Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Third semester B.Tech examinations (S) September 2020

Course Code: EE205

Course Name: DC MACHINES AND TRANSFORMERS

Max. Marks: 100 Duration: 3 Hours

Graph sheets shall be provided

PART A

Answer all questions, each carries 5 marks. Marks

1 Explain the phenomenon of electromechanical energy conversion in the case of a DC generator. What are the torques involved? (5)

2 Derive the expression for generated emf in DC generator. (5)

3 Explain significance of back emf? (5)

4 Explain different methods of cooling of a transformer. (5)

5 Derive the condition for maximum efficiency of a single-phase transformer. (5)

6 What is the difference between commercial efficiency and all day efficiency? (5)

7 What are the necessary conditions to be satisfied for parallel operation of a three phase transformer? (5)

8 What are the advantages and disadvantages of delta-delta connection? (5)

PART B

Answer any two full questions, each carries 10 marks.

9 a) Explain construction of DC machine with the help of neat diagram (10)

10 a) Equalizer ring is not needed for wave winding of a dc machine. Give reason. (5)

b) An 8 pole lap wound armature having 40 slots with 12 conductors/ slot generates 500V. Determine speed at which machine is running if the flux per pole is 50 mWb. (5)

11 A shunt generator gave the following open circuit characteristics: (10)

Field current (A)	0.5	1	1.5	2	2.5	3	3.5
OC emf (V)	54	107	152	185	210	230	245

The armature and field resistances are 0.1Ω and 80Ω respectively. Calculate :

i) The voltage to which the machine will excite when run as a generator at the same speed.

ii) The voltage lost due to armature reaction when 100A are passing in the armature at terminal voltage of 175V.

iii) The percentage reduction in speed for the machine to fail to excite on open circuit.

PART C

Answer any two full questions, each carries 10 marks.

12 a) A 460V dc series motor runs at 500 rpm taking a current of 40A. Calculate the speed and percentage change in torque if the load is reduced so that the motor is taking 30A. The total resistance of the armature and field circuits is 0.8Ω. Assume that flux is proportional to the field current. (10)

13 a) Explain different methods of speed control of dc shunt motor. (5)

b) Distinguish between core and shell type transformer? (5)

14 a) Draw the phasor diagram of an ideal transformer on no load. Also, draw a phasor diagram of a practical transformer supplying lagging power factor load. (7)

b) Why transformers are rated in KVA? (3)

PART D

Answer any two full questions, each carries 10 marks.

15 The test results of 2.5kVA, 230/115V single-phase transformer are as follows: (10)

OC Test : 115V, 1.2A, 60W

SC Test : 12V, 10.86A. 120W

Find i. efficiency at 50% full load, 0.8 pf

ii. regulation at 30% full load, 0.8 pf lag and lead

16 a) Derive an expression for the saving of copper in an autotransformer as compared to an equivalent two winding transformer. (5)

b) Explain the working of off-load tap changing transformer with help of neat diagram. (5)

17 a) 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)

****