UNIVERSITY OF PUNE

[4363]-163

T.E Electrical Examination - 2013

ELECTRICAL MACHINES-II

(2008 COURSE)

[Total No. of Questions :12] **[Total No. of Printed Pages :4]**

[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

*(1) Answer **three** question from each section.*

*(2) Answers to the **two sections** should be written in **separate answer-books**.*

(3) Black figures to the right indicate full marks.

(4) Neat diagrams must be drawn wherever necessary.

(5) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator is allowed.

(6) Assume suitable data, if necessary.

SECTION I

Q1 a) Define voltage regulation of alternator. Explain why Potier method gives more accurate results than synchronous impedance method. [6]

b) Compare salient pole & non salient type of alternators. [4]

c) A 1500 KVA, 6.6 KV 3 phase star connected alternator has effective armature resistance of 0.5 Ω/ph & synchronous reactance of 5Ω /ph. Find the voltage regulation at (i) unity pf (ii) 0.8 lagging pf. [8]

OR

Q2 a) What is armature reaction in case of three phase alternator? Explain its effect on the working of the alternator. [6]

b) Derive the expression for emf induced in case of a 3 phase alternator. [4]

c) A 1200 kvA, 3300 V, 50 Hz, 3-phase, star connected alternator has armature resistance of 0.25 Ωper phase. A field current of 40 A produces a short circuit current of 200 A and an open circuit emf of 1100 V line to line. Find the voltage regulation on (i) full load 0.8 pf lag (ii) full load 0.8 pf leading [8]

Q3 a) Explain the advantages of synchronizations of 3-phase alternators. Explain one dark & two bright lamp method for used for synchronizing of 3-phase alternator. [8]

b) The 11,000v, 3 phase star connected synchronize motor takes current of 60 Amp. The effective resistance & synchronize reactance per phase are respectively 1Ω and 30Ω. Find (1) the power supplied to the motor at 0.8 pf (2) induced emf for a power factor of 0.8 lead (3) induced emf for a power factor of 0.8 lagging [8]

OR

Q4 a) Explain operation & synchronize motor at [8]

1) Constant load & variable excitation

2) Constant excitation & variable load

b) A 3 phase alternator has direct axis synchronous reactance of 0.85 pu & quadrature axis synchronize reactance of 0.55 pu. Determine the load angle, the no load p.u. voltage & per unit voltage regulation for the alternator when operating on full load at 0.8 p.f lagging. [8]

Q5 a) State different methods of speed control of 3-phase Induction motor. Explain v/f method of speed control of 3-phase Induction motor [8]

b) Write a short note on 3 phase induction generator [8]

OR

Q6 a) Compare 3 phase induction motor with three phase synchronizes induction motor. [8]

b) Write a note on testing of 3-phase induction motor as per IS 325 & IS 402g [8]

SECTION-II

Q7 a) Explain the operation of d.c. series motor on a.c. supply and problems with a.c. operation. [8]

b) Draw the circle diagram of a plain series motor and explain? [8]

OR

Q8 a) Explain transformer and rotational e.m.f's in plain series motor. [8]

b) What are the types of compensated series motor? Describe each with circuit diagram. [8]

Q9 a) Explain with sketch the operation of brushless d.c. motor and the applications of it? [8]

b) Describe the working, characteristics and applications of permanent magnet stepper motor. [8]

OR

Q10 a) What are the types of harmonics and explain the remedies to reduce the harmonics? [8]

b) Explain the constructional features of variable reluctance type stepper motor. [8]

Q11 a) Draw the equivalent circuit of a single phase induction motor and discuss the experimental procedure to obtain its parameters. [8]

b) Explain the working principle and applications of single phase shaded pole motors. [4]

c) A 125W, 4 pole, 110V, 50Hz, single phase induction motor delivers rated output at a slip of 6%. The copper loss at full load is 25 Watts, calculate the full load efficiency & rotor copper loss caused by the backward field. Rotational losses may be assumed to be 25 Watts. Neglect stator copper loss. [6]

OR

Q12 a) Explain the cross field theory as applied to a single phase induction motor. [4]

b) What are the methods to make single phase induction motors self starting? Explain in detail with operation, characteristics. Characteristics of capacitor start motors. [6]

c) The constants of a 0.25 H.P., 230 V 4-pole, 60 Hz, single phase induction motor are as follows: [8]

stator resistance $R_1 = 10\Omega$

stator reactance $X_1 = 12.8\Omega$

Rotor resistance referred to stator $R_2^1 = 11.65\Omega$

Rotor reactance referred to stator $X_2^1 = 12.8\Omega$

Magnetising reactance $Xm = 258\Omega$

The total load is such that the machine runs at 3% slip, when the applied voltage is at 210V. The iron losses are 35.5 watts at 210 V. Calculate i) Input current ii) power developed iii) shaft power if mechanical losses are 7 watts. And iv) efficiency.

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