

R09

Code No: 09A50206

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD

B. Tech III Year I Semester Examinations, May/June – 2013

Electrical Machines – III

(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 75

Answer any five questions

All questions carry equal marks

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- 1.a) Define the terms pitch factor and distribution factor in case of an alternator. Derive an expression for distribution factor.
- b) A 3 phase, 50 Hz, 16 pole synchronous generator has a star connected winding with 144 slots and 10 conductors per slot. The flux per pole is 0.03 Webers, sinusoidally distributed and the speed is 375 rpm. Calculate the line induced emf. Take pitch factor as 1. [15]

- 2.a) Describe the principle and construction of slow speed operated generator with neat diagram.
- b) Derive the EMF equation of a 3-phase alternator. [15]

3. The open circuit and short circuit test readings for a 3-phase star connected, 1000kVA, 2000V, 50 Hz synchronous generator are

$V_{occ}(V)$	800	1500	1760	2000	2350	2600
$I_{SC}(A)$	-	200	250	300	-	-
$I_f(A)$	10	20	25	30	40	50

The armature effective resistance is  $0.2 \Omega$ / phase. Draw the characteristic curves and find full load percentage regulation at (a) 0.8 PF lagging, (b) 0.8 PF leading and (c) UPF. Use MMF method. [15]

- 4.a) Explain the condition for parallel operation of 3-phase alternator with neat diagram.
- b) A 3-phase, 50 Hz, 2 pole alternator is excited to generate the bus bar voltages of 11 kV at no load. Calculate the synchronizing power per degree of mechanical displacement of the rotor. The machine is star connected and the short circuit current for this excitation is 1200 amperes. Neglect armature winding resistance. [15]
- 5.a) Explain V and Inverted V curves of a 3-phase synchronous motor.
- b) Explain various torques associated with synchronous motor. [15]

- 6.a) Explain different methods of starting a 3-phase synchronous motor.
- b) A 3300V, 3 phase synchronous motor running at 1500 rpm has its excitation kept constant corresponding to no-load terminal voltage of 3000V. Determine the power input, power factor and torque developed for an armature current of 250A if the synchronous reactance is  $5\Omega$  per phase and armature resistance is neglected. [15]

- 7.a) What is the function of capacitor in a single phase induction motor?
- b) Develop equivalent circuit of a single phase induction motor ignoring core losses. [15]

- 8.a) Describe the constructional features of a 3-phase ac series commutator motor. How is the speed control affected in such a motor?
- b) State the applications of stepper motor. [15]

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