

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B. Tech. Winter 2022 - 23 Examination

Semester: 3**Subject Code: 203106203****Subject Name: Electrical Machines-I****Date: 06/10/2022****Time: 2:00pm to 4:30pm****Total Marks: 60****Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions - (Fill in the blanks, one word answer, MCQ-not more than Five in case of MCQ) (All are compulsory) (Each of one mark) (15)

1. Maximum efficiency will occur, when copper loss is _____ to iron loss.
2. In a transformer the voltage regulation will be zero when it operates at _____ pf.
3. The series field of DC short shunt generator is excited by _____ currents.
 - a) Shunt
 - b) Armature
 - c) Load
 - d) External
4. For a linear electromagnetic circuit, the field energy is _____ the co energy.
5. The current drawn by a 120 V DC motor of armature resistance 0.5 ohm and back emf 110V and _____ current.
6. When load is removed, which machine runs at highest speed?
7. Series field windings of a dc machine consist of _____ turns (more/ few) of _____ (thick/thin) wire
8. Stray losses are sum of _____
9. A transformer having 2000 primary turns is connected to a 250 V supply. For a secondary voltage of 400 V, the number of secondary turns is _____.
10. A transformer has negative voltage regulation when its load power factor is
 - a) Lag
 - b) Lead
 - c) Unity
 - d) Zero
11. In a dc machine, on no load the magnetic neutral axis
 - a) Moves from geometrical neutral axis in the direction of rotation
 - b) moves from geometrical neutral axis in the opposite direction of rotation
 - c) co-incides with geometrical neutral axis.
 - d) None of the above.
12. The emf induced in the primary of a transformer _____.
 - a) is in phase with the flux.
 - b) lags behind the flux by 90 degree.
 - c) leads the flux by 90 degree
 - d) is in phase opposition to that of flux.
13. What is the function of transformer oil in transformer?
14. Write working principle of Transformer.
15. Which of the following loss in a transformer is zero even at full load?
 - a) Eddy current loss
 - b) Hysteresis loss
 - c) Core loss
 - d) Friction loss

- Q.2** Answer the following questions. (Attempt any three) **(15)**
- A) What are different methods for speed control of DC shunt motor? Explain any one in detail for specific application.
- B) Explain regenerative testing method for DC Shunt machine with neat diagram.
- C) Draw phasor diagram of transformer on load with resistance and leakage reactance of the windings for lagging power factor load.
- D) Enlist different methods used to improve commutation process. Explain any one in detail.
- Q.3** A) Discuss Doubly Excited Magnetic System. **(07)**
- B) What is armature reaction? Describe the effects of armature reaction on the operation of DC machines. How the armature reaction is minimized? **(08)**
- OR**
- B) In a 120 V compound generator, the resistance of the armature, shunt and series windings are 0.06, 25 and 0.04 ohm respectively. The load current is 100 A at 120 V. Find the induced emf and the armature current when the machine is connected as (i) long shunt and as(ii) short shunt. Take 1 V per brush drop. Ignore armature reaction. **(08)**
- Q.4** A) Explain autotransformer working and derive expression of saving of Cu in autotransformer compare to two winding transformer. **(07)**
- OR**
- A) Following the results obtained from open circuit and short circuit test on 10 KVA, 450/120 V, 50 Hz transformer: **(07)**
- O.C. test: $V_1 = 120$ V; $I_1 = 4.2$ A; $W_1 = 80$ W; performed on LV side
- S.C. test: $V_1 = 9.65$ V; $I_1 = 22.2$ A; $W_1 = 120$ W; Short circuited LV side
- Compute: (1) The equivalent circuit constants
- (2) efficiency and voltage regulation for an 80% lagging p.f. load
- B) State various losses which take place in transformer. Derive the condition for maximum efficiency of transformer. **(08)**