B.E. (Electrical Engineering (Electronics & Power) / (Power Engineering) Fourth Semester (C.B.S.)

Electrical Machines - I

P. Pages : 2 **NIR/KW/18/3366/3395**

Time : Three Hours * 1 3 0 6 * 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.
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) Draw and explain phasor diagram of single phase transformer for Lagging power factor. **6**

b) A 20-KVA transformer has a maximum efficiency of 98% when delivering $\frac{3}{4}$ full load at unity power factor. If during the day, the transformer is loaded as follows: **7**

12 hours $\rightarrow$ No load

6 hours $\rightarrow$ 12kw, 0.8 p.f

6 hours $\rightarrow$ 20kw, 1.0 p.f .

Calculate the all day Efficiency of the transformer.

OR

2. a) Explain the following terms along with the phasor diagram and connection diagram **6**

i) Y_{d1} ii) Y_{y0}

b) Explain how to convert single phase transformer into an auto transformer. State advantages of autotransformer over two winding transformer. **7**

3. a) Enumerate various conditions for parallel operation of two 3 phase transformer. **3**

b) Write short note OFAN method of cooling of transformer. **4**

c) Describe 'Back to Back test for determining the regulation and efficiency of a pair of transformer giving in circuit diagram. **7**

OR

4. a) Explain (Scott Connection) i.e. 3 phase to 2 phase conversion for 3.ph. Supply what are its application? **7**

b) A Scott connected transformer set is rated at 11kv, on 3 phase side and at 80V on two phase side. When teaser transformer is loaded upto 500kw, unity power factor and the main transformer, upto 800kw at unity power factor, calculate the line currents on 11 KV side. **7**

5. a) Explain armature reaction in DC machine. **5**

b) A 2 - pole series motor runs at 707 rpm, when taking 100A at 85v and with the field coils in series. The resistance of each field coil is 0.03Ω. and that of armature is 0.04Ω. if the field coils are connected in parallel and load torque remains constant find:- **8**

i) Speed

ii) Additional resistance to be inserted in series with the motor to restore the speed to 707 rpm.

OR

6. a) Explain in brief following char for DC shunt and DC series motor. **6**

i) Torque - Armature current char ii) Speed - Torque char

b) A 250V shunt motor runs at 1000rpm while taking a current of 25A. The Resistance of the armature is $0.2\ \Omega$. and the resistance of the shunt field is $250\ \Omega$. Calculate the speed when loaded to take a current of 50A. If the armature reaction weakens the field by 3%. The voltage drop per brush is 1 Volt. Determine torques in both the cases. **7**

7. a) For a 3-Ph I.M. show that per phase Input Power to rotor can be divided in the ratio of: I:S: (I-S) = Pg; rotor ohmic loss : pm. **6**

b) A 4 pole, 50 Hz, 3 Ph IM when running on full load develops a useful torque of 100 N-m while rotor emf is observed to make 120 cycles per minute The torque lost on account of friction and windage is $7\,N\cdot M$. **7**

Calculate:-

i) Shaft Power output ii) Rotor copper loss

iii) Motor input iv) Efficiency if total Stater losses are 700w.

OR

8. a) Explain the No-load and blocked rotor test on 3. Ph I.M to find the parameter of equivalent circuit with necessary equations. **7**

b) An 18.65 kw, 4 pole, 50 Hz, 3 Ph, I.M has friction and windage losses of 2.5% of the output. The full load slip is 4%. Compute for full load. **6**

i) The rotor CU loss ii) The rotor O/P

iii) The gross Electromagnetic torque

9. Write a short note on:

a) Speed control of 3 phase I.M. **7**

b) Crawling and Coggin in 3 - Ph I.M. **7**

OR

10. a) Write various braking methods of 3 - ph. I.m and Explain "Plugging" in detail. **7**

b) What is necessity of starter in case of 3 ph I.m? Explain working of Autotransformer starting in detail. **7**

11. a) Explain shaded Pole I.M along with its applications. **7**

b) Explain split phase I.M What are its advantage and disadvantages. **6**

OR

12. a) Explain Double field Revaluing theory in case of 1 - Ph. I.M. **7**

b) Explain capacitor start I.M with construction and working Principle. **6**

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