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**3rd Sem / Mechanical / Automobile / Mecatronics  
Prod, T&D, Plastic, GE, CNC, CAD/CAM,  
Found& Forg, Metallurgy, print, Making Tech,  
mech(Ad.Manu.Tech),Mech Engg (Fabrication  
Tech); Rubber Tech, poly tech, AME,  
Mech. Engg. (prod.)**

**Subject:- Strength of Materials/ Basic Mech. Engg.**

Time : 3Hrs.    M.M. : 100

**SECTION-A**

**Note:** Multiple choice questions. All questions are compulsory (10x1=10)

- Q.1 Unit of Strain Energy-  
a) N-m                                      b) N/m  
c) N-m<sup>2</sup>                                      d) N/m<sup>2</sup>
- Q.2 Beam whose one end is fixed and another end is free is called-  
a) Simply Supported    b) Cantilever  
c) Fixed                                      d) Overhanging
- Q.3 U.V.L. stands for-  
a) Uniformly varying load  
b) Uniaxial varying load  
c) uniformly vertical load  
d) Uniaxial vertical load
- Q.4 The rate of change of bending moment is equal to-  
a) Shear force                                      b) Slope  
c) Deflection                                      d) None of the above

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- Q.5 Unit of section modulus is-  
a) m    b) m<sup>3</sup>  
c) m<sup>2</sup>    d) m<sup>4</sup>
- Q.6 Rankine's formula holds good for-  
a) short columns                      b) long columns  
c) medium columns                      d) both a and b
- Q.7 For a column with both ends hinged, the relation between Effective length(L) and Actual length(l) is-  
a) L=l    b) L=l/2  
c) L=l/√2    d) L=2/l
- Q.8 proof resilience per unit \_\_\_\_\_ is Known as Modulus of Resilience.  
a) Weight    b) Area  
c) volume    d) Density
- Q.9 Unit of Radius of Gyration is-  
a) m<sup>3</sup>    b) m<sup>4</sup>  
c) m    d) m<sup>2</sup>
- Q.10 The S.I. unit of Torque is N-m.  
a) True    b) False

**SECTION-B**

**Note:** Objective type questions. All questions are compulsory. (10x1=10)

- Q.11 Define Factor of Safety.  
Q.12 Define Compressive strain.  
Q.13 Explain Bulk modulus of elasticity.  
Q.14 What is Solid length of spring.  
Q.15 What is fixed beam.  
Q.16 Explain Neutral axis of beam.  
Q.17 Define column.

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- Q.18 Define Slenderness ratio.  
 Q.19 Write torsion equation.  
 Q.20 Define Toughness.

### SECTION-C

**Note:** Short answer type questions. Attempt any twelve questions out of fifteen questions. (12x5=60)

- Q.21 A rod 20cm in diameter, 2m long is subjected to an axial pull of 30KN. If modulus of elasticity (E) of rod material is 210 GPa. Calculate:  
 i) stress ii) strain
- Q.22 Define thermal stress and strain.
- Q.23 Derive an expression for the strain energy induced in a body due to suddenly applied load.
- Q.24 Explain Moment of Inertia and Second Moment of Area.
- Q.25 Draw the SFD and BMD diagrams for a simply supported beam carrying a point load at the midspan.
- Q.26 Name various types of ends supports for beams and explain any two with diagrams.
- Q.27 Explain Euler's formula to calculate Buckling load.
- Q.28 Explain-  
 a) Moment of Resistance  
 b) Section Modulus
- Q.29 Classify columns on the basis of slenderness ratio.
- Q.30 A column with both ends fixed is 2m long with cross section 10mm x 10mm. Calculate the load at which it will buckle. Take E for the material of column=80GPa.
- Q.31 Write any five assumptions in the theory of pure torsion.
- Q.32 Draw the stress- strain diagram for Ductile material.

- Q.33 Define springs. Also explain different type of springs.
- Q.34 A spring is having 100 coils, 64mm mean diameter and the wire diameter is 6.4mm. The modulus of rigidity of spring material is 80GPa. Calculate the deflection in spring (in mm ) under the load of 700N.

- Q.35 Explain the Theorem of Perpendicular Axis.

### SECTION-D

**Note:** Long answer type questions. Attempt any two questions out of three questions. (2x10=20)

- Q.36 Explain the following terms-  
 a) Hooke's law  
 b) Poisson's ratio  
 c) Hardness  
 d) Creep
- Q.37 A cantilever beam of length 4m carries a uniformly distributed load of 2kN/m which runs over a length of 2m from the free end. In addition to this there is a point load of 1kN at a distance of 2m from the free end. Draw SFD and BMD.
- Q.38 A steel bar of 30mm diameter and 3m long is rigidly fixed between the two walls. The temperature of the bar is raised by 30°C. If the coefficient of thermal expansion of steel is  $13.5 \times 10^{-6}/^{\circ}\text{C}$ . Determine-  
 i) Stress developed in the bar  
 ii) Force exerted by the wall on the bar.  
 iii) Nature of the force exerted.

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