

9-12-16



DOON UNIVERSITY, DEHRADUN
End Semester Examination, First Semester, 2016
Department of Physics, School of Physical Sciences
Integrated M.Sc. 5 Year Programme
Course: PHG-101: Mechanics Generic Elective

Time Allowed: 3 Hours

Maximum Marks: 60

Instructions:

- 1) All questions are compulsory. Read the questions carefully and attempt each part.
- 2) Number the questions and their sub parts properly.
- 3) Write proper units wherever applicable.

SECTION: A

Marks: 4 x 3 = 12

- 1) What is the difference between the two types of Elastic Modulus: Y and n ?
- 2) Write the expression for the principle of superposition.
- 3) Name and write the statement for the second law given by Kepler.
- 4) What quantity is obtained by the using the expression: $\frac{1}{2} \times \text{stress} \times \text{strain}$? What are the units of this quantity?

SECTION: B

Marks: 4 x 6 = 24

- 5) What is escape velocity? Derive the expression for escape velocity on earth.
- 6) Given a vector $\vec{A} = 4\hat{i} - 2\hat{j} + 3\hat{k}$. Write a vector \vec{B} that is:-
 - a) Parallel to \vec{A}
 - b) Anti-parallel to \vec{A}
 - c) Perpendicular to \vec{A}
- 7) Draw the stress-strain curve for a wire and clearly label the following items on the curve:
 - a. Hooke's law region
 - b. Elastic limit
 - c. Permanent set
 - d. Yield point
- 8) Write the statement for the law of conservation of energy. Derive the work-energy theorem.

SECTION: C

Marks: 3 x 8 = 24

- 9) Two satellites are moving in circular orbits of radius $R_1 = 4$ km and $R_2 = 64$ km around Jupiter. The time period of revolution for satellite 1 is $T_1 = 0.125$ hours. Find the time taken by the satellite 2 to go once around Jupiter. Give the answer in proper units.
- 10) Two vectors $\vec{P} = a\hat{i} + b\hat{j}$ and $\vec{Q} = c\hat{i} + d\hat{j}$ form the two adjacent sides of a square. Find the suitable relations between a, b, c and d that satisfy this condition.
- 11) Rank the net gravitational force on the particle m in increasing order: All the given particles have the same mass $m = 2$ kg and the distances shown are $d = 10$ m and $D = 50$ m. (Write the answers with proper units)

