3rd Sem. / Auto Mech., Mecatronic, Prod, T & D Plastic, GE, CNC, CAD/CAM, Found & Forg, Metallurgy, Print Making Tech, Mech (Ad. Manu. Tech.,) Mech Engg (Fabrication Tech), Rubber Tech, Polymer Tech, AME, Mech. Engg (Prod.)

Subject : Strength of Materials/ Basic Mech. Engg.

Time : 3 Hrs.   M.M. : 100

SECTION-A

Note: Multiple choice Questions. All questions are compulsory

(10x1=10)

Q.1   Unit of Bending Stress-
a)   N.M   b)   N/m
c) $N.M^2$ d) N/m^2

Q.2   At neutral axis, the bending stress is-
a)   Maximum   b)   Minimum
c)   Zero   d)   None of the above

Q.3   U.D.I Stands for-
a)   Uniformly diluted load
b)   Uniformly developed load
c)   Uniformly distributed load
d)   Uniaxial distributed load

Q.4   For simply supported beam bending moment will be maximum at-
a)   Center
b)   1/3rd from fixed ends
c)   Fixed ends
d)   None of the above

Q.5   Unit of moment of inertia is-
a)   m   b) m^3
c) m^2 d) m^4

Q.6   For a column with both ends fixed the relation between Effective length (L) and Actual length (*l*) is-
a) $L=l$ b) $L=l/2$
c) $L=l/\sqrt{2}$ d) $L=2l$

Q.7   Proof resilience is the _____ energy stored in a body upto_____.
a)   Minimum, elastic limit
b)   Maximum, elastic limit
c)   Minimum, yield limit
d)   Maximum, yield limit

Q.8   The shafts are designed on the basis of -
a)   Rigidity   b)   Strength
c)   Both A and B   d)   None of the above

Q.9   The S.I. unit of Torque is N/m.
a)   True   b)   False

Q.10 IN springs, load per unit deflection is defined as-
a)   Stiffness   b)   Spring Index
c)   Solid Length   d)   Free Length

SECTION-B

Note: Objective type questions. All questions are compulsory.

(10x1=10)

Q.11 Define Elastic Point.
Q.12 What is Shear Strain.
Q.13 Define Factor of Safety.
Q.14 What is spring index.
Q.15 What is Continuous beam.
Q.16 Explain Torsional rigidity of a shaft.
Q.17 Define strut.

Q.18 What is Equivalent length of column.
Q.19 Write Bending equation.
Q.20 Define Malleability.

SECTION-C

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

Q.21 A rod 40cm in diameter, 4m long is subjected to an axial pull of 60kN. If modulus of elasticity (E) of rod material is 200 GPa Calculate - (i) stress (ii) strain.

Q.22 Define circumferential stress and longitudinal stress in thin cylinders.

Q.23 Derive an expression for the strain energy induced in a body due to shear stress.

Q.24 Explain Radius of Gyration and Section Modulus.

Q.25 Draw the SFD and BMD diagrams for a simply supported beam carrying a UDL load over the whole span.

Q.26 Name different types of beams. Explain any two with diagrams.

Q.27 Explain Rankine Gourdan Formula to calculate crippling load.

Q.28 Write bending equation. Find the Section Modulus of a rectangular section.

Q.29 Explain:-
   a) Slenderness ratio
   b) Equivalent length

Q.30 A column with both ends hinged is 3m long with cross section 20mm x 20 mm. Calculate the load at which it will buckle. Take E for the material of column = 90GPa.

Q.31 Draw the stress - Strain diagram for Brittle material.

Q.32 A circular shaft of 60mm diameter is required to transmit torque to another shaft. Find the safe torque, which the shaft can transmit, if the shear stress cannot exceed 50MPa.

Q.33 Explain the following terms related to spring:
   a) helix angle   b) Stillness of spring
   c) angle of twist   d) free length
   e) Solid length

Q.34 A spring is having 200 coils, 80mm mean diameter and the wire diameter is 8mm. The modulus of rigidity of spring material is 80GPa. Calculate the deflection in spring (in mm) under the load of 900N.

Q.35 Explain the theorem of Parallel Axis.

SECTION-D

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

Q.36 Explain the following terms:
   a) Modulus of elasticity
   b) Modulus of rigidity
   c) Brittleness
   d) Fatigue

Q.37 A cantilever beam of length 6m carries a uniformly distributed load of 3kN/m which runs over a length of 3m from the free end. In addition to this their is a point load of 1kN at a distance of 3m from the free end. Draw SFD and BMD.

Q.38 Derive the Torsion Equation giving its assumptions.