

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S3 (R) (FT/WP) Examination November 2025 (2024 Scheme)

**Course Code: PCEET303****Course Name: DC MACHINES & TRANSFORMERS**

Max. Marks: 60

Duration: 2 hours 30 minutes

PART A**(Answer all questions. Each question carries 3 marks)****CO Marks**

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|---|---|---|-----|
| 1 | Name the parts of dc machine and state the functions of any two parts. | 1 | (3) |
| 2 | With the aid of a neat diagram, explain the role, and working of compensating winding in DC machines. | 2 | (3) |
| 3 | How does the back-emf makes the DC Motor a self-regulating machine? | 3 | (3) |
| 4 | Explain why the series motors should not be started without any load. | 3 | (3) |
| 5 | Draw the phasor diagram of a practical transformer under no-load condition. Name the no-load components and write its equation. | 4 | (3) |
| 6 | Using suitable equations, show that zero voltage-regulation in a transformer always occurs at leading power factor. | 4 | (3) |
| 7 | What are the necessary and desirable conditions to be satisfied for parallel operation of a three-phase transformer? | 5 | (3) |
| 8 | What are the advantages of star -delta connection? | 5 | (3) |

PART B**(Answer any one full question from each module, each question carries 9 marks)****Module -1**

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|---|---|---|-----|
| 9 | a) What are the effects of armature reaction on the operation of dc machine?
What are the remedial measures taken to counter effects of armature reaction? | 2 | (4) |
| | b) A shunt generator delivers 195A at a terminal voltage of 250V. The armature and shunt field resistance are 0.02Ω and 50Ω respectively. The | 2 | (5) |

iron and frictional losses are equal to 950W. Find (i) Emf generated, (ii) Copper losses, (iii) Output of prime mover, and (iv) Commercial efficiency.

- 10 a) A shunt generator gave the following open circuit characteristics: 2 (6)

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

- The voltage to which the machine will excite when run as a generator at the same speed.
 - The voltage lost due to armature reaction when 100A are passing in the armature at terminal voltage of 175V.
- b) Name the different losses occur in dc machine. How the magnetic losses are minimized in dc machine? 2 (3)

Module -2

- 11 a) During Swinburne's test a 250V DC machine was drawing 3A from the 250V supply. The resistances are 250Ω and 0.2Ω . Find the constant loss of the machine. Also find the efficiency of the machine when it is delivering a 20A at 250V. 3 (6)
- b) Explain any one method of speed control of dc shunt motor for above base-speed operation. 3 (3)
- 12 a) A 250 V shunt motor has resistances 0.2Ω and 250Ω . The motor is driving a constant load torque and running at 1000 rpm drawing 10 A current from the supply. Calculate the new speed and armature current if an external armature resistance of value 10Ω is inserted in the armature circuit. Also find the stalling current. Neglect armature reaction and saturation. 3 (6)
- b) Explain the principle of Hopkinson's test in DC motor. 3 (3)

Module -3



- 13 a) Why transformer is rated in KVA not in KW? 4 (3)
- b) A 20KVA, single phase 50 Hz 2200/200V transformer gave the following test results: 4 (6)
- OC Test: 2200v applied to primary, Power consumed 220W
- SC Test: Power consumed while full-load current is flowing in short circuited secondary is 240W
- Calculate the full load efficiency and half full load efficiency, at 0.8 lagging power factor load.
- 14 a) Draw and explain the circuit diagram, procedure and methodology to conduct OC and SC test on a single-phase transformer, and thereby develop its equivalent circuit. 4 (5)
- b) A 40 kVA transformer has iron loss of 450 W and full-load copper loss of 850 W. If the power factor of the load is 0.8 lagging, calculate (i) Full load efficiency, (ii) The kVA loading at which maximum efficiency occurs, and (iii) The value of maximum efficiency 4 (4)

Module -4

- 15 a) Derive an expression for the saving of copper in an autotransformer as compared to an equivalent two winding transformer. 5 (3)
- b) A distribution transformer has its maximum efficiency of 98% at 15KVA at UPF .During the day ,it is loaded as under: 5 (6)
- 12 Hrs: 2KW at p.f of 0.5 lagging
- 6 Hrs: 12KW at p.f of 0.8 lagging
- 6 Hrs: 18KW at p.f of 0.9 lagging
- Find the all day efficiency
- 16 a) Explain the working of off-load tap changing transformer with help of neat diagram. 5 (3)
- b) With the aid of three phase transformer connections and phasor diagram, explain the vector group Yd11 & Yd1 5 (6)
