Code: R7310205

R7

B.Tech III Year I Semester (R07) Supplementary Examinations, May 2013
ELECTRICAL MACHINES - III
(Electrical and Electronics Engineering)

Time: 3 hours   Max Marks: 80

Answer any FIVE questions
All questions carry equal marks
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1 (a) Draw a neat sketch showing the various parts of a synchronous machine and explain each part briefly.
  (b) A 3 phase, 50 Hz, 20-poles salient pole alternator with star connected stator winding has 180 slots on the stator. Each slot consists of 8 conductors. The flux per pole is 25 mWb and is sinusoidally distributed. The coils are full pitch. Calculate: (i) The speed. (ii) The generated e.m.f/ph. (iii) The line e.m.f.

2 (a) Explain OC and SC test of an alternator to find voltage regulation of an alternator to find voltage regulation of an alternator.
  (b) Draw the phasor diagram of an alternator when the power factor is leading.

3 (a) Explain clearly the ZPF method of determining the regulation of an alternator.
  (b) The open circuit and short circuit test results for 3-phase star connected, 1000 KVA, 1905 V, 50 Hz alternator are:

Open circuit terminal voltage (V_{oc}) $_{line}$, Volts	760	1500	1700	1905	2300	2600
Short circuit current (I_{sc}), Amp.	-	220	-	335	-	-
Field current (I_f), Amp.	10	20	25	30	40	50

The armature reactance per phase is 0.2 ohms. Find the regulation on full load 0.8 lagging p.f.by synchronous impedance method.

4 (a) What are the conditions to be satisfied before a 3-phase alternator is synchronized to an infinite bus-bar?
  (b) A 750 KVA, 11 KV, 4-pole, 3-Φ star connected alternator has % resistance and reactance of 1 and 15 respectively. Calculate the synchronous power per mechanical degree of displacement at:
  (i) No load. (ii) Full load 0.8 pf lag. Where, terminal voltage in each case is given to be 11KV.

5 (a) Explain the construction & working principle of Synchronous motor.
  (b) A 3-phase, 400 V star connected synchronous motor has effective per phase armature resistance and synchronous reactance of 0.2 ohms and 2 ohms respectively. It takes 20 A to deliver a certain load. Calculate the excitation e.m.f induced in the motor if it works with:
  (i) 0.8 p.f lagging. (ii) 0.8 p.f leading. (iii) UPF.

6 (a) Explain the procedure to plot 'V curves' with the help of 'power circle' and 'excitation circle'.
  (b) Explain the effect of damper winding on the performance of a synchronous machine.

7 (a) Explain, the speed of single phase Induction motor can be controlled by supply voltage whereas it is not possible with 3-phase IM, why?
  (b) The name plate of single phase IM, 4-pole induction motor gives the following data:
  Output = 410 W, Supply voltage = 230 V, Frequency = 50 Hz, Input current = 3.2 A,
  Power factor = 0.7, speed = 1410 RPM. Calculate:
  (i) The efficiency of the motor. (ii) The slip of the motor when delivering rated output.

8 With neat diagram explain the construction and working of variable reluctance stepper motor. Also explain its static and dynamic characteristics.
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