

Laxminarayan Institute of Technology, Nagpur
Rashtrasant Tukadoji Maharaj Nagpur University
Second Semester B.Tech. Chemical Technology (CBCS)
Question Bank of Engineering & Solid Mechanics

Unit 1

1. If a number of forces are acting at a point, their resultant will be inclined at an angle θ with the horizontal, such that:

- A) $\tan \theta = \frac{\sum V}{\sum H}$
- B) $\tan \theta = \frac{\sum H}{\sum V}$
- C) $\tan \theta = \frac{\sum V}{\sum H}$
- D) $\tan \theta = \frac{\sum V + \sum H}{\sum H}$

2. Varignon's theorem is used to find:

- A) Magnitude of resultant force
- B) Direction of resultant force
- c) Position of resultant force
- D) None of these

3. A 50 N force is acting 55 degrees east of south and a force P is acting 45 degrees west of north. Find the value of P in equilibrium.

- A) 57.92 N
- B) 40.55 N
- C) 75.56 N
- D) 65.32 N

4. Two forces are collinear and acts in opposite direction. If force A is greater than force B, then their resultant is given by

- A) A+B
- B) A-B
- C) B-A
- D) A/B

5. The following three forces acts in a system of forces; 40 N towards north, 60 N at 30 degrees east of south and 45 N at 75 degrees west of south. Find the magnitude of resultant force.

- A) 17.781 N
- B) 27.178 N
- C) 21.346 N
- D) 34.628 N

6. Two forces acting at a point are said to be in equilibrium, if they have same magnitude and

- A) same direction and collinear line of action
- B) opposite direction and collinear line of action
- C) perpendicular line of action
- D) None of these

7. Bow's Notation is used for:

- A) Showing direction of forces
- B) Assigning names to the forces
- C) Giving angles to the forces
- D) All of these

8. Two non-collinear parallel equal forces acting in opposite directions.

- A) Balance each other
- B) Constitute a moment
- C) Constitute a couple
- D) Constitute a force moment

9. Which is the correct statement about the law of polygon of forces?

- A) If any number of forces acting at a point can be represented by the sides of a polygon taken in order, then the forces are in equilibrium
- B) If any number of forces acting at a point can be represented in direction and magnitude by the sides of a polygon, then the forces are in equilibrium
- C) If a polygon representing forces acting at a point is closed then forces are in equilibrium
- D) If any number of forces acting at a point can be represented in direction and magnitude by the sides of a polygon taken in order, then the forces are in equilibrium

10. The resultant of two concurrent forces is found by applying

- A) Parallelogram Law
- B) Lami's Theorem
- C) Varignon's Theorem
- D) Newton's Second law of motion

Unit 2

1. A simply supported AB beam of length 4 m is subjected to a uniformly distributed load of 10 kN/m over entire span. The support reactions at ends A and B are?

- A) 20 kN, 40 kN
- B) 20 kN, 20 kN
- C) 40 kN, 20 kN
- D) 60 kN, - 30 kN

2. A perfect frame should satisfy the condition (where, n =no. of members in the frame, j = no. of joints in a frame):

- A) $n=2j-3$
- B) $n=3j-2$
- C) $n=2j+3$
- D) $n=3j+2$

3. Which of this statement is incorrect in the analysis of truss?

- A) All loadings (external forces) on the truss are acting only at joints
- B) The weight of the members is considered
- C) All members are straight and of uniform cross section
- D) The members are connected as their ends by frictionless pins

4. A redundant frame is also called _____ frame.

- A) perfect
- B) imperfect
- C) deficient
- D) efficient

5. The maximum value of frictional force at which a body just begins to slide over the surface of another body, is known

- A) sliding friction
- B) rolling friction
- C) limiting friction
- D) None

6. A body with 200 KN weight is resting on a rough horizontal plane. A horizontal force of 50 KN is applied on the body, the coefficient of friction calculated is:

- A) 0.15
- B) 0.25
- C) 0.30
- D) 0.35

7. A block of mass 50 kg is placed on a horizontal plane. When a horizontal force of 18 kg is applied, the block is just on the point of motion. The angle of friction is

- A) $17^{\circ} 48'$
- B) $18^{\circ} 48'$
- C) $19^{\circ} 48'$
- D) $20^{\circ} 48'$

8. The force of friction is independent of the:

- A) Angle of friction
- B) Resultant
- C) area of contact between the two surfaces
- D) coefficient of friction

9. Dynamic friction is always

- A) equal to Static friction
- B) greater than Static friction
- C) less than Static friction
- D) None

10. The angle of friction _____ angle of repose:

- A) greater than
- B) lesser than
- C) equal to
- D) None

Unit 3

1. ($P = mW + C$) in a machine is called as:

- A) Input of machine
- B) output of machine
- C) Law of machine
- D) friction in machine

2. A simple lifting machine lifts a weight of 2400 N by an effort of 150 N with V.R. of 24. State whether machine is:

- A) Reversible
- B) Irreversible

3. Difference between input and output of the machine is known as:

- A) Efficiency
- B) Machine friction
- C) Velocity ratio
- D) Law of machine

4. In a lifting machine an effort of 100 N raised a load of 9000 N. If efficiency is 50 %, Velocity ratio is

- A) 100
- B) 150
- C) 140
- D) 180

5. In an actual machine the mechanical advantage is always _____ velocity ratio.
- Less than
 - Greater than
 - Equal to
 - None
6. A triangle has a height of 100 mm with 40 mm base. The ratio of moment of inertia about the centroidal horizontal axis to moment of inertia about base is:
- 1/4
 - 2/3
 - 1/3
 - 4/3
7. Area moment of inertia is also mathematically called the _____ moment of area.
- Principal
 - Second
 - Parallel
 - Perpendicular
8. Moment of inertia of a triangular section of base (b) and height [heart] about an axis passing through its C.G. and parallel to the base, is
- $bh^3/4$
 - $bh^3/8$
 - $bh^3/12$
 - $bh^3/36$
9. The point at which the entire area of the body is assumed to be concentrated is called as:
- Centre of mass
 - Centre of gravity
 - Centroid
 - None
10. An ideal machine will have
- No frictional losses
 - Work output = Work input
 - M.A. = V.R.
 - All of these

Unit 4

1. Bulk modulus is the ratio of:
- shear stress to shear strain
 - strain to stress
 - stress to strain
 - direct stress to volumetric strain
2. Relationship between E & K is:
- $E=2K (1+2/m)$
 - $E=3K (1-2/m)$
 - $E=3K (1-1/m)$
 - $E=2K (1 + 2/m)$
3. Poisson's ratio is the ratio of:
- lateral strain to longitudinal strain
 - longitudinal strain to lateral strain
 - shear stress to shear strain

D. stress to volumetric strain

4. In composite sections connected rigidly and subjected to axial loads:

- A. load is not shared and strains are different
- B. strains are different and total load is shared
- C. strains are same and total load is shared

5. A mild steel test piece subjected to a tensile test, it is found that at yield zone there is:

- A. increase in stress
- B. drop in strain
- C. drop in stress
- D. None of these

6. A sagging bending moment is the

- A. positive moment
- B. negative moment
- C. clockwise moment
- D. counter moment

7. A rectangular cross section beam having moment of inertia $3.8125 \times 10^6 \text{ mm}^4$ and bending moment 30 KN-m. The modulus of elasticity of material is $2 \times 10^5 \text{ N/mm}^2$. The radius of curvature developed is:

- A. 25.416 m
- B. 26.128 m
- C. 28.521 m
- D. 21.518 m

8. If the deflection value is negative, then the deflection is:

- A. towards right
- B. upward
- C. downward
- D. towards left

9. The term 'EI' stands for:

- A. flexural rigidity
- B. shear rigidity
- C. modular rigidity
- D. torsional rigidity

10. If the bracketed term in Macaulay's method is negative, then:

- A. it is kept negative
- B. it is taken zero
- C. it is taken positive
- D. its square value is taken

Unit 5

1. A circular shaft is said to be in pure torsion, when it is subjected to:

- A. equal end couples coinciding with the axis of the shaft.
- B. opposite end couples coinciding with the axis of the shaft.
- C. equal and opposite end couples whose axis coincide with the axis of the shaft.
- D. none of these.

2. A solid shaft 125 mm in diameter rotates at 160 rpm with a torque of 3500 N-m. The power transmitted by the shaft in KW is:

- A. 58.64
- B. 64.85

- C. 46.58
- D. 85.46

3. For the same power transmission conditions between solid and hollow shafts:

- A. $Z_p(\text{solid}) > Z_p(\text{hollow})$
- B. $Z_p(\text{solid}) = Z_p(\text{hollow})$
- C. $Z_p(\text{solid}) < Z_p(\text{hollow})$

4. Polar moment of inertia (I_p) of circular shaft section is:

- A. $I_{xx} - I_{yy}$
- B. $I_{yy} - I_{xx}$
- C. $I_{xx} + I_{yy}$

5. Factor of safety is the ratio of:

- A. safe load to critical load
- B. ultimate load to critical load
- C. critical load to safe load
- D. critical load to ultimate load

6. The validity of Rankine's formula for critical load is for:

- A. both long & short columns
- B. only long columns
- C. only short columns

7. Slenderness ratio is the ratio of:

- A. actual length to minimum radius of gyration
- B. minimum radius of gyration to the effective length
- C. effective length to minimum radius of gyration
- D. minimum radius of gyration to the actual length

8. Torsional rigidity is given by: (where, f_s = shear stress, E = Young's Modulus, I = Moment of inertia, Z_p = polar modulus, I_p = polar moment of inertia, C = Modulus of rigidity)

- A. $C I_p$
- B. $f_s Z_p$
- C. $E I$
- D. $E I_p$

9. A cylindrical cast iron column 200 mm diameter is 6 metres in length. If both ends of the column are hinged and $E = 8 \times 10^4 \text{ N/mm}^2$, the Euler's critical load (in KN) is:

- A. 1272.75
- B. 1722.57
- C. 1517.27
- D. 1472.32

10. A solid shaft of same cross-section area as compared to a hollow shaft transmit:

- A. less torque
- B. more torque
- C. same torque
- D. cannot predict