

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
THIRD SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

**Course Code: EE205**

**Course Name: DC MACHINES AND TRANSFORMERS (EE)**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions, each carries 5 marks*

Marks

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|---|---|-----|
| 1 | Point out the necessity of equalizer rings in a lap wound dc machine. Why this is not applicable in wave wound machines   | (5) |
| 2 | What is armature reaction and how it is eliminated in DC machines   | (5) |
| 3 | Compare the electrical and mechanical characteristics of a DC shunt motor with those of a DC series motor. Based on this point out the application areas of these motors. | (5) |
| 4 | What is the principle of operation of a transformer? Show how the flux is balanced when the transformer is supplying a load.  | (5) |
| 5 | With supporting phasor diagrams, derive the expression for secondary side voltage regulation of a transformer for lagging and leading power factor loads.                 | (5) |
| 6 | What are the necessary and desirable conditions to be satisfied for parallel operation of two single phase transformers?  | (5) |
| 7 | Distinguish the vector groupings Yy0, Dd0, Dy1, Yd11 in three phase transformer connections   | (5) |
| 8 | Show how three phase power is obtained by using two single phase transformers connected in open delta.  | (5) |

**PART B**

*Answer any two full questions, each carries 10 marks*

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|----|---|------|
| 9  | For a 6 pole DC armature with 16 slots having two coil sides per slot and single turn coils, calculate the relevant pitches for a wave winding and draw the developed winding diagram.  | (10) |
| 10 | Draw the magnetisation characteristics of a DC shunt machine. Point out the conditions for voltage build-up of a DC shunt generator. Give the significance of the terms critical resistance and critical speed as applicable to a DC shunt generator.   | (10) |
| 11 | A short shunt compound DC generator supplies a current of 100A at 220V. If the resistance of the shunt field is 50 $\Omega$ , of the series field is 0.02 $\Omega$ , of the armature is 0.05 $\Omega$ , the iron and friction losses amount to 1KW. Find:<br>i) The generated emf            ii) The copper losses<br>iii) Output power of the prime-mover driving the generator<br>iv) The generator efficiency. | (10) |

**PART C**

*Answer any two full questions, each carries 10 marks*

- 12 With a neat sketch, explain the working of three-point starter. What is its main drawback? How this is eliminated in four point starters? (10)
- 13 a) With supporting diagrams, show how the retardation test can be employed to find out the various losses occurring in a DC machine. (6)
- b) Explain the working principle of  $1\phi$  transformers. (4)
- 14 Readings from O.C and S.C test on a 8kVA, 400/200V, 50Hz transformer are (10)  
OC Test : 200V, 2A, 80W ;meters on low voltage side  
SC Test : 10V, 20A, 120W; meters on high voltage side  
Compute equivalent circuit of the transformer as referred to high voltage side.

**PART D**

*Answer any two full questions, each carries 10 marks*

- 15 a) Derive the condition for maximum efficiency for a transformer. (5)
- b) Distinguish between auto transformers and two winding transformers. Derive the expression for saving in copper in an auto transformer. (5)
- 16 a) Derive the condition to be satisfied for zero voltage regulation and maximum voltage regulation for a transformer. (4)
- b) With neat circuit diagram, explain how a two-phase supply can be obtained from a three-phase supply. (6)
- 17 Draw the connection diagram for T-T connection of transformers and explain the formation of three phase four wire system with two single phase transformers. Point out its advantages and disadvantages (10)

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