



TKRCET
In Character International in Excellence

R22 Regulation

Subject code:4E3BD

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech III Semester Regular/Supplementary Examinations, December 2025 ELECTRICAL MACHINES-I (EEE)

Maximum Marks: 60

Date:22.12.2025

Duration: 3 hours

- Note: 1.This question paper contains two parts A and B.
2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

| All the following questions carry equal marks (10X1M=10 Marks) | | Marks | CO | BTL |
|--|---|-------|----|-----|
| 1.a) | Classify D.C generators. | 1M | 1 | L2 |
| b) | A 220-V d.c. generator has an armature resistance of 0.6 Ω. Find the induced e.m.f if the full-load armature current is 25 A. | 1M | 1 | L4 |
| c) | Define Back EMF. | 1M | 2 | L2 |
| d) | What is the need for starter in a DC motor? | 1M | 2 | L1 |
| e) | Illustrate the purpose of testing D.C machines. | 1M | 3 | L2 |
| f) | Mention the disadvantages of Swinburne's Test? | 1M | 3 | L1 |
| g) | Draw the phasor diagram of transformer on no-load. | 1M | 4 | L2 |
| h) | What happens if D.C supply is given to Transformer? | 1M | 4 | L1 |
| i) | What are the conditions for satisfactory parallel operation of 3-φ transformer? | 1M | 5 | L1 |
| j) | List out the applications of Scott connection . | 1M | 5 | L4 |

Part-B

| Answer All the following questions. (5X10M=50Marks) | | Marks | CO | BTL | | | | | | | | | | | | | | | |
|---|--|-------------------|-----|-----|-----|-----|-----|-----|-----|---------|----|----|-----|-----|-----|-----|-----|----|---|
| 2 | a) Derive e.m.f equation of d.c generator. A dc shunt generator has the following open circuit magnetization curve running at 800 rpm: | 5M | 1 | L4 | | | | | | | | | | | | | | | |
| | <table border="1" style="margin-left: 20px;"> <tr> <td>Field current (A)</td> <td>0</td> <td>0.5</td> <td>1.0</td> <td>2.0</td> <td>3.0</td> <td>4.0</td> <td>5.0</td> </tr> <tr> <td>EMF (V)</td> <td>10</td> <td>50</td> <td>100</td> <td>175</td> <td>220</td> <td>245</td> <td>262</td> </tr> </table> | Field current (A) | 0 | 0.5 | 1.0 | 2.0 | 3.0 | 4.0 | 5.0 | EMF (V) | 10 | 50 | 100 | 175 | 220 | 245 | 262 | 5M | 1 |
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| EMF (V) | 10 | 50 | 100 | 175 | 220 | 245 | 262 | | | | | | | | | | | | |
| | b) Find graphically the critical resistance of shunt field circuit. If the field resistance is changed to 70 ohms, what will be the critical speed for the machine to build up? | | | | | | | | | | | | | | | | | | |
| OR | | | | | | | | | | | | | | | | | | | |
| 3 | Explain the effect of armature reaction in a DC shunt generator. How are its demagnetizing and cross-magnetizing ampere turns calculated? | 10M | 1 | L2 | | | | | | | | | | | | | | | |

| | | | | |
|----|---|-----|---|----|
| 4 | a) Derive the torque equation of a DC Motor. | 5M | 2 | L4 |
| | b) A dc shunt motor takes 1.5A on no-load when connected to 220V mains with an armature resistance of 1.2Ω when the field current is 0.6A. Determine the load current corresponding to maximum efficiency. | 5M | 2 | L5 |
| OR | | | | |
| 5 | What is the necessity of starter in a DC motor? Explain the working principle of 3-point starter with a neat sketch. Also explain about protective measures in the starter. | 10M | 2 | L1 |
| 6 | a) Explain the procedure of conducting Brake test on a d.c motor. | 5M | 3 | L2 |
| | b) A 200 V DC shunt motor with armature and field resistances of 0.2 ohm and 225 ohm respectively, takes a no load current of 7A. If it takes 65 A under loaded conditions, find its efficiency as generator. | 5M | 3 | L5 |
| OR | | | | |
| 7 | What is Hopkinson's test and why is it called regenerative test? Draw and explain the connection diagram to conduct this test. | 10M | 3 | L1 |
| 8 | a) Explain the phasor diagram of single phase transformer under leading power factor conditions with a neat sketch. | 5M | 4 | L2 |
| | b) Explain why hysteresis and eddy current losses occur in a transformer. What are the methods to reduce these losses? | 5M | 4 | L2 |
| OR | | | | |
| 9 | a) Derive the condition for zero regulation in 1- ϕ Transformer. | 5M | 4 | L4 |
| | b) Define all day efficiency? Derive the expression. | 5M | 4 | L1 |
| 10 | The test results of 3 KVA, 230/115 V Single phase transformer is as follows: OC test: 115V, 1.2A, 60W SC test: 12V, 10.86 A, 120W Find a) efficiency at 60% full load 0.8 pf. b) Regulation at 50% full load, 0.85 pf lead and lag. | 10M | 5 | L5 |
| | OR | | | |
| 11 | a) Explain the working of single phase auto transformer with neat diagrams? Derive an expression for saving of copper in it when compared to ordinary two winding transformer? | 5M | 5 | L2 |
| | b) Draw the connection diagrams and explain the features of Y-Y, Y- Δ , Δ -Y and Δ - Δ three-phase connections. | 5M | 5 | L2 |