

**Government College of Engineering, Aurangabad**  
(An Autonomous Institute of Government of Maharashtra)

**T. E. (EEP) old Examination**  
End Semester Examination      2016

**EE 301: ELECTRICAL MACHINE S III**

Time: Three Hours

Date: 15 NOV 2016

Max. Marks: 60

**N.B:-**

1. Solve any five questions
2. Figures to the right indicate full marks
3. Assume suitable data if necessary and state it clearly
4. Use of non-programmable calculator is allowed

- Q.1. a) Name the various methods for determining the voltage regulation for a 3 phase alternator and describe ZPF method in short (05M)
- b) A 5,000 KVA, 6600V, 3-phase, 50 Hz, star connected alternator gave the following test results at full load and unity power factor.: (07M)

Field current(A)	32	50	75	100	140
O.C.Line emf (kv)	3100	4100	6600	7500	8300
Line volts ,Zero p.f.(V)	0	1850	4250	5800	7000

Calculate by voltage regulation at unity power factor by zero power factor method. The armature resistance is neglected

- Q.2. a) Explain the V-curves and inverted V-curves for synchronous motor. (05M)
- b) A 440 V, 4-pole, 3-phase, 50 Hz star connected synchronous motor has a resistance of 0.5  $\Omega$  per phase and synchronous impedance of 4 $\Omega$ /phase. It takes a current of 10 A at unity power factor when operating with certain field current. if the load torque is increased until the line current is increased to 50 A, the field current remaining unchanged, calculate the gross torque and new power factor (07M)
- Q.3. a) Derive the expression for the output power of cylindrical rotor alternator connected to infinite bus in terms of excitation voltages ,bus bar voltage and load angle. (06M)
- b) Two three phase alternators operate in parallel. The rating of one machine is 300MW and that of other is 400 MW. The droop characteristics of their governors are 4% and 5% respectively from no load to full load. Assuming that governors are operating at a frequency of 50 Hz at no load, how the load of 700 MW be shared between them. What will be the system frequency at this load? (06M)
- Q.4. a) Derive the output equation of three phase transformer. (05M)

- b) A 250 KVA, 6600/400V, 3-phase core type transformer has total loss of 4800 watts at full load. The transformer tank is 1.25 m in height and 1 m x 0.5 m in plan. (07M)

Design a suitable scheme for tubes if the average temperature rise is to be limited to  $35^{\circ}\text{C}$ . The diameter of tubes is 50 mm and are spaced 75 mm from each other. The average height of the tubes is 1.05 m.

Specific heat radiation due to radiation and convection is 6 and  $6.5 \text{ W/m}^2\text{-}^{\circ}\text{C}$  respectively. Assume that convection is improved by 35% due to provision of tubes.

- Q.5. a) Deduce For the three phase induction motor an expression showing the relationship between output, its main dimensions, speed, the specific electrical and magnetic loading, efficiency and power factor. (05M)
- b) Apply the above expression to obtain suitable values of for the main dimensions of the stator of the 5 hp, 3-phase, 400V, 50 Hz, 1500 Synchronous r.p.m. squirrel cage induction motor with star delta starter. Appropriate values for additional data may be assumed (07M)

Q.6. Solve any three of the following (3x4M) (12M)

- Factors which affects the choice of specific magnetic loading
- Comparison between 3-phase synchronous and induction motor
- Armature reaction of the alternator
- Factors which influence the choice of specific electric loading.
- Methods for reduction of harmonics in synchronous machines

===== End =====