Nov- Dec - 2012

Total No. of Questions : 12]

P771

SEAT No. :

[Total No. of Pages : 4

# [4263] - 253
# T.E. (Electrical)
# ELECTRICAL MECHINES - II
# (2008 Pattern) (Sem. - I)

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

*Instructions to the candidates:*

1) *Answer three questions from Section - I and three questions from Section - II.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator is allowed.*
6) *Assume suitable data, if necessary.*

## SECTION - I

*Q1)* a) What is meant by short circuit ratio in case of alternator. Elaborate its significance. **[4]**

b) A three phase 50 Hz 2 pole star connected alternator generates 6 kV between lines on open circuit. It has 54 slots with 4 conductors per slot. The pitch of the coils is less than the pole pitch by 2 slots. Assuming sinusoidal flux distribution, find the flux per pole. **[6]**

c) A 100 kVA 3000V, 50Hz, 3 phase star connected alternator has effective armature resistance of 0.2Ω. The field current of 40A produces short circuit current of 200A and an open circuit emf of 1040V (line). Calculate the full load voltage regulation at 0.8 lagging p.f. and 0.8 leading p.f. **[8]**

OR

*Q2)* a) Compare salient pole type construction with non salient pole type construction in case of 3 phase alternator. **[4]**

b) State different methods of finding voltage regulation of alternator. Which method gives more accurate results? Why? **[4]**

*P.T.O.*

c) A 10 kVA, 440V, 50Hz, 3 phase star connected alternator has the open circuit characteristics as given below.

| If (Amp) | 1.5 | 3 | 5 | 8 | 11 | 15 |
|---|---|---|---|---|---|---|
| Voc line (Volts) | 150 | 300 | 440 | 550 | 600 | 635 |

with full load zero p.f., the excitation required is 14 Amp to produce 500V of terminal voltage. On short circuit, 4 Amp excitation is required to give full load current. Determine voltage regulation at full load 0.8 p.f. lagging. Neglect Ra. **[10]**

*Q3)* a) State three important features possessed by 3 phase synchronous motor. What do you mean by 'V' curves and Inverted 'V' curves of synchronous motor. **[6]**

b) A 10 kVA, 380V, 50Hz 3 phase star connected salient pole alternator has direct axis and quaderature axis synchronous reactance of 12Ω & 8Ω respectively. The armature has resistance of 1Ω per phase. The generator delivers rated load at 0.8 p.f. lagging with the terminal voltage being maintained at rated value. Calculate the excitation voltage of alternator (line value). **[6]**

c) State necessary conditions of synchronisation of 3 phase alternators.**[4]**

OR

*Q4)* a) A 2 MVA, 3 phase 8 pole alternator is connected to 600V, 50Hz busbar & has synchronous reactance of 4Ω per phase. Calculate the synchronizing power and synchronizing torque per mechanical degree of rotor displacement at no load. Assume normal excitation. **[6]**

b) A synchronous motor has synchronous reactance of 10Ω per phase and negligible resistance. It takes an input power of 5 kw per phase when operating at 250 V per phase. Find its induced ent and angle of retard. Assume unity power factor. **[6]**

c) Explain the dark lamp method used for synchronizing of alternators.**[4]**

*Q5)* a) Write a short note on 3 phase synchronous Induction Motor. **[8]**

b) Why v/f ratio is to be kept constant for speed control of Induction Motor. With neat circuit diagram, explain speed control of 3 phase Induction Motor using rotor resistance control. **[8]**

OR

*Q6)* a) Write a short note on 3 phase Induction voltage regulator. **[8]**

b) Explain operation of 3 phase Induction motor as an induction generator. State its advantages & applications. **[8]**

## SECTION - II

*Q7)* a) What do you mean by universal motor? Compare the performance on a.c. and d.c. supply. **[6]**

b) Draw the phasor diagram of a plain series motor and explain it ignoring leakage fluxes, magnetising current and currents in short circuited armature coils. **[6]**

c) What are the types of compensated series motor? Describe each with circuit diagram. **[6]**

OR

*Q8)* a) Describe in detail the transformer and rotational e.m.f's in plain series motor. **[6]**

b) What do you mean by commutation in compensated series motor? State the methods to improve the commutation? **[4]**

c) Draw the circle diagram of a plain a.c. series motor and describe how to find out motor input, torque, output & speed. **[8]**

*Q9)* a) Explain principle of operation of linear Induction motor. Draw it's characteristics. State its important applications. **[8]**

b) Explain the construction, working and applications of permanent magnet type stepper motor. **[8]**

OR

*Q10)*a) Define time & space harmonics. What are their effects on an Induction motor and synchronous generator. **[8]**

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

*Q11)*a) What are the methods to make single phase Induction motors self starting? Explain in detail operation, characteristics & applications of capacitor start motors. **[8]**

b) What are the tests to determine the parameters of a equivalent circuit of a single phase induction motor? Draw and explain the equivalent circuit of a single phase induction motor, without considering losses. **[8]**

OR

*Q12)*a) Explain the double revolving field theory in case of single phase induction motor. Hence draw its torque - speed characteristics. **[8]**

b) A 220V, single phase induction motor gave the following tests :
Blocked rotor test : 120V, 9.6A, 460W.
No load test : 220V, 4.6A, 125W.
The stator winding resistance is 1.5Ω and during the blocked rotor test, the starting winding is open. Determine the equivalent circuit parameters. Also find the core, frictional and windage losses. **[8]**



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