



Printed Pages : 4

TEE - 405

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2049

Roll No.

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B. Tech.

(SEM. IV) EXAMINATION, 2008-09

ELECTRICAL MACHINES

Time : 3 Hours]

[Total Marks : 100

- Note :
- (1) Attempt **all** questions
 - (2) All questions carry **equal** marks.

1 Answer any **two** parts of the following :

- (a) A 100 kVA transformer has its maximum efficiency of 0.98 at full load at unity power factor. During the day it is loaded as follows: 10
12 hrs - 20 kW at power factor 0.5
6 hrs - 45 kW at power factor 0.9
6 hrs - 80 kW at power factor 0.8
Calculate all-day efficiency of the transformer.
- (b) What is necessity of a starter for a d.c. motor? 10
Explain with a neat sketch the working of a 3-point d.c shunt motor starter bringing out the protective features incorporated in it.
- (c) Explain the effects of armature reaction on the main field flux by using developed view of armature current sheet and poles of a d.c. machine. Hence outline the bad effects of armature reaction. 10



2 Answer any **two** parts of the following:

- (a) Calculate the overall efficiency of a 250 V, 100 kW, d.c. shunt generator at full load if the resistance of the armature and shunt field are 0.006Ω and 25Ω respectively. The core, friction and windage losses together are 3.2 kW.
- (b) Why is it advantageous to use double revolving field theory for determining the running performance of a single-phase induction motor?

Draw torque-speed characteristics of a $1-\phi$ induction motor based on double-revolving field theory and discuss about the magnitude of torque at zero speed and synchronous speed.

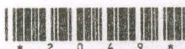
- (c) A 4-pole $3-\phi$ induction motor delivers 37 H.P. at the shaft at a speed of 1425 rpm on 500 V, 50 Hz supply. The mechanical losses total 3 HP and power factor is 0.9. Calculate for this load :
- (i) The slip
 - (ii) The rotor copper losses
 - (iii) The total power input if the stator losses are 2500 W.
 - (iv) The efficiency
 - (v) The line current.

3 Answer any **four** parts of the following :

- (a) Explain the terms :
- (i) air-gap power
 - (ii) internal mechanical power developed and
 - (iii) shaft power.

How are these terms related with each other?

5



- (b) Explain working principle of a synchronous motor. 5
- (c) What is an auto transformer? State its merits and demerits over the 2-Wdg. transformers. 5
- (d) A 11000 / 2200 V, single phase transformer is rated at 1000 kVA, if the two windings are connected in series to form an auto transformer determine its rated voltage and power. 5
- (e) What is meant by three phase transformer groups? What are the possible connections for a 3- ϕ transformer bank? 5

4 Answer any **four** parts of the following :

- (a) Why rotating field system is preferred over the stationary field system in synchronous generator? A 4 pole alternator rotates at 1500 rpm. What is the frequency of the generated voltage? 5
- (b) Draw the phasor diagram of a loaded alternator for the following conditions : 5
 - (i) lagging p.f.
 - (ii) leading p.f
 - (iii) unity p.f.
- (c) What do you mean by synchronization? Describe any one method of synchronizing alternators. 5
- (d) A 3- ϕ 6 pole star connected alternator revolves at 1000 rpm. the stator has 90 slots and 8 conductors/slot The flux/pole is 0.05 Wb (sinusoidally distributed). Calculate the voltage generated / phase by the machine if winding factor is 0.96. 5
- (e) Explain the effect of excitation on the line current with regard to synchronous motor. 5



- 5 Answer any **four** parts of the following:
- (a) What is a two phase servo motor? Draw its torque speed characteristics for various control voltages. 5
 - (b) Describe the construction and working of a capacitor-start single-phase induction motor. 5
 - (c) Explain the operation of a stepper motor. What are the merits and demerits of stepper motors? 5
 - (d) Describe Sumpner's (back to back) test used for transformers. Indicate its advantages? 5
 - (e) Explain concept of braking in dc and ac motors. 5
 - (f) Discuss industrial applications of dc series motors. 5

