

## Electrical Machines - II

P. Pages : 2

Time : Three Hours

\*0210\*

**NJR/KS/18/4477**

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. Assume suitable data whenever necessary.
  9. Illustrate your answers whenever necessary with the help of neat sketches.
  10. Use of non programmable calculator is permitted.

### SECTION - A

- 1.** a) Why are the coils of alternator stator winding are short pitched? **6**
- b) The stator of a 3-phase, 16 pole alternator has 144 solts and there are 4 conductors per solt connected in two layers and the conductors of each phase are connected in series. If the speed of the alternator is 375 rpm. Calculate the emf induced/phase. Resultant flux in the air gap is  $5 \times 10^{-2}$  wb/pole sinusoidally distributed. Assume the coil span as  $150^\circ$  electrical. **7**

### OR

- 2.** a) What are the advantages of having stationary armature. **6**
- b) Calculate the pitch factor for the under given windings. **7**
- a) 36 stator slots, 4 poles, coil span 1 to 8
  - b) 72 stator slots, 6 poles, coil span 1 to 10
  - c) 96 stator slots, 6 poles coil span 1 to 12
- sketch the three coil spans.
- 3.** a) Explain Synchronous Impedance Method for calculation of voltage regulation of alternator. **7**
- b) From the following test results, determine the voltage regulation of a 2000V, single phase alternator delivering a current of 100Amp at **7**
- i) Unity power factor
  - ii) 0.8 leading power factor and
  - iii) 0.71 lagging power factor
- Test results: Full load current of 100Amp is produced on short circuit by a field excitation of 2.5 Amp.
- An emf. of 500V is produced on open circuit by the same excitation. The armature resistance is  $0.8\Omega$ .

### OR

- 4.** a) Explain potier reactance method to find the regulation of 3-phase alternator. **7**

- b) A three phase alternator has a direct axis synchronous reactance of 0.7p.u. and a quadrature axis synchronous reactance of 0.4p.u. Draw the vector diagram for full load 0.8p.f. lagging and obtain the load angle and the no. load per unit voltage. Also calculate voltage regulation. **7**
- 5.** a) How negative and zero sequence reactances are measured in the laboratory? **6**
- b) Write the condition for parallel operation of synchronous generator. Also explain bright lamp method of synchronization. **7**
- OR**
- 6.** a) Write short note on short circuit ratio and also discuss how it will affect size, characteristics and voltage regulation of alternator. **6**
- b) Explain how slip test is conducted in laboratory to find  $x_d$  and  $x_q$  of salient pole synchronous generator. **7**
- 7.** a) Explain V and inverted V curves of synchronous motor. **7**
- b) Compare three phase synchronous motor with three phase induction motor. **6**
- OR**
- 8.** a) A 75kW, three phase, star connected 50Hz, 440V cylindrical rotor synchronous motor operates at rated condition with 0.8 power factor leading. The motor efficiency is 95% and synchronous reactance is  $2.5\Omega$ . Calculate. **7**
- i) Mechanical power developed                      ii) Armature current  
 iii) Back emf    iv) Power angle  
 v) Max. or pull out torque of the motor
- b) Why synchronous motor is not self starting motor? Explain. **6**
- 9.** a) What is role of damper winding in synchronous generator. **7**
- b) Draw and explain equivalent circuit diagrams of synchronous machine under steady state, transient and sub transient condition. **6**
- OR**
- 10.** a) Explain the phenomenon of hunting in detail. **7**
- b) Write short note on sudden three phase short circuit. **6**
- 11.** a) Write short note on:
- i) Universal motor **7**  
 ii) B.L.D.C Motor **7**
- OR**
- 12.** a) Explain the construction and working of Hysteresis motor. **7**
- b) Explain working of Repulsion motor. **7**

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