



R25 Regulation

Subject code: F431PC2

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
(Autonomous, Accredited by NAAC with 'A+' Grade)

M.Tech I Semester Regular Examinations, March 2026

MACHINE MODELLING AND ANALYSIS
(POWER ELECTRONICS)

Maximum Marks: 60

Date:04.03.2026

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 (5X2M=10Marks)		Marks	CO	BTL
1.a	Define the transfer function of a d.c motor.	1M	1	1
b	What is a primitive 2-axis machine?	1M	1	1
c	What is a phase transformation?	1M	2	1
d	What is a linear transformation?	1M	2	1
e	What is a rotor reference frame?	1M	3	1
f	What is the advantage of state space representation in the modelling of machines?	1M	3	1
g	What are the various windings of a synchronous motor?	1M	4	1
h	What happens if a short circuit occurs across the terminals of the synchronous motor?	1M	4	1
i	Give the applications of PMSM motor.	1M	5	1
j	What type of windings are available in Brushless DC motor?	1M	5	1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
2	Obtain the transfer function of a separately excited D.C motor with armature inductance, L_a and load torque T_L .	10M	1	3
OR				
3	Obtain the mathematical model of a d.c. compound motor. Derive its steady state torque expression.	10M	1	3
4	Obtain identical transformations for currents and voltages from a rotating balanced 3-phase (a, b, c) winding to a rotating balanced 2-phase (α , β) winding. Show that power invariance is maintained under this transformation.	10M	2	5
OR				

5	What is transformation? What are the various types of transformations used in the modelling of electrical machines? Explain them in detail.	10M	2	4
6	Obtain the voltage expressions of a 3-phase Induction motor for the stator reference frame.	10M	3	3
OR				
7	Obtain the voltage expressions for a 3-phase Induction motor in state variable form (i) rotor reference frame, (ii) synchronously rotating reference frame.	10M	3	4
8	Obtain flux linkage equations of a 3- phase synchronous motor from the model of the motor. Also, derive the expressions for self and mutual inductances of the motor.	10M	4	5
OR				
9	Give detailed analysis on the performance of 3-phase Synchronous Motor during a three-phase fault (d-q model) across the machine terminals.	10M	4	5
10	Discuss the modelling of permanent magnet synchronous motor.	10M	5	4
OR				
11	Obtain the modelling of Brushless D.C motor.	10M	5	4