SUBJECT CODE: 19MT/PE/ME15

M. Sc. DEGREE EXAMINATION, APRIL 2023
BRANCH I - MATHEMATICS
SECOND SEMESTER

COURSE : ELECTIVE
PAPER   : MECHANICS
TIME   : 3 HOURS   MAX. MARKS : 100

SECTION – A
ANSWER ALL THE QUESTIONS (5 × 2 = 10)

1.   Define degrees of Freedom.
2.   Define Cyclic Coordinates.
3.   State Eulers theorem on the motion of a rigid body.
4.   What is Jacobi's form of the least action principle.
5.   Define generating function.

SECTION – B
ANSWER ANY FIVE QUESTIONS (5 × 6 = 30)

6.   Show that kinetic energy of the system can be written as a sum of three homogeneous functions of generalized velocities.
7.   Establish the conservation theorem for the angular momentum of a particle.
8.   Discuss the Brachistochrone Problem.
9.   Obtain the amount of deflection from the vertical of a freely falling particle due to coriolis force.
10.   Obtain the expression of the total angular momentum about one stationary point in terms of moments of inertia coefficients.
11.   Discuss about the Routh's procedure for non-cyclic coordinates.
12.   Using Canonical transformation to solve the problem of the simple harmonic oscillator in one dimension.

SECTION – C
ANSWER ANY THREE QUESTIONS (3 × 20 = 60)

13.   a) State and prove D'Alembert's principle.
      b) Explain Atwood's machine problem for a conservative system.
14.   a) Derive Lagrange's equation for a holonomic system.
      b) Explain in detail an application of Lagrange's equation with a non- holonomic
         constraint.   (14+6)
15.   Explain the Eigen values of the inertia tensor in detail.
16.   Derive the Canonical equation of Hamilton.
17   a) State and prove Jacobi's identity relating Poissons Brackets.
      b) Derive the conditions for restricted transformations to be canonical.

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