

B.Sc. (NEP) Semester-I
BSCPH501 - Core - Physics - Mechanics

P. Pages : 2

Time : Three Hours



GUG/S/25/15916

Max. Marks : 40

- Notes :
1. All questions are compulsory.
 2. Draw neat diagram wherever necessary.
 3. Scientific calculator is allowed in exam.

Either:

1. A) i) Obtain a relation between elastic coefficients of γ , η and σ . 3
- ii) Draw stress-strain diagram and explain the terms. 4
- i) Elastic limit ii) Yield point iii) Elastic fatigue.
- iii) State Hooke's law. 1

OR

- B) a) Obtain an expression for work-done in twisting a wire. 2
- b) Obtain an expression of rigidity using torsional pendulum. 2
- c) Derive an expression for work done in stretching a wire under the load. 2
- d) How much the force required to stretch a steel wire 1cm^2 in cross-section to double the length? $\left[\text{Given } \gamma = 2 \times 10^{11} \text{ N/m}^2 \right]$ 2

Either:

2. A) i) Discuss the phenomenon of perfectly elastic collision in one dimension. Derive an equation for final velocity after elastic collision. 6
- ii) Consider two bodies of masses 10 kg and 8 kg. Their respective velocities are 5m/s and 6m/s. Find final velocities after elastic collision. 2

OR

- B) a) Distinguish between free and damped oscillations. 2
- b) Derive differential equation of damped oscillations. 2
- c) Show total energy is constant in S.H.M. 2
- d) Derive an expression for power dissipation due to damping. 2

Either:

3. A) i) Define moment of inertia. State its physical significance. 3
- ii) Prove that torque is the time rate of change of angular momentum. 3
- iii) Find the moment of inertia of disc of mass 3kg and radius 50cm about an axis passing through the centre and perpendicular to plane of the disc. 2

OR

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|----|----|---|---|
| B) | a) | State Newton's law of Gravitation. Give the SI unit and dimension of gravitational constant. | 2 |
| | b) | Derive an expression for gravitational potential due to spherical shell at a point outside the shell. | 2 |
| | c) | Show that angular, momentum is conserved in central force field. | 2 |
| | d) | Derive an expression for gravitational self-energy of the body. | 2 |

Either:

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|----|----|-----|--|---|
| 4. | A) | i) | State Newtonian principle of relativity. Derive an expression for Galilean transformation. | 6 |
| | | ii) | Differentiate between inertial and non-inertial frame of reference. | 2 |

OR

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|----|----|--|---|
| B) | a) | State and explain postulates of special theory of relativity. | 2 |
| | b) | State physical significance of mass energy equivalence. | 2 |
| | c) | Derive an equation for time dilation using Lorentz transformation. | 2 |
| | d) | Find out relativistic time, if T_0 is 7 year and velocity of the object is $0.55C$. | 2 |

5. Attempt **any eight** from the following questions.

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|----|--|---|
| a) | Define a Poisson's ratio. | 1 |
| b) | What is strain? | 1 |
| c) | What is bulk modulus? | 1 |
| d) | Define simple harmonic motion. | 1 |
| e) | What is inelastic collision? | 1 |
| f) | What is damping coefficient? | 1 |
| g) | Write SI and CGS unit of moment of inertia. | 1 |
| h) | What is gravitational field? | 1 |
| i) | Define gravitational potential. | 1 |
| j) | What is length contraction? | 1 |
| k) | Gives any two drawbacks of special theory of relativity. | 1 |
| l) | Give examples of inertial frame of reference. | 1 |
