

Electrical Machines - II

P. Pages : 2

Time : Three Hours



TKN/KS/16/7425

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Due credit will be given to neatness and adequate dimensions.
 9. Assume suitable data whenever necessary.
 10. Diagrams and chemical equations should be given whenever necessary.
 11. Illustrate your answers whenever necessary with the help of neat sketches.
 12. Use of non programmable calculator is permitted.

1. a) Why the field winding is placed on rotor in 3ϕ alternator. 6
 b) 3 phase, 4 pole, 50 Hz star connected alternator has 60 slots with 2 conductor/slot and having armature winding of the two layer type coils are short pitched in such a way that if one coil side lies in slot number 1, the other lies in slot number 13, Determine the useful flux per pole required to generate a line voltage of 6000V. 7
- OR**
2. a) Define and explain the following terms. 6
 i) Pitch factor. ii) Distribution factor.
 iii) Winding factor. iv) Coil span.
 b) Calculate the pitch factor for the Given winding i) 36 stator slot, 4 pole, coil span 1 to 8. 7
 ii) 72 stator slot, 6 poles, coil span 1 to 10 iii) 96 stator slots 6 poles coil span 1 to 12.
3. a) Explain the synchronous impedance method to determination of voltage regulation of an alternator. 6
 b) A 3-phase star connected alternator is rated at 1600 KVA, 13500v. The armature effective resistance and synchronous reactance are 1.5Ω & 30Ω respectively per phase. calculate the % regulation for a load of 1280kw at power factor (a) 0.8 leading (b) 0.8 lagging. 8
- OR**
4. a) Explain how potier triangle can be obtained from OCC & ZPFC characteristics. 4
 b) A 5000KVA, 6600V, 3ϕ star connected alternator has a resistance of 0.75Ω per phase Estimate by ZPF method the regulation for a load of 500A at power factor (a) Unity (b) 0.9 Leading. 10
- | | | | | | |
|------|------|------|------|------|------|
| If | 32 | 50 | 75 | 100 | 140 |
| Voc | 3100 | 4900 | 6600 | 7500 | 8300 |
| Zpfc | 0 | 1850 | 4250 | 5800 | 7000 |
5. a) Describe in detail with suitable diagrams and waveform how slip test is conducted in laboratory to find x_d and x_q . 6

- b) A 1500 KVA, star connected 2300v, 3 phase salient pole synchronous generator has reactance $x_d = 1.95 \Omega/\text{ph}$ and $x_q = 1.40 \Omega/\text{phase}$. All losses may be neglected. Find the excitation voltage for operation at rated KVA and power factor of 0.85 lagging. **7**
- OR**
6. a) Compare the performance of synchronous machine having low short circuit ratio and machine having high short circuit ratio. **5**
- b) Define negative sequence and zero sequence reactance of a synchronous machine. Give laboratory test to find negative sequence and zero sequence reactance. **8**
7. a) Explain V and inverted V curve of synchronous motor. **6**
- b) A 75 kW, 3 ϕ , γ Connected, 50Hz, 440V cylindrical rotor synchronous motor operates at rated condition with 0.8 p. f. leading. The motor efficiency including field and stator losses, is 95% and $x_s = 2.5 \Omega$. Calculate
- i) Mechanical power Developed ii) Armature current
iii) Back emf iv) Power Angle.
- OR**
8. a) Compare 3 ϕ synchronous motor with 3 ϕ Induction motor. **7**
- b) Why synchronous motor is not self started? **6**
9. a) Draw nature of S. C. current when 3 ϕ alternator is suddenly short circuited. **7**
- b) Derive the expression for obtaining power angle characteristic of salient pole generator. Explain what do you mean by reluctance power? **7**
- OR**
- 10 a) Define subtransient, transient and steady state reactance giving equivalent circuit. How can these reactances be found from oscillogram. **7**
- b) What is the Roll of Damper winding in synchronous generator & synchronous motor. **6**
11. Write short note on. **14**
- i) Universal motor.
ii) Power selsyns position selsyns.
- OR**
12. Write short note on.
- a) BLDC motor. **7**
b) Hysteresis motor. **7**
