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

EP-402 - Electrical Machines-I

P. Pages : 2 **GUG/W/18/1550**

Time : Three Hours * 1 2 1 9 * Max. Marks : 80

Notes : 1. All questions carry equal marks.
2. Answer **five** questions as per the choice given.
3. Due credit will be given to neatness and adequate dimensions.
4. Assume suitable data wherever necessary.
5. Illustrate your answers wherever necessary with the help of neat sketches.
6. Use of slide rule, Logarithmic tables, Steam tables, Mollier's chart, Drawing instruments, and Non – Programmable calculator is permitted.
7. Use of mobile phone in Exam Hall is not permitted.

1. a) Define voltage regulation of a transformer and derive condition for **8**
i) Zero regulation. ii) Maximum regulation.

b) The efficiency at unity power factor of a 6600/384V, 200kVA, 1-phase transformer is 98% at full load. The power factor at no load is 0.2 and full load regulation at a lagging power factor of 0.8 is 4%. Draw the equivalent circuit referred to LV side and insert all values. **8**

OR

2. a) Derive the condition for maximum efficiency for a single phase transformer. **4**

b) Distinguish between distribution and power transformer. **4**

c) A 100 kVA, 6600/330V, 50 Hz, single phase transformer took 10A and 436W at 100V in a short circuit test, the figure referring to the high voltage side. Calculate the voltage to be applied to the high voltage side on full load at power factor of 0.8 lagging when secondary terminal voltage is 330V. **8**

3. a) What is the difference between a 3-phase transformer bank and a 3-phase transformer unit? What are the advantages of three-phase unit transformer over three single-phase transformer bank of the same kVA rating? **8**

b) A 900kVA load is supplied by three phase transformers connected in delta-delta. The primaries are connected to a 2300V supply line, while secondaries are connected to a 230V load. If one transformer is removed for repair, what load can the remaining two transformers supply without overloading? What are the currents in the high-and low voltage sides of the transformer windings when connected in open delta? **8**

OR

4. a) Discuss the essential and desirable conditions to be fulfilled for operating two three phase transformers in parallel. **8**

b) Two three-phase transformers which have same turn ratio are connected in parallel and supply a total load of 800kW at 0.8 power factor lagging. Their ratings are as follows : **8**

Transformer	Rating	Per unit Resistance	Per unit Reactance
A	400kVA	0.02	0.04
B	600kVA	0.01	0.05

Determine the power output and power factor of each transformer.

muquestionpapers.com

5. a) What is armature reaction? Describe the effects of armature reaction on the operation of dc machine. How the armature reaction is minimized? **8**

b) A shunt generator gives full load output of 30kW at a terminal voltage of 200V. The armature and shunt field resistances are 0.05Ω and $50\ \Omega$ respectively. The iron and friction losses are 1000W.
Calculate :
i) Generated emf ; **3**
ii) Copper losses **3**
iii) Efficiency. **2**

OR

6. a) What is commutation in dc machine? Discuss the method to improve it. **8**

b) A lap wound dc shunt generator having 80 slots with 10 conductors per slot generates at no load an emf of 400V when running at 1000 rpm. At what speed should it be rotated to generate a voltage of 220V on open circuit? **8**

7. a) Explain with neat figure the characteristics of a dc series motor. **8**

b) A 250V shunt motor on no-load runs at 1000 rpm and takes 5A. The total armature and shunt field resistance are 0.2Ω and $250\ \Omega$ respectively. Calculate the speed when loaded and taking a current of 50A, if armature reaction weakens the field by 3%. **8**

OR

8. a) Discuss various speed control methods for dc motor. **8**

b) A 460V series motor runs at 500 rpm. taking a current of 40A. Calculate the speed and percentage change in torque if the load is reduced so that the motor is taking 30 A. Total resistance of the armature and field circuit is 0.8Ω. Assume flux and field current to be proportional. **8**

9. a) Compare cage and wound 3-phase induction motor with reference to construction, performance and application. **8**

b) A 6 pole, 50Hz, 3-phase induction motor running on full load develops a useful torque of 150Nm at a rotor frequency of 1.5Hz. Calculate the shaft power output. If the mechanical torque lost in friction be 10Nm, determine **8**
i) Rotor copper loss, ii) The input to the motor and
iii) Efficiency.

OR

10. a) Discuss the torque-slip and torque speed characteristics of 3-phase induction motor. **8**

b) A 3-phase induction motor with rotor resistance per phase equal to standstill rotor reactance, has a starting torque of 25Nm for negligible stator impedance and no load current determine the starting torque in case the rotor circuit resistance per phase is **8**
i) Doubled ii) Halved.

****

mumotes.in