

SM QUE BANK
2 MARKS

1. What do you mean by volumetric strain?
Volumetric strain can be numerically defined as the change in volume to the original volume of the material. It is denoted by the symbol ' ϵ_v '.

2. What do you mean by "Bulk Modulus"?
The ratio of change in pressure (P) to the fractional change in volume i.e. volumetric strain is called bulk modulus of a material. It is denoted by the symbol 'K'.

Note: The reciprocal of the bulk modulus is defined as the compressibility of the material.

3. What do you mean by compound bar?
A compound bar is an assembly of more than one bar having same or different cross sections made of same or different materials.
4. What do you mean by thermal stresses?
If an arbitrary body is allowed to expand or contract freely, with the rise or fall of temperature no stress is developed but if free expansion is prevented the stress developed is called temperature stress or strain.

5. What is meant by principal plane?
Principal plane is plane in which the stress vector will be wholly normal and there will not be any tangential or shear stress in that particular plane. Such a plane is called principal plane. The corresponding stress is called principal stress. Since the resultant stress is along the normal, tangential or shear stress is always zero. Therefore the principal plane is called shearless plane.

6. What is principal stress?
The normal stress which is acting on the principal plane is called principal stress.

7. What is a beam?
A beam is a horizontal member which is always loaded in the transverse direction, perpendicular to the longitudinal axis of the beam.

8. What are the different types of beams?
- Simply supported beam (one end hinged and other being roller supported)
 - Cantilever beam (one end fixed and other end being free)
 - Fixed beam (both the ends are clamped or fixed)
 - Over-hanging beam (some loaded portion of the beam extends beyond the support)
9. What are the types of loads?
- Point Load with zero inclination
 - Point Load with some inclination to the transverse axis

- Uniformly Distributed Load (U.D.L)
- Varying Load
- Moment

10. What is meant by transverse loading of beam?

If the load is acting perpendicular to longitudinal axis of the beam then it is called transverse loading of beam.

11. List the various types of support.

- Simple support (it resist loads which are acting perpendicular to the longitudinal axis of the beam)
- Fixed support (it resists forces in all direction and also restrict the rotation of the beam)
- Hinged support (it can resist forces in two directions but allows rotation about the axis of the pin, example, hinge)

12. What is power?

Power can be defined as the rate of transferring energy. It is calculated as

$$P = T \times 'n'$$

where, P is the power, T is the torque and 'n' is the rotational speed.

13. What do you mean by Torsion?

Torsion refers to the loading of a circular or non-circular member that tends to cause it to rotate or twist. Such a load is called torque, torsional moment, rotational moment, twisting moment or simply couple.

14. What are the assumptions made in Torsion equation

- The material of the shaft is homogeneous, perfectly elastic and obeys Hooke's law.
- Twist is uniform along the length of the shaft
- The stress does not exceed the limit of proportionality
- The shaft circular in section remains circular after loading
- Strain and deformations are small.

15. Define spring?

A spring is an elastic member, which deflects under the action of load and regains its original shape after the removal load.

16. What are the various types of springs?

- Disc spring (or) Belleville spring
- Leaf spring
- Spiral spring
- Helical spring

Helical springs can be again classified into

- ☐ Open coil helical spring
- ☐ Closed coil helical spring

17. State any two major functions of a spring.

- To absorb the shock energy
- To measure forces in spring balance and engine indicators

18. Why deflection of beams is needed for engineering applications like mechanical engineering?

The spindle of a lathe or drill press and the arbor of a milling machine carry cutting tools for machining metals. Therefore the deflection of the spindle would have an adverse effect on the accuracy of the machine output. The manner of loading and support of these machine elements behave like that of a real beam. This is the reason why deflection of beams is necessary for engineering applications like mechanical engineering.

19. Name the various methods of determining slope and deflection of beams.

- Double –Integration method
- Macaulay's method
- Moment – Area method
- Conjugate Beam method.

20. What are major classifications of a pressure vessel?

Pressure vessels are classified into

- Thin walled pressure vessels
- Thick walled pressure vessels

If the mean radius (average of outer and inner radius) to the thickness of the pressure vessel is greater than or equal to 10, it is called thin walled pressure vessels otherwise it is called thick walled pressure vessels.

21. Distinguish between cylindrical shell and spherical shell.

*Cylindrical Shells

- Circumferential stress is twice the longitudinal stress.
- It withstands low pressure than spherical shell for the same diameter.

*Spherical Shells

- Only hoop stress presents.
- It withstands more pressure than cylindrical shell for the same diameter.

22. Define hoop stress.

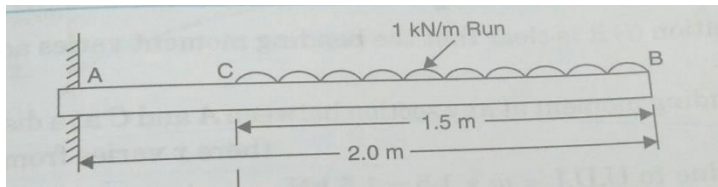
The stress is acting in the circumference of the cylinder wall (or) the stresses induced perpendicular to the axis of cylinder.

23. Define longitudinal stress.

The stress is acting along the length of the cylinder is called longitudinal stress.

16 MARKS

- 1) Define the following
i) stress ii) strain iii) rigid body iv) deformable body v) types of stresses.
- 2) Draw shear force bending moment diagram for the following.



- 3) Derive an expression for torsion in hollow shafts. .
- 4) A hollow shaft transmit power of 300 KW at 80 r. p. m speed. If the shear stress is not exceed to 60 N/mm^2 and internal diameter is 0.6 of the external diameter. Find the internal and external diameters assuming that the maximum torque is 1.4 times the mean.
- 5) Derive slope and deflection by double integration method
- 6) Derive Maxwell reciprocal theorem.
- 7) Derive expressions for stresses in thin cylinder due to longitudinal and circumferential stresses.
- 8) Derive lame's theorem.
- 9) Derive area moment method.
- 10) Find and draw shear force and bending moment for the following beam.

