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SE-6163

B. E. II (Sem - III) (EC/IC/CO) Examination

April / May – 2011

Electrical Machines

(Old Syllabus)

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. 2 (Sem - 3)**

Name of the Subject :

☛ **Electrical Machines (Old)**

☛ Subject Code No. : **6 1 6 3** ☛ Section No. (1, 2,.....) : **1, 2**

Seat No. :

Student's Signature

(2) Attempt all questions.

(3) Figures to the right indicate full marks.

(4) Scientific calculator up to Casio-100D, 100MS series is permitted.

SECTION - I

1 (a) Match the following : **5**

(1)	Cu loss	(1)	Wound rotor induction motor
(2)	Core loss	(2)	Auto transformer
(3)	No-losses	(3)	Transformer winding
(4)	Slip rings	(4)	Transformer core
(5)	Single winding	(5)	Ideal transformer

(b) Identify that the given statement is true or false : **5**

(1) Transformer converts electrical energy in to mechanical energy.

(2) Open circuit test perform on transformer to obtain core loss.

(3) 3-phase induction motor is not self-starting.

(4) Induction motor always runs at synchronous speed.

(5) Slip of induction motor at blocked rotor test is always one.

(c) A 3-phase, 5 hp, 415 V, 50 Hz, 4-pole induction motor runs at 1460 rpm at full load. Calculate (i) synchronous speed, (ii) slip at full load, (iii) rotor current frequency at full load, (iv) speed of motor at s = 6%, (v) synchronous speed at 25 Hz frequency, (vi) speed of motor at f = 25 Hz and s = 4%. **6**

2 Attempt any **two** : **16**

(a) Develop equivalent circuit of transformer.

(b) Explain no-load and blocked rotor test of 3-phase induction motor. Write equations to find out parameter of equivalent circuit.

(c) Discuss no-load and on-load operation of single phase transformer.

(d) What is auto transformer ? Prove that copper material is saved in auto transformer compared to same rating of two winding transformer.

3 Attempt any **three** : **18**

(a) Universal motor

(b) Sumpner's test on transformer

(c) Construction of transformer

(d) Slip-torque characteristics of induction motor

(e) Compare : squirrel cage induction motor and slip-ring induction motor

SECTION - II

Instructions : (1) All questions are **compulsory**.

(2) Draw figures wherever necessary and make necessary assumptions wherever required.

(3) Figures to the right indicate marks.

4 (a) Fill in blanks : **4**

(1) In a dc series machine, the field winding has _____ turns.

(2) Compensating windings help in reducing the effect of _____ .

(3) The efficiency of a dc generator is maximum when its variable loss equals _____ .

(4) In a dc generator, for large current output, _____ type of winding can be used.

(5) List the advantages of using short-pitch winding in alternator. **2**

(6) What is synchronous capacitor ? **2**

(7) In a dc machine, let P : no. of poles, Z : no. armature conductors, Φ : flux per pole (Wb), N : armature speed (rpm), a : no. of parallel path. The expression for induced emf E is given by _____ . **2**

(b) Derive expression of generated EMF on a dc generator. **5**

(c) Explain working principle of dc motor. **5**

5 (a) What is armature reaction ? Describe the effect of armature reaction on the operation of dc machine. **8**

(b) A 220 V dc series motor is running at a speed of 800 rpm and draws 100 A. Find the speed of motor when motor is developing half the torque. The resistance of armature and field is 0.1 ohm. Assume that magnetic characteristic is unsaturated. **7**

OR

5 (a) Compare Cylindrical rotor machine with salient-pole rotor machine. **7**

(b) Determine the voltage regulation for a 2000 volt 1-phase alternator delivering a current of 100 amp at (i) unity p.f. (ii) 0.8 leading p.f., (iii) 0.71 lagging p.f. test result : Test result : Full-load current of 100 amp is produced on short-circuit by a field excitation of 2.5 amp. An e.m.f. of 500 V is produced on open-circuit by same excitation. The armature resistance is $0.8\,\Omega$. **8**

6 Write short notes : (any **three**) **15**

(a) 3-point starter

(b) Swinburne's test of dc machine

(c) Construction of dc machine

(d) Write the conditions for parallel operation of an alternator with infinite busbar.

(e) Derive equations for distribution-factor and pitch-factor

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