**KCG COLLEGE OF TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**CE 6306-STRENGTH OF MATERIALS (SEM: 3)**

**QUESTION BANK FOR UNIT 2**

## PART-A (2 Marks)

1. ***State the assumptions made in the theory of simple bending***
   - The material is perfectly homogenous and isotropic
   - The value of young's modulus is same in tension as well as in compression
   - The radius of curvature of beam is very large compared to the cross sectional dimension of the beam.
   - Each layer of beam is free to expand or contract.
   - Transverse section which was plane before bending remains plane after bending.
2. ***Define Beam***

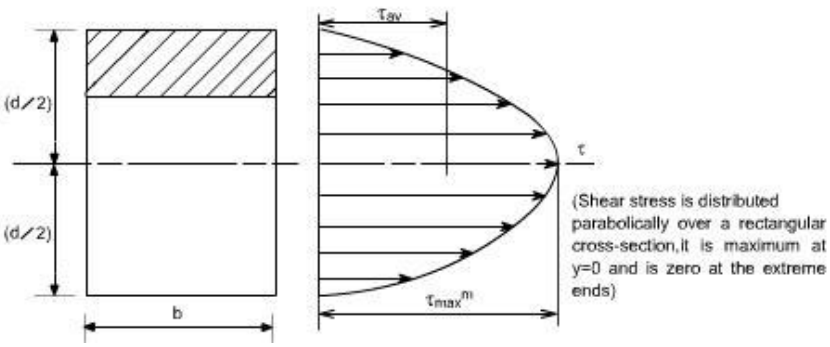
   BEAM is a structural member which is supported along the length and subjected to external load acting transversely (i.e) Perpendicular to the centre line of the beam.
3. ***Write the theory of simple bending equation.***

$$\frac{M}{I} = \frac{\sigma}{Y} = \frac{E}{R}$$

M- Maximum bending moment; I-Moment of inertia

$\sigma$ -Maximum stress induced; Y- Distance from the neutral axis; E-young's modulus.

4. ***Draw the shear stress distribution diagram for a rectangular section.***




5. ***What is the section modulus for a circular and hollow circular section***

   Section Modulus for a circular cross section,

   $Z = \frac{\pi}{32} d^3$ and for hollow circular section $\frac{\pi}{32}\frac{D^4 - d^4}{D}$
6. ***What is meant by sagging and hogging***

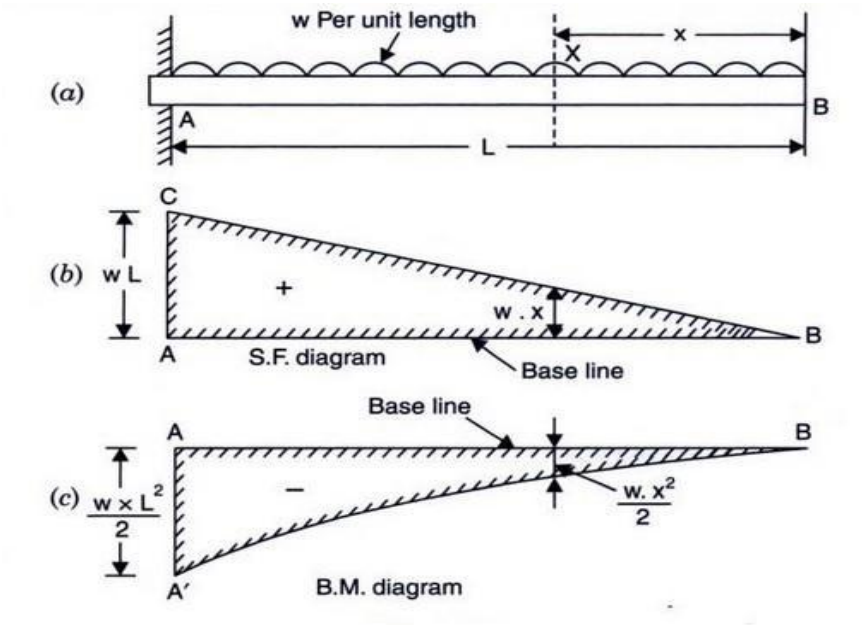
   If the moment of the force in the left side of the beam is clockwise or right side of the beam is counter clockwise then it is said to be positive BM or sagging.

   If the moment of force in the left side of the beam is counter clockwise or right side of the beam is clockwise then it is said to be negative BM or hogging.
7. ***What is cantilever beam?***

   Cantilever beam is a horizontal beam which is fixed at one and free at the other end.
8. ***What are the types of beams?***
   - Simply supported beams

- Cantilever beams
- Fixed beam
- Overhanging beam
- Continuous beam

***9. Draw the rough sketch of SF and BM for the cantilever beam with a UDL.***




***10. Write the relation between SF and BM.***

The rate of change of BM is equal to the shear force at the section,

$$dM / dx = -F$$

***11. What is shear force***

Shear force is an equal and opposite force pushing one part of a body in one direction and another part in opposite direction.

***12. What is bending moment in a beam?***

BM at any cross section is defined as algebraic sum of the moments of all the forces which are placed either side from that point.

***13. What is meant by transverse loading on beams***

If a load acting on the beam which is perpendicular to Centre line of it, then it is called transverse loading.

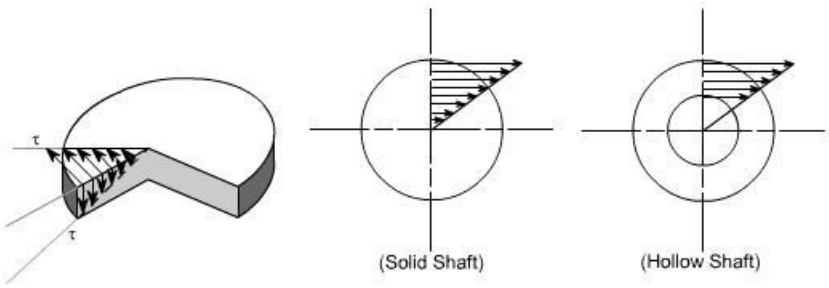
***14. Define point of contraflexure.***

The point where the BM changes its sign or zero is called point of contraflexure.

***15. What is meant by shear flow***

It is defined as the gradient of shear stress through the body.

***16. Sketch the shear stress distribution in a beam made of hollow circular section***



***17. What is meant by section modulus?***

It is the ratio of moment of inertia of section to the distance of the extreme layer from the neutral axis.

***18. What are the different types of loading***

- Point load
- Uniformly distributed load
- Uniformly varying load

***19. In a simply supported beam how will you locate point of maximum bending moment?***

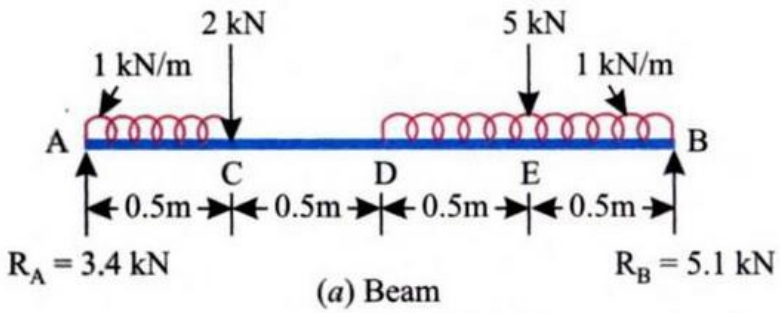
The bending moment is maximum when SF is zero. Write SF equation at that point and equating to zero we can find out the distance 'x' from one end, then find maximum bending moment at that point by taking all moment on right or left hand side of the beam.

***20. When is bending moment maximum?***

BM will be maximum when shear force change its sign.

**PART-B (16 Marks)**

1. A simply supported beam of span 6m is carrying a uniformly distributed load of 2KN/m over the entire span. Calculate the magnitude of shear force and bending at every section, 2m from the left support. Also draw the shear force and bending moment diagram.
2. A cantilever 1.5 m long is loaded with a uniformly distributed load of 2 KN/m run over a length of 1.25 m from the free end. It also carries a point load of 3 KN at a distance of 0.25 m from the free end. Draw the shear force and bending moment diagram of the cantilever.
3. Draw the bending moment and shear force diagrams for the beam shown in figure.



(*a*) Beam

4. A 500 mm long bar has rectangular cross section 20mmx40mm. This bar is subjected to (i) 40 KN tensile force on 20mm x40mm faces (ii) 200KN compressive force on 20mmx500mm faces, and (iii) 300KN tensile force on 40mmx500mm faces. Find the change in volume if $E=2x10^5$ $N/mm^2$ and Poisson's ration = 0.3
5. State the assumptions made in the theory of simple bending and drive the simple bending equation.
6. Two wooden planks 150 mm x50 mm each, are connected to form a T-section of a beam. If a moment of 3 KN-m is applied around the horizontal neutral axis, including tension below the neutral

axis, find the stresses at the extreme fibers of the cross section. Also calculate the total tensile force on the cross section.