

- 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. Illustrate your answers whenever necessary with the help of neat sketches.
  11. Use of non programmable calculator is permitted.

- 1.** a) Explain the difference between cylindrical & salient pole synchronous machine. **6**
- b) In a three phase, 4 pole, 1000 rpm Y connected alternator has 60 slots with 8 conductor/slot for double layer winding. The flux per poles 100 mwb. find the line value of the produce emf if coil are short piten by 3 slots. If the flux per pole has third harmonics component which is 20% of fundamental find the valve of induce line emf. **7**

**OR**

- 2.** a) State the advantages of stationary armature and rooting field system in an alternator. **4**
- b) Why are the coils of alternator stater winding are short pitched? **3**
- c) A three phase, 16 pole alternator has a star connected winding with 144 slot and 10 conductor per slot. The flux per pole is 0.03 wb sinusoidally distributed and the speed is 375 rpm. Find the frequency and line Emf. Assume full piten coil. **6**
- 3.** a) Explain the synchronous impedance method for the determination of voltage regulation of an alternator. **6**
- b) A 3 – phase, 100 KVA, 1000 volts alternator is tested for O.C and S.C tests. The alternator generates 950 volts across its terminals at an excitation of 5 Amp during O.C test. The same excitation circulates rated current during S.C test. The effective armature resistance per phase is 0.5  $\Omega$  Determine the voltage regulation of the alternator at full Load 0.8 p.f lagging with terminal voltage 200V **7**

**OR**

- 4.** a) Explain the effect of armature reactions in three phase synchronous generator at lagging, leading and unity p.f. **7**
- b) A salient pole synchronous generator has following per unit parameters  $r_a/ph = 0.05pu$ ,  $x_d/ph = 0.8pu$ ,  $X_q = 0.5pu$ . If the generator is supplying rated kvA at of rated voltage at 0.8 p.f lagging and 0.6 p.f leading. Calculate the regulating and load angle for both cases. Draw phaser diagram. **6**

5. a) What is mean by synchronization of alternator. Explain the process of synchronizing 3 $\phi$  alternator with suitable experimental set up. **7**
- b) How negative and zero sequence reactance's are measured in the laboratory. **7**
- OR**
6. a) Explain in brief slip test to determine the d and q axis synchronous reactances of a synchronous machines. **7**
- b) Write a short note on short circuit ratio and its significance. **7**
7. a) Explain in detail the effect of variable excitation and the power Input on synchronous generator operation. **6**
- b) The Input to an 11,000 V, 3 $\phi$  star connected synchronous motor is 60 A. The effective resistance and synchronous reactance per phase are respectively 1  $\Omega$  and 30  $\Omega$  find, **7**
- i) Power supplied to the motor.
- ii) Mechanical power developed.
- iii) Induced emf for a power factor of 0.8 lagging.
- OR**
8. a) Explain 'V' and 'Inverted V' curve of a Synchronous machine. **6**
- b) A 75 Kw, 440V, 3 $\phi$  star connected synchronous motor has a resistance & leakage reactance of 0.04  $\Omega$  , and 0.5  $\Omega$  per phase respectively. Calculate **7**
- i) Excitation E.m.f. / Phase for full load at 0.8 p.f. leading.
- ii) The mechanical power developed assume motor efficiency of 91% on full load.
9. a) Define Sub transient, transient and steady state reactance of a synchronous generator. Also draw the equivalent circuit of alternator during subtransient, transient and steady state condition, **7**
- b) Draw and explain P- $\delta$  curve for salient pole synchronous generator. **6**
- OR**
10. a) What is bonding of synchronous machine How it is reduced by using damper winding. **7**
- b) Explain the sequence reactance and draw the equivalent circuit of sequence reactance of synchronous machines under 3 phase short circuit conditions. **6**
11. a) Explain the constructional details and the hancing principles of Hysteresis Motor. **7**
- b) Explain with neat diagram the hancing of repulsion motor at different angle between its. brusharms and main field arms. **7**
- OR**
12. a) Explain the constructional details and the working principles of universal motor. **7**
- b) With neat diagram, Explain the operation of d.c brushess motor. **7**

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