

PSG POLYTECHNIC COLLEGE, COIMBATORE - 641 004

E12303 - DC MACHINES AND TRANSFORMERS

MODEL QUESTION PAPER

Time : 3 Hours

Max.Marks: 100

**Instructions:**

1. **Group A** and **Group B** questions should be answered in the Main Answer book.
2. Answer any **TEN** questions in **Group A**. Each question carries three marks.
3. Answer **ALL** questions either **(a)** subdivision or **(b)** subdivision in **Group B**. Each question carries 14 marks.

**Group – A**

**Marks: 10 x 3 = 30**

1. What is the use of commutator in DC machine?
2. Differentiate lap and wave winding
3. Draw the load characteristics of dc generator.
4. Define back EMF.
5. What is the need for using starters in DC motor?
6. List the applications of DC shunt motor.
7. Name the various losses occur in DC machine.
8. Write the condition to get maximum efficiency in DC machine.
9. What are the uses of conducting indirect method of testing in DC machine?
10. Brief the functioning of transformer.
11. Define all day efficiency of a transformer.
12. List the conditions to connect transformer in parallel.
13. Define step angle in stepper motor.
14. Mention the applications of DC servo motor.
15. What is hybrid stepper motor?

**Group– B**

**Marks: 5 x 14 = 70**

16. a) i] Describe the construction of DC machine with neat diagram. (7)  
ii] Derive the EMF equation of DC generator from its first principle. (7)  
(OR)
- b) i] Brief the types DC generator. (6)  
ii] A 4 pole, 220V dc shunt generator has armature and field resistances of  $0.2\Omega$  and  $220\Omega$  respectively. The armature has 520 conductors lap wounded. The machine runs at 1600 rpm. Find the generated EMF and flux developed per pole. (8)

17. a) i] Explain the principle of operation of DC motor. (7)  
ii] A 220V, 4 poles, wave connected dc series motor has armature and field resistances of  $0.15\Omega$  and  $0.85\Omega$  respectively. The armature of motor has 60 conductors per pole. The flux developed in the air gap is 20mWb. Find the speed of the motor. (7)
- (OR)
- b) i] With the help of speed torque characteristics, explain the motoring function of DC compound motor. (7)  
ii] Name the speed control techniques used in DC motor. Explain each one of them. (7)
18. a) i] Describe the method to calculate the efficiency of DC motor by brake test. (7)  
ii] A 220 V, 3.7KW dc motor operates at full load with 90% efficiency has constant losses 180W. Find the copper loss at full load. Also find the efficiency of motor at half full load. (7)
- (OR)
- b) i] With neat circuit diagram, explain the procedure to conduct Swinburne's test. (7)  
ii] List the calculations to be made to predetermine the efficiency of DC motor by using Swinburne's test results. (7)
19. a) i] Derive the EMF equation of transformer. (7)  
ii] A 400/230V, 50Hz, single phase transformer has 200 turns on high voltage side. Find turns ratio, transformation ratio, and number of turns on low voltage winding. Also find the flux developed in the core. (7)
- (OR)
- b) i] Draw the various types of three phase transformer connections and brief each one of them. (7)  
ii] What are the tests to be conducted to predetermine the efficiency of transformer? Explain the testing procedure. (7)
- 20 a) i] Explain the principle of operation of DC servo motor. (7)  
ii] Describe the speed torque characteristics of DC servo motor. (7)
- (OR)
- b) i] With the help of neat diagram, describe the construction of permanent magnet type DC servo motor. (7)  
ii] Explain the modes of operation of stepper motor. (7)

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