

GANPAT UNIVERSITY
B. TECH SEM- IV (ELECTRICAL)
REGULAR EXAMINATION APRIL-JUNE 2017
2EE405: D.C. MACHINES & TRANSFORMER

TIME: 3 HRS

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 whenever necessary

SECTION- I

- Que.-1** (A) What is an ideal transformer? Draw & explain the phasor & vector diagram for an ideal transformer. [03]
 (B) Explain the working principle of single phase transformer and derive the emf equation. [04]
 (C) Draw and explain equivalent circuit of single phase transformer. [03]
- OR**
- Que.-1** (A) A 10 KVA, 500/250V, 1 Φ transformer has its maximum efficiency of 94% when delivering 90% of its rated output at unity p.f. Estimate its efficiency when delivering its full load output at p.f. 0.8 lagging. [03]
 (B) Derive the condition for maximum efficiency of a single phase transformer. [03]
 (C) Discuss open circuit test on single phase transformer with circuit and necessary equations. [04]
- Que.-2** (A) The no-load current of a transformer is 5.0 A at 0.3 power factor when supplied at 230-V, 50-Hz. The number of turns on the primary winding is 200. Calculate (i) the maximum value of flux in the core (ii) the core loss (iii) the magnetizing current. [03]
 (B) With neat diagram explain the characteristic of D.C. series motor. [04]
 (C) Discuss condition for parallel operation of single phase transformers. [03]
- OR**
- Que.-2** (A) Explain various methods for speed control of D.C. shunt motor. [04]
 (B) Explain field test for DC series motor with necessary diagram. [03]
 (C) Compare electrical braking with mechanical braking. Discuss types of electric braking. [03]
- Que.-3** **Attempt the following questions.**
- (A) Two shunt machines loaded for the Hopkinson's test take 15A at 200V from the supply. The motor current is 100A and shunt currents are 3A and 2.5A. If the armature resistance of each machine is 0.05ohm, calculate the efficiency of each machine for the particular load-condition. [04]
 (B) The armature winding of a 4 pole, 250V D.C. shunt motor is lap connected. there are 120 slots, each slot containing 8 conductors. the flux per pole is 20 mwb and current taken by the motor is 25A. The resistance of armature and field circuit are 0.1 Ω and 125 Ω respectively. if the rotational losses amount to be 810 W. Find (i) gross torque (ii) useful torque (iii) efficiency. [03]
 (C) Compare ordinary transformer with auto transformer. prove that saving of copper in auto transformer equal to transformation ration times weight of copper used in ordinary transformer. [03]

SECTION-II

- Que.-4 (A) What is stray losses ? Explain different types of losses in DC Generator. [05]
- (B) A long-shunt dynamo running at 1000 r.p.m. supplies 22 kW at a terminal voltage of 220 V. The resistances of armature, shunt field and the series field are 0.05Ω , 110Ω and 0.06Ω respectively. The overall efficiency at the above load is 88%. Find (i) Cu losses (ii) iron and friction losses (iii) the torque exerted by the prime mover. [05]

OR

- Que.-4 (A) Derive the emf equation of DC Generator. [03]
- (B) The following information is given for a 300 kW, 600 V, long-shunt compound generator: Shunt field resistance = 75Ω , armature resistance including brush resistance = 0.03Ω , commutating field winding resistance = 0.011Ω , series field resistance = 0.012Ω , diverter resistance = 0.036Ω . When the machine is delivering full load, calculate the voltage and power generated by the armature. [05]

- (C) Discuss critical resistance and critical speed for DC Generator. [02]
- Que.-5 (A) What do you understand by tap changing transformer? Discuss ON load tap changing of transformer. [05]
- (B) A short-shunt compound DC Generator supplies a current of 100 A at a voltage of 220 V. If the resistance of the shunt field is 50Ω , of the series field 0.025Ω , of the armature 0.05Ω , the total brush drop is 2 V and the iron and friction losses amount to 1 kW, find (i) the generated emf (ii) the copper losses (iii) the output power of the prime-mover driving the generator and (iv) the generator efficiency. [05]

OR

- Que.-5 (A) How does the emf induced in a coil rotating in a magnetic field ? Discuss. [03]
- (B) Draw and discuss scott connection of three phase transformer. [04]
- (C) Explain the construction of DC generator. [03]

Que.-6 **Attempt the following questions.**

- (A) A 120-kVA, 6,000/400-V, Y/Y 3-phase, 50-Hz transformer has an iron loss of 1,600 W. The maximum efficiency occurs at $3/4$ full load. Find the efficiencies of the transformer at (i) full-load and 0.8 power factor (ii) half-load and unity power factor (iii) the maximum efficiency. [04]
- (B) Discuss about tertiary winding of transformer. Provide the merits & demerits of it. [03]
- (C) 3-phase, 6,600/415-V, 2,000 kVA transformer has a per unit resistance of 0.02 and a per unit leakage reactance of 0.1. Calculate the Cu loss and regulation at full-load 0.8 p.f. lag. [03]

END OF PAPER