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Total No. of Pages : 02

Total No. of Questions : 18

B.Tech (Civil Engg.) (2018 & Onwards)/(CSE)/(EE)/(ME) (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 is physical significance of gradient of scalar field?
2. What do you mean by the conservative and non-conservative force?
3. Define Central Force. Is central force always conservative?
4. Give necessary and sufficient conditions for a motion to be simple harmonic.
5. What is resonance? Give two examples.
6. Does the position vector of the centre of mass depend upon the choice of origin of coordinates? Explain.
7. If two points in rigid body are fixed in space, then how many co-ordinates are required to specify the configuration of rigid body?
8. Define moment of inertia. What is its physical significance?
9. What is force of friction and on which factors it will depend?
10. Briefly explain the concept of stress and strain at a point.

SECTION-B

11. (a) Discuss the different types of forces in nature? Give accounts of their relative strength.
(b) State and explain the law of conservation of angular momentum. Illustrate with examples.

12. (a) Discuss the effect of Coriolis force on the free vertical fall of a body on the earth.
(b) What do you understand by inertial and non-inertial frames of reference? Give examples.
13. (a) What are plane polar coordinates? Show that plane polar coordinate system is orthogonal.
(b) Define Amplitude and period of SHM. A particles executes SHM, show that its total energy remains constant.
14. Write down the differential equation of damped oscillations and find its solution. Explain the special cases of damping force is less than, equal to, or greater than the restoring force.

SECTION-C

15. (a) Define the rigid body and prove that total internal torque on a system of interacting particles is zero.
(b) A solid cylinder of mass M rolls without slipping down a plane of length L inclined at angle θ . What is the velocity of centre of mass of the cylinder at the bottom of the plane?
16. (a) State and prove perpendicular axis theorem for a lamina by treating it as continuous rigid body.
(b) Find the moment of inertia of a uniform ring about an axis perpendicular to its plane and passing through the centre of ring.
17. (a) A block slides down an inclined surface of inclination 30° with the horizontal. Starting from rest it covers 8 m in the first two seconds. Find the coefficient of kinetic friction between the two.
(b) When two surfaces are polished, the friction coefficient between them decreases. Explain.
18. (a) Compare the strain energy of three bars of equal length and having cross sectional area in the ratio 1:2:4 are all subjected to equal load.
(b) Define shear θ . Show that shear strain is equivalent to an extension strain plus a compression strain at right angles to each other, each of value $\theta/2$.

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.