* U F - 8 0 8 5 *

UF-8085

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

May\June – 2012

Electrical Machines - I

(New Course)

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) Back-to-back test on a transformer is also called as _____ test. (sumpners, swinburnes)

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

(iii) A transformer does not trnsform _____. (current, impedance)

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

(v) The principle of operation of an induction motor is based on _____ induction. (mutual, self)

(b) Identify whether the following statements are True (T) or False (F). **5**

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

(ii) In case of an ideal transformer, primary and secondary currents are in phase opposition.

(iii) The number of stator slots should be equal to the number of rotor slots to avoid cogging.

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

(v) Rotor core of a 3 phase induction motor is always laminated.

(b) Explain the construction and working of three phase induction motor. **10**

2 (a) Explain the equivalent circuit of a single phase transformer. **7**

(b) The power input to a 500v, 50Hz, 6pole, 3phase squirrel cage induction motor running at 975 rpm is 40kW. The stator losses are 1kW. Calculate (i) slip, (ii) rotor copper loss (iii) rotor speed (iv) mechanical power developed. **8**

OR

2 (a) A 10kVA, 200/400V, 50Hz single phase transformer gave the following test results : **8**
O.C. Test: (hv winding open) 200V, 1.3A, 120W
S.C. Test: (1v winding short circuited) 20V, 30A, 200W
Find parameters of equivalent circuit as referred to low voltage side.

(b) Derive the torque equation of a three phase induction motor and find the starting torque. **7**

3 Attempt any **three** : **15**

(a) Derive the condition for maximum torque of a three phase induction motor.

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

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

(d) Write a short note on Autotransformer.

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

(i) A dc machine armature is laminated to reduce _____ loss. (eddy current, hyteresis)

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

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

(iv) Cylindrical rotor alternator has _____ speed. (high, low)

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

(b) Identify whether the following statements are True (T) or False (F). **5**

(i) Swinburnes test can be performed on no load.
(ii) Speed of an alternator depends upon frequency.
(iii) For parallel operation of two alternators polarity must be different.
(iv) Commutator converts dc to ac.
(v) Interpoles are connected in a dc machine to reduce sparking.

(b) What is the principle of operation of a dc machine and explain its construction in brief with relevant diagrams. **5**

5 (a) Derive the emf equation of an alternator. **7**

(b) A 6 pole lap wound shunt motor has 500 conductors in the armature. The armature resistance is 0.5Ω and the resistance on shunt field is 25Ω. Find the speed of the motor when it takes 120A from dc supply of 100V. Flux per pole is 0.02 Wb. **8**

OR

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

(b) A three phase star connected synchronous generator is rated at 1500kVA, 11kV. The armature effective resistance and synchronous reactance are 1.2Ω and 25Ω respectively per phase. Calculate the percentage voltage regulation for a load of 1437.5Ab at 0.8pf lagging. **7**

6 Attempt any **three** : **15**

(a) Explain DC series motor characteristics.
(b) Explain 4 point starter for dc machine.
(c) Define salient pole alternator and non salient pole alternator and differentiate the two.
(d) Write down the conditions for parallel operation of two alternators.
