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Total No. of Pages : 02

Total No. of Questions : 18

B.Tech (Civil Engg.) (2018 & Onwards) (Sem.–1,2)

MECHANICS OF SOLIDS

Subject Code : BTPH-101-18

M.Code : 75351

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C. have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

Write briefly :

1. What are the properties of equipotential surfaces?
2. Differentiate between rotational and irrotational force field.
3. Define Centripetal and Coriolis accelerations.
4. Discuss the energy decay in a damped harmonic oscillator.
5. Write the differential equations of motion for a particle executing simple, damped and forced oscillations.
6. State the parallel-axis and perpendicular axis theorems of moment of inertia.
7. Define a Rigid Body.
8. Justify the statement, "*friction is a necessary evil*".
9. Give some methods to increase and decrease friction.
10. State the generalized Hooke's law. How it is different to special form of Hooke's law?

SECTION-B

11. a) Define the potential energy function (F) and show that $F = \text{Grad } V$. 4
b) Make a summary of different forces in nature. 4
12. Using Newton's laws of motion, deduce the conservation theorems of angular momentum and energy for the motion of a system of particles. 4,4
13. Discuss the methods (logarithmic decrement, relaxation time and quality factor) for quantitative measurement of damping effect in a damped simple harmonic oscillator. 3,3,2
14. What are forced oscillations? Establish a differential equation of motion for a forced harmonic oscillator and obtain an expression of displacement. Discuss the cases of forced oscillations. 1,5,2

SECTION-C

15. a) Derive the expression for angular momentum about a point of a rigid body in planar motion. 4
b) Define : Centre of mass and moment of inertia. 4
16. a) State perpendicular axis theorem of inertia and prove it. 5
b) Derive the expression for the moment of inertia of a circular ring about its centre. 3
17. a) Discuss different types of friction. Why rolling friction is less than kinetic friction? 4
b) State all laws of static and limiting friction. 4
18. a) Define stress and strain and their different types. 5
b) Explain Generalized Hooke's law. 3

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.