

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S4 (S,FE) (FT/WP/S2PT) Examinations May 2026 (2019 Scheme)

Course Code: EET202

Course Name: DC MACHINES AND TRANSFORMERS

Max. Marks: 100

Duration: 3 Hours

PART A

(Answer all questions; each question carries 3 marks)

Marks

- | | | |
|----|---|---|
| 1 | Which type of armature winding is suitable for low-voltage but high-current DC machine? Substantiate your answer. | 3 |
| 2 | Find the values of (i) front pitch (ii) back pitch (iii) resultant pitch of a 4 pole wave wound DC generator with 30 armature conductors. | 3 |
| 3 | A 4-pole, lap wound DC generator with 492 armature conductors, delivers a current of 153A. The brushes are given an actual lead of 10° . Find the demagnetising and cross magnetising ampere-turns per pole. | 3 |
| 4 | What are the reasons for drop in terminal voltage of a DC shunt generator under load condition? | 3 |
| 5 | What is the need of commutator in DC motor? | 3 |
| 6 | Which is the most energy efficient braking method of DC motor? Justify your answer. | 3 |
| 7 | "A transformer is a constant flux machine". Do you agree with the statement? Justify your answer. | 3 |
| 8 | With the aid of relevant equations explain the methods to minimise the core loss of a transformer. | 3 |
| 9 | What are the demerits of auto-transformer compared to a two winding transformer. | 3 |
| 10 | What are the advantages of using a bank of three separate single phase transformers over a three phase transformer? | 3 |

PART B

(Answer one full question from each module, each question carries 14 marks)

Module -1

- | | | |
|----|--|----|
| 11 | a) Explain the need of dummy coils in wave winding. | 4 |
| | b) Draw the sectional view of a DC machine. Explain the selection of materials and functions of each part. | 10 |

- 12 Draw the developed winding diagram of a simplex 2-layer wave winding for a 4 pole dc generator with 30 armature conductors. Mark the current direction, position of brushes and draw the sequence diagram. 14

Module -2

- 13 a) A long shunt DC generator running at 1000 rpm, supplies 25kW at a terminal voltage of 250V. The resistances of the armature, series field and shunt field are 0.05Ω , 0.06Ω and 100Ω respectively. The overall efficiency at the given load is 85%. Find (i) the induced emf (ii) Copper loss (iii) iron and frictional loss. 9
b) Derive the condition for maximum efficiency of the DC generator. 5
- 14 a) What are the reasons for poor commutation in DC generator? How these can be minimised? 9
b) What are the conditions for voltage build up in a self-excited DC generator? 5

Module -3

- 15 a) A DC series motor is the best choice for electric traction. Justify this statement with relevant equations and characteristics. 5
b) A 4 pole 200V lap connected series motor has 250 slots and 4 conductors per slot. The current is 45A, and the flux per pole is 18 mWb. The field resistance is 0.4Ω and armature resistance is 0.5Ω . The iron and frictional loss is 800W. Find the shaft torque. Also calculate the speed and percentage change in torque if the load is reduced so that motor takes a current of 30A. 9
- 16 With the aid of a neat circuit diagram, explain Hopkinson's test to predetermine the efficiency of the given DC machine. Also mention the merits of the test. 14

Module -4

- 17 a) A 2kVA 110/220 V 50 Hz single phase transformer carries a no-load current of 0.5A at a power factor of 0.3 lagging. If the secondary supplies a current of 9A at a power factor of 0.8 lagging, estimate the primary current. Also draw a vector diagram. 5
- b) A 10kVA 1100/220 V 50 Hz single phase transformer gives the following test results. 9
- | | | |
|---------------|-------|----------------|
| OC test: 220V | 3A | 100W (lv side) |
| SC test: 50V | 9.09A | 180W (hv side) |
- Obtain the following.
- (i) Equivalent circuit referred to high voltage side

(ii) Voltage regulation at full load 0.8 pf leading

- 18 a) What are the conditions to be satisfied for parallel operation of two single phase transformers? 5
- b) Define all-day efficiency and Calculate the all-day efficiency of a 500kVA distribution transformer whose core loss and copper loss at full load are 5kW and 4kW respectively. During a day it is loaded as follows: 9

No. of hours	Load in kW	power factor
6	400	0.8
10	300	0.75
4	100	0.8
4	0	

Module -5

- 19 a) Derive the expression for saving of copper in autotransformer compared to a two-winding transformer. Also mention the advantages of auto-transformer compared to two-winding transformer. 7
- b) Explain the functions of tertiary winding in transformer. 7
- 20 a) A distribution transformer is normally delta-star connected. Why? 4
- b) With the help of connection diagram explain $\Delta - \Delta$ and $Y - Y$ 10

Connection of a three phase transformer. Write the merits and demerits of each connection.
