

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-III(New) • EXAMINATION – WINTER 2016****Subject Code:2130904****Date:09/01/2017****Subject Name:DC Machines and Transformer****Time:10:30 AM to 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

**MARKS****Q.1 Short Questions****14**

- 1 Example of singly excited magnetic field system.
  - a) D.C motor
  - b) Relay
  - c) Synchronous motor
  - d) all of above
- 2 Armature of D.C machine is laminated to.
  - a) reduce eddy current losses
  - b) reduce hysteresis losses
  - c) reduce inductance
  - d) reduce mass
- 3 In D.C machine for same value of  $\phi$ , Z and N Which one of the following statement is correct?
  - a) Armature emf is more with wave winding than with lap windings.
  - b) Armature emf is less with wave winding than with lap windings.
  - c) Armature emf same as long as flux density remains same.
- 4 The generator may loose residual magnetism due to
  - a) Heating
  - b) vibration
  - c) over excitation.
  - d) all of these.
- 5 The power factor of a transformer on no load is poor due to
  - a) open –circuited secondary
  - b) magnetizing reactance of transformer
  - c) low no-load current
  - d) low primary winding resistance.
- 6 In order to reduce the hysteresis losses in transformer
  - a) core may be laminated
  - b) silicon steel may be used as core material
  - c) core may be impregnated with varnish
  - d) All of the above.
- 7 P1 and P2 are iron losses and copper losses of a transformer at full load and maximum efficiency is 75% at full load then, what is the ratio of P1 and P2?
  - a) 10/16
  - b) 3/4
  - c) 9/16
  - d) 3/16
- 8 If speed of D.C. motor increases with load torque, then it is
  - a) Series motor
  - b) Cumulative compound motor
  - c) differential compound generator
  - d) all of above.
- 9 Running the machine at no load is inadvisable for
  - a) dc shunt motor
  - b) dc series motor
  - c) dc compound generator
  - d) transformer.

- 10 Ward Leonard control is basically a  
 a) Armature voltage c) field diverter  
 b) field d) armature resister.
- 11 Mechanical power developed by D.C motor is maximum When  
 a) back e.m.f is equal to applied voltage  
 b) back e.m.f is equal to half applied voltage  
 c) back e.m.f is zero.  
 d) none of above.
- 12 A d.c series motor is best suited for driving  
 a) Blowers and fans c) punching machine  
 b) machine tools d) cranes and hoists
- 13 Open circuit test on transformer gives  
 a) Equivalent resistance and leakage reactance  
 b) Magnetizing current and core losses at rated voltage  
 c) Copper losses  
 d) Both a and c
- 14 Which of the following tests can be conducted on other than shunt machine  
 a) Swinburne's test c) Field's test  
 b) Retardation test d) Back to back test.
- Q.2 (a)** Explain following terms: 1) coil span 2) single layer and double layer winding 3) coil span factor. **03**
- (b)** Explain critical field resistance of d.c. shunt generator with its significance. **04**
- (c)** A 4-ole 250V wave –connected shunt motor gives 10Kw when running at 1000 r.p.m. and drawing armature and field currents of 60A and 1A respectively It has 560 conductors. Its armature resistance is 0.2  $\Omega$ . Assuming a drop of 1V per brush, determine (a) total torque; (b) useful torque; (c) useful flux per pole (d) rotational losses; (e) efficiency. **07**
- OR**
- (c)** A 4-pole, long-shunt lap wound generator supplies 25 kW at a terminal voltage of 500 V. The armature resistance is 0.03  $\Omega$ , series field resistance is 0.04  $\Omega$  and shunt field resistance is 200  $\Omega$ . The brush drop may be taken as 1V. Determine the e.m.f. generated. Also calculate the No. of conductors if the speed is 1200 r.p.m. and flux per pole is 0.02 Weber. Neglect armature reaction. **07**
- Q.3 (a)** Define "All day efficiency" and % regulation of transformer. **03**
- (b)** A single phase transformer on no-load takes 4.5 A at a power factor of 0.25 lagging when connected to a 230V, 50Hz. Supply. The number of turns of the primary winding is 250. Calculate (a) the magnetizing current (b) the core loss (c) maximum value of flux in the core. **04**
- (c)** Derive the equivalent circuit of a single phase transformer and show how it is useful in the analysis of the performance of a transformer. **07**
- OR**
- Q.3 (a)** Compare Current transformer and potential transformer with Diagram. **03**

- (b) A single phase transformer having a core of cross-sectional area of  $150\text{cm}^2$  operates at maximum flux density of  $1.1\text{ wb/m}^2$  from a 50 Hz. Supply. If the secondary winding has 66 turns, determine the output in KVA When connected to a load of  $4\Omega$  impedance. Neglect any voltage drop in the secondary. **04**
- (c) Derive expression which shows comparison of copper required in auto transformer and two-winding transformer. **07**
- Q.4** (a) Explain operating principle of transformer. What happens if D.C supply is given to the transformer? **03**
- (b) Discuss conditions for parallel operation of two 3--phase transformer. **04**
- (c) A 3-phase step down transformer is connected to 6600V on primary side. The ratio of turns per phase is 12 and the line current drawn from the mains is 20A. Find the secondary line voltage and secondary line current if the transformer is connected in (a) star-star connection (b) delta-delta connection (c) star-delta connection (d) delta connection. Neglect losses. **07**
- OR**
- Q.4** (a) Explain necessity of starter in D.C motor. Draw neat sketch of 3-point starter by indicating its part. **03**
- (b) Explain speed control method of D.C series motor. **04**
- (c) The Hopkinson's test on two identical shunt machines gave the following results: Input voltage =500 V; input current = 15 A; output current of generator = 120A; Field current of generator= 4 A Field current of motor =3 A Armature resistance of each machine =0.06  $\Omega$  .Find the efficiency of motor and generator. **07**
- Q.5** (a) Write D.C. machine nameplate with significance of each name. **03**
- (b) Give Reason 1) Speed of D.C shunt motor is practically constant. 2) Efficiency of Transformer is higher than D.C machine. **04**
- (c) Derive the expression of armature torque developed in a dc motor using fundamental equation and power equation. Draw the speed-torque characteristics of shunt, series and compound motors. **07**
- OR**
- Q.5** (a) Write Function and location of interpoles and commutating winding in D.C generator. **03**
- (b) Discuss conditions to be satisfied for a self-excited generator to build up voltages. **04**
- (c) Discuss retardation test on D.C machine. **07**

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