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(FOR THE CANDIDATES ADMITTED DURING THE ACADEMIC YEAR 2021 ONLY)

21PMS208

REG.NO. :

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI
END-OF-SEMESTER EXAMINATIONS : JULY - 2022
M.Sc.-MATHEMATICS **MAXIMUM MARKS: 70**
SEMESTER: II **TIME : 3 HOURS**

MECHANICS

SECTION - A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.
MULTIPLE CHOICE QUESTIONS. (K1)

1. The net virtual work of the constraint is _____.
   a) 0 b) 1 c) 2 d) 3
2. If the Lagrangian of a system does not contain a given coordinate q then the coordinate is said to be _____
   a) acyclic b) cyclic c) constant d) variable
3. The Hamiltonian procedure is adapted to the treatment of problems involving _____ co-ordinates
   a) generalized b) cartesian c) spherical d) cyclic
4. Hamilton – Jacobi equation's solution is usually known as _____.
   a) Jacobi's Principle function b) Hamilton's Principle function
   c) Poisson equation d) Lagrange's function
5. For a Poisson bracket $(u, u) =$ _____
   a) 0 b) 1 c) -1 d) $(-v, u)$

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES. (K2)

6. Define degrees of freedom.
7. What is an Ignorable coordinate?
8. State Hamilton's Principle.
9. Write the Hamilton-Jacobi equation.
10. Define Lagrange's bracket.

SECTION – B (5 X 4 = 20 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.
(Qn. No. 11 to 15)10 questions (a & b) – 2 questions from each unit. (K3)

11. a) Derive D'Alembert's Principle.

(OR)

b) A Particle of mass m is suspended by a massless wire of length $r = a + b\cos\omega t \quad (a > b > 0)$ to form a spherical pendulum. Find the equations of motion.

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12. a) Find the differential equations of motion for a spherical pendulum of length l.

(OR)

b) Derive the energy integral.

13.a) Derive the Euler's Lagrange's equation.

(OR)

b) Find the curve joining two points along which a particle falling from rest under the influence of gravity travels from higher to the lower point in a minimum time.

14.a) Derive the modified Hamilton-Jacobi equation.

(OR)

b) State and prove Jacobi's Theorem.

15.a) Show that the transformation $Q = \sqrt{2q}\ e^{\alpha} cos\ p, \quad P = \sqrt{2q}\ e^{-\alpha} sin\ p$ is canonical.

(OR)

b) State and prove Poisson's Theorem.

SECTION - C **(4 X 10 = 40 MARKS)**

ANSWER ANY FOUR OUT OF SIX QUESTIONS
(16th QUESTION IS COMPULSORY AND ANSWER ANY THREE QUESTIONS (FROM Qn. No : 17 to 21) **(K4 (Or) K5)**

16. Derive the Lagrange's equation for holonomic system.

17. State and prove Principle of Virtual Work.

18. Discuss Routh's procedure.

19. Obtain the Hamilton's canonical equations of motion.

20. Obtain the solution of the Hamilton principle function.

21. Show that the transformation $Q = \log \frac{sinp}{q}, \quad P = qcot\ p$ the four types of is canonical and obtain generating functions associated with this transformation.

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