Code : 031403

B.Tech 4th Semester Examination, 2017

Electrical Machine-II

Time : 3 hours *Full Marks : 70*

Instructions :

*(i) There are **Nine** Questions in this Paper.*

*(ii) Attempt **Five** questions in all.*

*(iii) **Question No. 1 is Compulsory.***

(iv) The marks are indicated in the right-hand margin.

1. Answer any Seven questions from this: 2×7

(a) Cylindrical -rator synchronous m/c has dirn _____ field winding.

(b) In a synchronous m/c the rator field axis and the resultant field have an angle between them called _____.

(c) Prime mover for a salient pole synchronous machine is _____.

(d) Emf induced in SM under loaded conditions is known as _____.

(e) Short circuit test on SM is conducted at _____ excitated condition with armature current at 150 % of the rated value.

P.T.O.

(f) saliency in a synchronous causes the production of _____ torque which is proportional to _____.

(g) In a 1-Phase IM auxiliary winding located at _____ to main winding causes development of _____torque.

(h) A two-phase servomotor at any control phase voltage has almost _____torque speed characteristic with torque _____with increase in speed.

(i) A steeper motor does not require an output _____ sensor.

(j) Universal motors have _____ power factor of _____contributed by cross flux.

2. (a) What is "Synchronous" in a synchronous m/c? Why does such a m/c produce no torque at any other speed. 4

(b) A 50 Hz. 6-pole synchronous generator has 36 slats. it has a two-layer winding with full pich coil of eight turns each. The flux per pole is 0.015 wb. Determine the induced emf (line-to-line) if the coils are connected to form (a) 2-phase winding. (b) star-connected 3-phase winding. 10

3. (a) Explain the meaning and significance of SCR. (Short circuit ratio). 4

(b) A 3-phase 2.5 MVA, 6.6 kV synchronous generator gave the following data for occ at synchronous speed. 10

If (A) :	16	20	25	32	45
Voc (line) (v) :	4400	5500	6600	7700	8800

with the armature short-circuitaed and full load current flowing, the field current is 18 A. when the m/c is applying full-load current at zero Bt at rated voltage, the field current is 45A.

Determine the leakage reactance in Ω per phase and the full-load armature reaction in terms of equivalent field amperes. Find also the field current and voltage regulation when the m/c is supplying full load at 0.8 p.f lagging at rated voltage neglect armature resistance.

4. For a salient-pole synchronous m/c, neglecting the effect of armature resistance, derive an expression for power developed as a function of load angle. 14

5. Two identical, $3-\phi$, star-connected generators, operating in prallel, share equally a total load of 750 kW at 6000 V and p.f 0.8. The synchronous reactance and resistance of each machine are respectively 50Ω and $2.5\ \Omega$ per phase. The field of first generator is excited so that armature current is 40 A (lagging). Find (O) the armature current of the second alternator; (b) the p.f of each machine (c) the electromotive force of each machine (d) the load angle of each machine.

14

6. (a) What are V-curves of a synchronous motor? What are the main characteristic of a synchronous motor. 4

(b) A $3-\phi$, 11 kV star connected synch. motor takes 50 A input current. The effective resistance and synchronous reactance per phase are $1\ \Omega$ and $30\ \Omega$ respectivelly. Calculate the induced emf for a power factor of (a) 0.8 lagging (b) 0.8 leading and (c) the power supplied to the motor. 10

7. A 230V, 50 Hz, 4-pole single-phase Induction motor has the following equivalent circuit parameters: 14

$R_{1m} = R_2' = 8\Omega$

$X_{1m} = x_2' = 12\Omega,\ X_M = 200\Omega,$

at a slip of 4% calculate (a) input current (b) input power (c) developed power, and developed torque at rated voltage. The motor speed is 140 rpm.

8. (a) Draw and explain the phasor diagram of an ac series motor. 4

(b) A universal series motor, when operating on 220 V d.c draws 10A and runs at 1400 rpm. Find the new speed and p.f. when connected to 220 V, 25Hz supply, the motor current remains the same. The motor has total resistance of 1Ω and total inductance of 0.1 H. 10

9. Describe the construction of permanent-magnet d.c. motor. What are the advantage and disadvantage of permanent magnet d.c. motor compared with conventional shunt d.c. motors? 14

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