

GANPAT UNIVERSITY
B.TECH SEM-IV (ELECTRICAL)
CBCS REGULAR EXAMINATION APRIL-JUNE-2016
2EE405:-D.C. MACHINES & TRANSFORMER

Time: 3 Hours

Total Marks: 60

- Instructions:** (1) This Question paper has two sections. Attempt each section in separate answer book.
 (2) Figures on right indicate marks.
 (3) Be precise and to the point in answering the descriptive questions.
 (4) Make suitable assumptions wherever necessary

SECTION-I

- Que-1 (A)** Explain working principle of transformer in detail and also derive E.M.F equation of transformer. [04]
- (B)** A 50 kVA, 4400/220 V transformer has $R_1 = 3.45 \Omega$, $R_2 = 0.009 \Omega$. The values of reactances are $X_1 = 5.2 \Omega$ and $X_2 = 0.015 \Omega$. Calculate for the transformer (i) equivalent resistance as referred to primary (ii) equivalent resistance as referred to secondary (iii) equivalent reactance as referred to both primary and secondary (iv) equivalent impedance as referred to both primary and secondary (v) total Cu loss, first using individual resistances of the two windings and secondly, using equivalent resistances as referred to each side. Assume efficiency of the transformer equal to 100%. [04]
- (C)** Why efficiency of transformer is high? [02]
- OR**
- Que-1 (A)** Derive the equivalent circuit of a single phase transformer and show how it is useful in the analysis of the performance of a transformer? [04]
- (B)** The efficiency of a 200 kVA, single phase transformer is 98.75 % when delivering full load at 0.8 power factor and 99 % on 80 % of full load at 0.9 power factor. Calculate (1) iron losses (2) copper losses of transformer at full load and (3) efficiency at unity power factor. [04]
- (C)** Discuss the importance of voltage regulation in transformer. [02]
- Que-2 (A)** Explain characteristics of d.c. series motor. [05]
- (B)** A 250 V shunt motor has armature resistance of 0.25Ω , on load it takes an armature current of 50 A and runs at 750 r.p.m. If the flux of motor is reduced by 10% without changing the load torque, find the new speed of the motor. [05]
- OR**
- Que-2 (A)** Why starter is required for d.c motor? With diagram discuss three point starter. [05]
- (B)** A 4 -pole, 220-V Shunt motor has 340 lap wound conductor. It takes 32 A from the supply mains and develops 7.5 H.P (5.595kW).The field winding takes 1 A. The armature resistance is 0.09Ω and the flux/pole is 30 mWb. Calculate (1) the speed (2) the torque developed in newton-meter. [05]

Que-3 Attempt the following questions.

- (A) Derive the condition of maximum power for d.c motor. [02]
(B) Discuss open circuit and short circuit test of transformer. [04]
(C) Compare autotransformer with ordinary transformer and prove that saving of copper in auto transformer equal to transformation ratio times copper used in ordinary transformer. [04]

SECTION-II

- Que-4 (A) Explain losses in a d.c. generator. [05]
(B) A shunt generator supplies 195 A at 220 V. Armature resistance is 0.02Ω , shunt field resistance is 44Ω . If the iron and frictional losses amount to 1600 W. Find generated emf, copper loss, b.h.p of the engine and electrical and commercial efficiencies [05]

OR

- Que-4 (A) Discuss the process of building up of voltage in a d.c shunt generator and give the conditions to be satisfied for voltage build up. [05]
(B) A long shunt compound generator delivers a load current of 50 A at 500 V and has armature, series field and shunt field resistances of 0.05Ω , 0.03Ω and 250Ω respectively. Calculate the generated voltage and the armature current. Allow 2 V brush contact drop. [05]

- Que-5 (A) Discuss Scott-connection of transformer in detail with necessary diagram. [04]
(B) Discuss the off load tap changing transformer with necessary figure. [04]
(C) What is the advantage of star-connection over delta connection in a 3-phase transformer? [02]

OR

- Que-5 (A) Explain the concept of electromechanical energy conversion process with necessary example. [05]
(B) A 500 KVA, 3-phase transformer has a line voltage ratio of 33/11 kV and delta star connected. The resistances per phase are: high voltage 35Ω , low voltage 0.876Ω and the iron loss is 3050 W. Calculate the value of efficiency at full load and one half of full load respectively at (a) unity power factor (b) 0.8 power factor. [05]

Que-6 Attempt the following questions.

- (A) With neat diagrams explain the phenomenon of armature reaction in a d.c. machine. [04]
(B) Draw and explain internal and external characteristics of d.c shunt generator. [03]
(C) Discuss the following terms related to armature winding [03]
(a) pole pitch (b) front pitch and back pitch (c) lap and wave winding

END OF PAPER

Best of Luck