor and bring out their advantages and limitations **(05)**
   i) By Injecting an E M F in rotor circuit & ii) Cascade OR Canacatation method

b) Derive an expression for the torque under running condition of an Induction Motor and hence discuss dependence of torque speed curve on supply voltage and frequency.

OR

c) With neat sketch Explain the complete torque slip characteristics of an induction motor. **(03)**

d) The results of no load and blocked rotor test on a 400 V 50 hp. 50 Hz, three phase, 4 pole induction motor are as under.

No load Test: V_o = 400 V , I_o = 30 A, W_o =1800 W.

Blocked rotor test: V_{sc} = 110 V , I_{sc} = 80 A, W_{sc} =4000 W.

The motor has star connected stator having a resistance of 0.1 Ω per phase. Draw the current locus diagram and determine; full load current, slip, torque and efficiency **(04)**

Q. No.6

a) Why a single phase induction motor is not self-starting, explain the phenomenon through double field revolving theory. **(04)**

OR

b) Discuss briefly following methods of starting single phase induction motor and discuss their merits and limitations.
   i) Split phase method and capacitor start method

c) Develop a circuit model of single phase induction motor and hence S T resultant torque is sum of forward and backward torques. **(04)**

d) Explain the principle of operation & application of following special machines; **(04)**
   i) Reluctance motor and ii) Hysteresis motor

**********Paper End**********