



Shree H.N. Shukla Group of Colleges

M.Sc. Mathematics

Sub. Code: EMT-1011

Elec. Sub. 1 : Classical Mechanics 02

Question Bank

Q-1 : Short Questions :

- 1) Define moment of inertia and product of inertia.
- 2) Write value of ω'_x , ω'_y and ω'_z .
- 3) Write Maxwell's equations about electromagnetic propagate at a velocity $C = \frac{km}{sec}$.
- 4) Discuss about postulate of special theory of Relativity.
- 5) If we write $u'_1 = u'$, $u'_2 = 0$, $u'_3 = 0$ then $u_x = \underline{\hspace{2cm}}$?
- 6) Write Euler's equations of motion for rigid body with one point fixed.
- 7) $E = mc^2$ equations shows an equivalence ?
- 8) Define up-front premium and speculative price.
- 9) State only the Galilean transformation equations when the reference frame s' in moving in the direction of positive X- axis.
- 10) State the Lorentz transformation equations when the reference frame s' is moving in the direction of positive x-axis.
- 11) State the postulate of special theory of relativity.
- 12) State the transformation equations when the generating function is of type $F_2(q, P, t)$.
- 13) state only the Euler's equation of motion for a rigid body with one point fixed.
- 14) State only the Hamilton-Jacobi equation.
- 15) Which equations are satisfied by cyclic coordinates in Routh's Procedure?



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16) Which equations are satisfied by non cyclic coordinates in Routh's Procedure?

17) Define Poisson bracket of two functions u and v .

Q-2 : Write short notes on given following questions :

1) Obtain the expression for angular momentum for discrete rigid body and continuous rigid body.

2) Discuss in detail the motion of a heavy symmetrical top and above analytic solution for the same.

3) Derive Gallilian transformation equations.

4) Prove that $m = \frac{m_0}{\sqrt{1-\frac{u^2}{c^2}}}$; where u is the velocity of the body when it's mass is m and m_0 is the

mass of the body when it is at rest.

5) The length of a rocketship is 100mt. on ground. When it is flight its length is observed from the ground is 99 mt. calculate its speed.

6) Express the component of angular velocity ω of rigid body along the space set of axes in terms Of Euler angles.

7) Show that the angular velocity is same in both the coordinate system.

8) Derive Galilean transformation equations.



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- 10) Derive Euler's equations of motion for rigid body with one point fixed.
- 11) Express the components of angular velocity ω of a rigid body along the space of axes in terms of Euler angles.
- 12) Explain in detail the phenomenon of time dilation.
- 13) State and prove Jacobi's identity for the Poisson bracket of two functions.
- 14) Derive Hamilton's canonical equations.
- 15) Discuss in detail the phenomenon of length contraction.
- 16) A rod has proper length 1000cm is in a satellite which is moving with velocity $0.6c$.
What will be the difference of lengths measure by an observer situated in the
Laboratory (a) Laboratory (b) Satellite.
- 17) State all the four types of generating functions and derive the transformation equation
if the generating function in $F_1(q, Q, t)$.
- 18) Show that the transformations $Q = \log\left(\frac{1}{q} \sin p\right)$, $p = qcot p$ are canonical and find the
suitable generating function.
- 19) Prove in the usual notation the relation $E = mc^2$.
- 20) Find the analytic solution of a torque free motion.



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- 21) Discuss in detail the Routh's procedure.
- 22) Obtain Hamilton's principal function for the problem of the one dimensional simple harmonic oscillator.
- 23) Establish the relation $m = \frac{m_0}{\sqrt{1-\frac{u^2}{v^2}}}$, where notations are standard.