* K C - 8 0 8 5 *

KC-8085

B. E. II (Sem. III) (Electrical) Examination

November/December – 2012

Electrical Machines - I

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. II (Sem. III) (Electrical)**

Name of the Subject :

☛ **Electrical Machines - I**

☛ Subject Code No. : **8 0 8 5** ☛ Section No. (1, 2,.....) : **Nil**

Seat No. :

Student's Signature

(2) Answer all questions.

(3) Figures on right hand side indicate marks.

(4) Assume suitable data whatever is necessary.

(5) Scientific calculator fx100 or equivalent is permissible.

1 (a) Fill in the blanks : **5**

(i) A 3 phase, 4pole squirrel cage induction motor has 36 stator slots and 28 rotor slots. The number of phase in the rotor is _____ (3,9)

(ii) Transformer core is laminated to reduce _____ loss. (eddy, current, hysteresis current)

(iii) At normal load the slip of an induction motor is usually _____. (high, less)

(iv) The basic function of a transformer is to change the level of _____ (voltage, power)

(v) Maximum regulation occurs when the power factor of the load is _____. (leading, lagging)

(b) Identify whether the following statements are TRUE (T) or FALSE (F). **5**

(i) In blocked rotor test on an induction motor the rotor runs at very slow speed.

(ii) The power factor of an induction motor is always leading.

(iii) In a two winding transformer, primary and secondary windings are electrically connected.

(iv) At standstill the slip of an induction motor is zero.

(v) The regulation of a transformer at a given kVA output remains constant irrespective of load power factor.

(c) Derive the expression for developed torque in a three phase induction motor and find the condition for maximum torque. **6**

(d) Draw the phasor diagram of a transformer on load for (i) resistive load and (ii) inductive load. **4**

2 (a) Explain the no load and short circuit test of a single phase transformer and show that from test results, how constants of equivalent circuit can be determined ? **8**

(b) A 6 pole induction motor is supplied by a 10 pole alternator which is driven at 600 rpm. If the motor is running at 970 rpm, determine the percentage slip and the rotor frequency. **7**

OR

2 (a) A 5kVA, 500/250 V, 50 Hz single phase transformer gave the following test results : **8**

O.C. Test : 500 V, 1A, 50 W (Iv side open)

S.C. Test : 25 V, 10 A, 60 W (Iv side shorted)

Find parameters of equivalent circuit as referred to primary side.

(b) Explain the construction and working principle of operation of a 3-phase induction motor. **7**

3 Attempt any three : **15**

(a) Explain the speed torque characteristic of an induction motor.

(b) Explain various losses in a single phase transformer.

(c) Explain the speed torque characteristic of an induction motor.

(d) Derive the condition for maximum efficiency of a single phase transformer.

4 (a) Fill in the blanks : 5

(i) _____ is the rotating part of an alternator. (stator, rotor)

(ii) In a dc shunt machine field winding is connected in _____ with the armature winding. (series, paralle)

(iii) Alternators are also called as _____ generator. (induction, synchronous)

(iv) When two alternators are working in synchronism, synchronizing power will be _____ (one, zero)

(v) Generally alternator field is mounted on _____ part of the alternator . (rotating, stationary)

(b) Identify whether the following statements are TRUE (T) or FALSE (F). 5

(i) Speed of an alternator depends upon frequency.

(ii) In an alternator voltage generated per phase is proportional to flux per pole.

(iii) Swinburnes test can be performed on no load.

(iv) Interpoles are connected in a dc machine to reduce sparking.

(v) A dc series motor is that which can be started without load.

(b) What is the principle of operation of a dc machine and explain its construction in brief with relevant diagrams. 10

5 (a) What is regulation in an alternator ? Explain the ampere-turn method of voltage regulation. 7

(b) A dc generator has an armature emf of 100V when the useful flux per pole is 20 m Wb, and the speed is 800 rpm. Calculate the generated emf (i) with the same flux and speed of 1000 rpm, (ii) with a flux per pole of 24 m Wb and a speed of 900 rpm. 8

OR

5 (a) Discuss different methods of speed control of a dc shunt motor. 8

(b) Derive the emf equation of an alternator. 7

6 Attempt any three : 15

(i) Write down the conditions for parallel operation of two alternators.

(ii) Derive the condition for maximum efficiency for a dc generator.

(iii) Define salient pole alternator and non salient pole alternator and differentiate the two.

(iv) Derive the torque equation of dc motor.