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UH-6129

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

May\June – 2012

Electrical Technology

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) (Chemical)**

Name of the Subject :
☛ **Electrical Technology**

☛Subject Code No. : **6 1 2 9** ☛Section No. (1, 2,.....) : **Nil**

Seat No. :

Student's Signature

(2) Figures to the right hand side indicate full marks.
(3) Assume suitable data wherever necessary.
(4) Attempt all questions.

1 (a) Fill in the blanks : **10**

(i) The no-load input power to a transformer is practically equal to _____ loss in the transformer.

(ii) The regulation of transformer may become negative for _____ power factor loads.

(iii) _____ is minimized by laminating the core of transformer.

(iv) The transformer core is usually made of _____ material.

(v) The phase relation between primary & secondary voltages of power transformer is _____.

(vi) The actual speed of induction motor is always _____ than the synchronous speed.

(vii) The value of slip at starting of induction motor is _____.

(viii) The efficiency of an induction motor is _____ than that of a transformer.

(ix) The difference between the synchronous speed & the actual speed of an induction motor is known as the _____.

(x) If the slip of a 3-Phase induction motor increases, the power factor of rotor circuit is _____.

(b) Draw the circle diagram for a 3-phase, 6-pole, 50 Hz, star-connected induction motor from the following test : **10**

No Load : 400V, 9A, 1250W
Short Circuit :200V, 50A, 6930W
Full Load Current = 32 A.
Stator lo at standstill = 0.55 times total copper loss.
From the circle diagram find the following :

(i) Power factor, Slip, Output, Speed & torque at full load.
(ii) Starting Torque.
(iii) Maximum Power input.

2 (a) Derive the condition of max. torque of Induction Motor. Also explain factors affecting max. torque condition. **7**

(b) A 5 kVA, 500/250 V, 50 Hz Single phase transformer gave the following test results. **8**

OC test (LV Winding Open) : 500 V, 1 A, 50 W
SC test (LV Winding Short-Circuited) : 25 V, 10 A, 60 W
Find parameters of an equivalent circuit as referred to HV Winding.

OR

2 (a) Develop the exact equivalent circuit of I-Phase transformer. From this derive the approximate and simplified equivalent circuits of transformer. State the various assumptions made. **7**

(b) A 4-Pole, 50 Hz, 3-Phase induction motor has a rotor resistance of 4.5 Ω/phase and a standstill reactance of 8.5 Ω/phase with no external resistance in the rotor circuit, the starting torque of the motor is 85 Nm. **8**

(i) What is the rotor voltage at standstill ?
(ii) What would be the stating torque if a 3 Ω resistance were added in each rotor phase ?
(iii) Neglecting stator voltage drop, what would be the induced rotor voltage & the torque at slip of 3%?

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

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

(b) Explain the construction & working of 3-Phase induction motor.

(c) Draw the phasor diagram and equivalent circuit of a 3-phase induction motor.

(d) A Single phase, 3300/330 V, transformer gave the following test results.
Short Circuit test (HV Side) : 124 V, 15.4A, 540W
Calculate the voltage regulation of transformer on full load & 0.8 p.f. lagging.

(e) A 3–Phase induction motor supplies a load of 36.775 KW at 90% efficiency when its stator copper loss and rotor copper loss each equals the iron loss. If its mechanical losses are one third of no-load loss, extimate the Slip, Assume no load copper loss as negligible.

4 (a) Fill in the blanks : **10**

(i) The commutator brushes are generally made up of _____.

(ii) If Ns is the synchronous speed and N, the actual speed of rotor, then % slip = _____.

(iii) Magnetizing Characteristics is graph between _____ & _____.

(iv) The frequency of voltage generated by an alternator having 4-poles and rotating at 1800 rpm is _____ Hz.

(v) Brushes facilitate the collection of _____ from the commutator.

(vi) The field of synchronous motor is excited with _____ source.

(vii) Alternator converts _____ energy into _____ energy.

(viii) In d.c. series motor field winding is connected in _____ with armature winding.

(ix) D.C. shunt motor is preferred when constant _____ is required.

(x) If the field of a synchronous motor is underexcited the power factor will be _____.

(b) Explain complete method of ZPF and the aim. **5**

(c) Explain various types of D.C. Generator. **5**

5 (a) State the condition for voltage build up of dc shunt generator. **2**

(b) Draw and explain internal and external characteristics of a separately excited d.c. generator and a self excited dc shunt generator. **6**

(c) A 220V, dc shunt motor takes 4A at no load when running at 700 rpm. The field resistance is 100 ohm. The resistance of armature at standstill gives a drop of 6V across armature terminals when 10A were passed through it. Calculate (a) Speed on load (b) Torque in N.m and (c) efficiency. The normal input of the motor is 8KW. **7**

OR

5 (a) Explain how synchronous motor can be used as a power factor corrective device. **4**

(b) Explain the effect of change in excitation with constant intake in case of synchronous motor. **3**

(c) The following test results are obtained on 6600V alternator. **8**

Open circuit voltage	3100	4900	6600	7500	8300
Field current amperes	16	25	37.5	50	70

A field current of 20A is found necessary to circulate full - load current on short-circuit of the armature. Calculate by (i) the ampere - turn method and (ii) the synchronous impedance method the full-load regulation at 0.8pf (lag). Neglect resistance and leakage reactance. State the drawback of each of these methods.

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

(a) Derive torque equation of d.c. motor.

(b) Write the short note on Synchronous Condenser.

(c) What is commutation ? Discuss the methods for improving commutation.

(d) Explain Synchronous impedance method to find out regulation of alternator.

(e) Explain working principle of DC motor and derive condition for maximum power.