

MAHARASHTRA ANIMAL AND FISHERY SCIENCES UNIVERSITY, NAGPUR
SEMESTER END THEORY EXAMINATION, B.Tech. (D.T.)

Semester	: VI (V Dean)	Academic Year	: 2021-2022
Course No.	: DE-613	Course Title	: Material Strength and Dairy Machine Design
Credits	: 2+1=3	Total Marks	: 50
Day & Date	: Tuesday, 17/05/2022	Time	: 02:30 hrs.

- Note :** 1) All questions from **Section 'A'** are compulsory.
2) Solve **Any Three** questions from **Section 'B'**.
3) Draw neat and well labelled diagram wherever necessary.

SECTION – 'A'

Q. 1 A) Choose the most appropriate answer from the options given below: (05)

- i) The ability of a material to resist deformation under stress is known as
 - a) Stiffness
 - b) Strength
 - c) Toughness
 - d) Resilience
- ii) The property of a material which refers to a relative ease with which a material can be cut is referred as
 - a) Strength
 - b) Machinability
 - c) Resilience
 - d) Brittleness
- iii) It is the property of a material enabling it to be drawn into wire with the application of a tensile force is known as
 - a) Creep
 - b) Plasticity
 - c) Ductility
 - d) Malleability
- iv) Failure of a material is at stresses below the yield point stress when subjected to repeated stresses is called as
 - a) Brittleness
 - b) Elasticity
 - c) Creep
 - d) Fatigue
- v) The property of a material which retains the deformation produced under load permanently is referred as
 - a) Strength
 - b) Hardness
 - c) Elasticity
 - d) Plasticity

B) Obtain the magnitude and direction of the resultant force, when two forces of equal magnitude 1 N are acting at a point such that the angle between them is: (05)

- i) 0°
- ii) $\frac{\pi}{2}^\circ$
- iii) π°
- iv) $\frac{3\pi}{4}^\circ$
- v) $\frac{2\pi}{3}^\circ$

Q. 2 A) State the Moment of Inertia about centre of gravity of following plane figures. (05)

- i) Rectangle of width 'b' and depth 'd'
- ii) Hollow rectangle of outer and inner widths 'b' and 'b₁' and depths 'd' and 'd₁'
- iii) Circle of diameter 'd'
- iv) Hollow circle of outer and inner diameters 'd' and 'd₁'
- v) Triangle of base 'b' and height 'h'

P.T.O.

- B) Give the formulae for the following. (05)
- i) Modulus of Elasticity
 - ii) Poisson's ratio
 - iii) Relation between Modulus of Elasticity and Shear Modulus
 - iv) Factor of safety
 - v) Ultimate stress

SECTION - 'B'

- Q. 3 A) State the Torsion equation. Explain its importance in the design of shaft. (05)
B) A solid shaft is transmitting 150 kW at 240 rpm. The maximum allowable shear stress is 60 MPa. The shaft is not to twist more than 1° in a length of 3 m. Determine the diameter of the shaft, if the modulus of rigidity is 80 GPa. (05)
- Q. 4 A) Explain shear force and bending moment in the context of beams. Enumerate the various types of beams and types of loading with suitable sketches. (05)
B) A cantilever beam 4 m long, fixed at the left end, is loaded with a point load of 4 kN at a distance of 1 m from the free end and a uniformly distributed load of 2 kN/m over a length of 3 m from the fixed end. Draw the shear force and bending moment diagrams for the beam. (05)
- Q. 5 A) Write a note on 'Bearings and their types'. (03)
B) Write a note on 'Springs'. Describe how the potential energy is stored in springs. (03)
C) An electric light fixture weighing 25 N hangs from a point M, by two strings KM and LM, such that the string KM is inclined at 60° to the horizontal and LM at 45° to the horizontal. Using Lami's theorem, determine the forces in the strings KM and LM. (04)
- Q. 6 A) Define: Friction. State the types of friction. What is meant by Limiting friction. (03)
B) A body of weight 300 N is lying on a rough horizontal plane having a coefficient of friction as 0.3. Find the magnitude of the force, which can move the body, while acting at an angle of 25° with the horizontal. (03)
C) The piston rod of a steam engine is 50 mm in diameter and 600 mm long. The diameter of the piston is 400 mm and the maximum steam pressure is 0.9 N/mm^2 . Find the compression of the piston rod if the Young's modulus for the material of the piston rod is 210 kN/mm^2 . (04)
- Q. 7 Explain the terms: Load, Stress and Strain, in the context of design of machine parts. (10)
Describe the stress-strain diagram with associated terminology for a standard tensile test.
