

# Strength of Materials

1. Strain is defined as the ratio of
- (a) change in volume to original volume
  - (b) change in length to original length
  - (c) change in cross-sectional area to original cross-sectional area
  - (d) any one of the above
  - (e) none of the above.

Ans: d

2. Hooke's law holds good up to
- (a) yield point
  - (b) limit of proportionality
  - (c) breaking point
  - (d) elastic limit
  - (e) plastic limit.

Ans: b

3. Young's modulus is defined as the ratio of
- (a) volumetric stress and volumetric strain
  - (b) lateral stress and lateral strain
  - (c) longitudinal stress and longitudinal strain
  - (d) shear stress to shear strain
  - (e) longitudinal stress and lateral strain.

Ans: c

4. The unit of Young's modulus is
- (a) mm/mm
  - (b) kg/cm
  - (c) kg
  - (d) kg/cm<sup>2</sup>
  - (e) kg cm<sup>2</sup>.

Ans: d

5. Deformation per unit length in the direction of force is known as
- (a) strain
  - (b) lateral strain
  - (c) linear strain
  - (d) linear stress
  - (e) unit strain.

Ans: c

6. If equal and opposite forces applied to a body tend to elongate it, the stress so produced is called
- (a) internal resistance
  - (b) tensile stress
  - (c) transverse stress
  - (d) compressive stress
  - (e) working stress.

Ans: b

7. The materials having same elastic properties in all directions are called
- (a) ideal materials
  - (b) uniform materials
  - (c) isotropic materials

- (d) paractical materials
- (e) elastic materials.

Ans: c

8. A thin mild steel wire is loaded by adding loads in equal increments till it breaks. The extensions noted with increasing loads will behave as under

- (a) uniform throughout
- (b) increase uniformly
- (c) first increase and then decrease
- (d) increase uniformly first and then increase rapidly
- (e) increase rapidly first and then uniformly.

Ans: d

9. Modulus of rigidity is defined as the ratio of

- (a) longitudinal stress and longitudinal strain
- (b) volumetric stress and volumetric strain
- (c) lateral stress and lateral strain
- (d) shear stress and shear strain
- (e) linear stress and lateral strain.

Ans: d

10. If the radius of wire stretched by a load is doubled, then its Young's modulus will be

- (a) doubled
- (b) halved
- (c) become four times
- (d) become one-fourth
- (e) remain unaffected.

Ans: e

11. The ultimate tensile stress of mild steel compared to ultimate compressive stress is

- (a) same
- (b) more
- (c) less
- (d) more or less depending on other factors
- (e) unpredictable.

Ans: b

12. Tensile strength of a material is obtained by dividing the maximum load during the test by the

- (a) area at the time of fracture
- (b) original cross-sectional area
- (c) average of (a) and (b)
- (d) minimum area after fracture
- (e) none of the above.

Ans: b

13. The impact strength of a material is an index of its

- (a) toughness
- (b) tensile strength
- (c) capability of being cold worked
- (d) hardness
- (e) fatigue strength.

Ans: a

14. The Young's modulus of a wire is defined as the stress which will increase the length of wire compared to its original length

- (a) half

- (b) same amount
- (c) double
- (d) one-fourth
- (e) four times.

Ans: b

15. Percentage reduction of area in performing tensile test on cast iron may be of the order of

- (a) 50%
- (b) 25%
- (c) 0%
- (d) 15%
- (e) 60%.

Ans: c

16. The intensity of stress which causes unit strain is called

- (a) unit stress
- (b) bulk modulus
- (c) modulus of rigidity
- (d) modulus of elasticity
- (e) principal stress.

Ans: d

17. True stress-strain curve for materials is plotted between

- (a) load/original cross-sectional area and change in length/original length
- (b) load/instantaneous cross-sectional area original area and log.
- (c) load/instantaneous cross-sectional area and change in length/original length
- (d) load/instantaneous area and instantaneous area/original area
- (e) none of the above.

Ans: b

18. During a tensile test on a specimen of 1 cm cross-section, maximum load observed was 8 tonnes and area of cross-section at neck was 0.5 cm<sup>2</sup>. Ultimate tensile strength of specimen is

- (a) 4 tonnes/cm<sup>2</sup>
- (b) 8 tonnes/cm<sup>2</sup>
- (c) 16 tonnes/cm<sup>2</sup>
- (d) 22 tonnes/cm<sup>2</sup>
- (e) none of the above.

Ans: b

19. For steel, the ultimate strength in shear as compared to in tension is nearly

- (a) same
- (b) half
- (c) one-third
- (d) two-third
- (e) one-fourth.

Ans: b

20. Which of the following has no unit

- (a) kinematic viscosity
- (b) surface tension
- (c) bulk modulus
- (d) strain
- (e) elasticity.

Ans: d

21. Which is the false statement about true stress-strain method

- (a) It does not exist
- (b) It is more sensitive to changes in both metallurgical and mechanical conditions
- (c) It gives, a more accurate picture of the ductility
- (d) It can be correlated with stress-strain values in other tests like torsion, impact, combined stress tests etc.
- (e) It can be used for compression tests as well.

Ans: a

22. In a tensile test on mild steel specimen, the breaking stress as compared to ultimate tensile stress is

- (a) more
- (b) less
- (c) same
- (d) more/less depending on composition
- (e) may have any value.

Ans: b

23. If a part is constrained to move and heated, it will develop

- (a) principal stress
- (b) tensile stress
- (c) compressive stress
- (d) shear stress
- (e) no stress.

Ans: c

24. Which of the following materials is most elastic

- (a) rubber
- (b) plastic
- (c) brass
- (d) steel
- (e) glass.

Ans: d

25. The value of modulus of elasticity for mild steel is of the order of

- (a)  $2.1 \times 10^5$  kg/cm<sup>2</sup>
- (b)  $2.1 \times 10^6$  kg/cm<sup>2</sup>
- (c)  $2.1 \times 10^7$  kg/cm<sup>2</sup>
- (d)  $0.1 \times 10^6$  kg/cm<sup>2</sup> (<?)  $3.8 \times 10^6$  kg/cm<sup>2</sup>.

Ans: b

26. The value of Poisson's ratio for steel is between

- (a) 0.01 to 0.1
- (b) 0.23 to 0.27
- (c) 0.25 to 0.33
- (d) 0.4 to 0.6
- (e) 3 to 4.

Ans: c

27. The buckling load for a given material depends on

- (a) slenderness ratio and area of cross-section
- (b) Poisson's ratio and modulus of elasticity
- (c) slenderness ratio and modulus of elasticity
- (d) slenderness ratio, area of cross-section and modulus of elasticity
- (e) Poisson's ratio and slenderness ratio.

Ans: d

28. The total elongation produced in a bar of uniform section hanging vertically downwards due to its own weight is equal to that produced by a weight

- (a) of same magnitude as that of bar and applied at the lower end
- (b) half the weight of bar applied at lower end
- (c) half of the square of weight of bar applied at lower end
- (d) one-fourth of weight of bar applied at lower end
- (e) none of the above.

Ans: b

29. The property of a material by virtue of which a body returns to its original, shape after removal of the load is called

- (a) plasticity
- (b) elasticity
- (c) ductility
- (d) malleability
- (e) resilience.

Ans: b

30. The materials which exhibit the same elastic properties in all directions are called

- (a) homogeneous
- (b) inelastic
- (c) isotropic
- (d) isentropic
- (e) visco-elastic.

Ans: c

31. The value of Poisson's ratio for cast iron is

- (a) 0.1 to 0.2
- (b) 0.23 to 0.27
- (c) 0.25 to 0.33
- (d) 0.4 to 0.6
- (e) 3 to 4.

Ans: b

32. The property of a material which allows it to be drawn into a smaller section is called

- (a) plasticity
- (b) ductility
- (c) elasticity
- (d) malleability
- (e) drawabihty.

Ans: b

33. Poisson's ratio is defined as the ratio of

- (a) longitudinal stress and longitudinal strain
- (b) longitudinal stress and lateral stress
- (c) lateral stress and longitudinal stress
- (d) lateral stress and lateral strain
- (e) none of the above.

Ans: c

34. For which material the Poisson's ratio is more than unity

- (a) steel
- (b) copper
- (c) aluminium
- (d) cast iron
- (e) none of the above.

Ans: e

35. The property of a material by virtue of which it can be beaten or rolled into plates is called

- (a) malleability
- (b) ductility
- (c) plasticity
- (d) elasticity
- (e) reliability.

Ans: a

36. The change in the unit volume of a material under tension with increase in its Poisson's ratio will ,

- (a) increase
- (b) decrease
- (c) remain same
- (d) increase initially and then decrease
- (e) unpredictable.

Ans: b

37. The percentage reduction in area of a cast iron specimen during tensile test would be of the order of

- (a) more than 50%
- (b) 25—50%
- (c) 10—25%
- (d) 5—10%
- (e) negligible.

Ans: e

38. If a material expands freely due to heating it will develop

- (a) thermal stresses
- (b) tensile stress
- (c) bending
- (d) compressive stress
- (e) no stress.

Ans: e

39. In a tensile test, near the elastic limit zone, the

- (a) tensile strain increases more quickly
- (b) tensile strain decreases more quickly
- (c) tensile strain increases in proportion to the stress
- (d) tensile strain decreases in proportion to the stress
- (e) tensile strain remains constant.

Ans: a

40. The stress necessary to initiate yielding is

- (a) considerably greater than that necessary to continue it
- (b) considerably lesser than that necessary to continue it
- (c) greater than that necessary to stop it
- (d) lesser than that necessary to stop it
- (e) equal to that necessary to stop it.

Ans: a

41. In the tensile test, the phenomenon of slow extension of the material, i. e. stress increasing with the time at a constant load is called

- (a) creeping
- (b) yielding
- (c) breaking

- (d) plasticity
- (e) none of the above.

Ans: a

42. The stress developed in a material at breaking point in extension is called

- (a) breaking stress
- (b) fracture stress
- (c) yield point stress
- (d) ultimate tensile stress
- (e) proof stress.

Ans: a

43. Rupture stress is

- (a) breaking stress
- (b) maximum load/original cross-sectional area
- (c) load at breaking point/A
- (d) load at breaking point/neck area
- (e) maximum stress.

Ans: d

44. The elasticity of various materials is controlled by its

- (a) ultimate tensile stress
- (b) proof stress
- (c) stress at yield point
- (d) stress at elastic limit
- (e) tensile stress.

Ans: d

45. The ratio of lateral strain to the linear strain within elastic limit is known as

- (a) Young's modulus
- (b) bulk modulus
- (c) modulus of rigidity
- (d) modulus of elasticity
- (e) Poisson's ratio.

Ans: e

46. The ratio of direct stress to volumetric strain in case of a body subjected to three mutually perpendicular stresses of equal intensity, is equal to

- (a) Young's modulus
- (b) bulk modulus
- (c) modulus of rigidity
- (d) modulus of elasticity
- (e) Poisson's ratio.

Ans: b

47. The stress at which extension of the material takes place more quickly as compared to the increase in load is called

- (a) elastic point of the material
- (b) plastic point of the material
- (c) breaking point of the material
- (d) yielding point of the material
- (e) ultimate point of the material.

Ans: d

48. In question 56, the internal reaction in bottom 80 cm length will be

- (a) same in both cases
- (b) zero in first case

- (c) different in both cases
  - (d) data are not sufficient to determine same
  - (e) none of the above.
- Ans: b

49. Flow stress corresponds to
- (a) fluids in motion
  - (b) breaking point
  - (c) plastic deformation of solids
  - (d) rupture stress
  - (e) none of the above.
- Ans: c

50. When it is indicated that a member is elastic, it means that when force is applied, it will
- (a) not deform
  - (b) be safest
  - (c) stretch
  - (d) not stretch
  - (e) none of the above.
- Ans: c

51. The energy absorbed in a body, when it is strained within the elastic limits, is known as
- (a) strain energy
  - (b) resilience
  - (c) proof resilience
  - (d) modulus of resilience
  - (e) toughness..
- Ans: a

52. Resilience of a material is considered when it is subjected to
- (a) frequent heat treatment
  - (b) fatigue
  - (c) creep
  - (d) shock loading
  - (e) resonant condition.
- Ans: d

53. The maximum strain energy that can be stored in a body is known as
- (a) impact energy
  - (b) resilience
  - (c) proof resilience
  - (d) modulus of resilience
  - (e) toughness.
- Ans: c

54. The total strain energy stored in a body is termed as
- (a) resilience
  - (b) proof resilience
  - (c) modulus of resilience
  - (d) toughness
  - (e) impact energy.
- Ans: a

55. Proof resilience per material is known as
- (a) resilience



- (b) proof resilience
- (c) modulus of resilience
- (d) toughness
- (e) impact energy.

Ans: c

56. The stress induced in a body due to suddenly applied load compared to when it is applied gradually is

- (a) same
- (b) half
- (c) two times
- (d) four times
- (e) none of the above.

Ans: c

57. The strain energy stored in a body due to suddenly applied load compared to when it is applied gradually is

- (a) same
- (b) twice
- (c) four times
- (d) eight times
- (e) half.

Ans: c

58. A material capable of absorbing large amount of energy before fracture is known as

- (a) ductility
- (b) toughness
- (c) resilience
- (d) shock proof
- (e) plasticity.

Ans: b

59. Coaxing is the method of increasing

- (a) strength by reversible cycling
- (b) corrosion resistance by spraying
- (c) hardness by surface treatment
- (d) fatigue resistance by over-stressing the metal by successively increasing loadings
- (e) creep by heat treatment.

Ans:

60. A beam is loaded as cantilever. If the load at the end is increased, the failure will occur

- (a) in the middle
- (b) at the tip below the load
- (c) at the support
- (d) anywhere
- (e) none of the above.

Ans: d

61. A non-yielding support implies that the

- (a) support is frictionless
- (b) support can take any amount of reaction
- (c) support holds member firmly
- (d) slope of the beam at the support is zero
- (e) none of the above.

Ans: d

62. The ratio of elongation in a prismatic bar due to its own weight (W) as compared to another similar bar carrying an additional weight (W) will be

- (a) 1:2
- (b) 1 : 3
- (c) 1 : 4
- (d) 1 : 2.5
- (e) 1 : 2.25.

Ans: b

63. In a prismatic member made of two materials so joined that they deform equally under axial stress, the unit stresses in two materials are

- (a) equal
- (b) proportional to their respective moduli of elasticity
- (c) inversely proportional to their moduli of elasticity
- (d) average of the sum of moduli of elasticity
- (e) none of the above.

Ans: b

64. In riveted boiler joints, all stresses, shearing, bearing and tensile are based on the

- (a) size of rivet
- (b) size of the drilled or reamed hole
- (c) average of size of rivet and hole
- (d) smaller of the two
- (e) any one of the above.

Ans: b

65. The distance between the centres of the rivets in adjacent rows of zig-zag riveted joint is known as

- (a) pitch
- (b) back pitch
- (c) diagonal pitch
- (d) diametral pitch
- (e) lap.

Ans: c

66. Efficiency of a riveted joint is the ratio of its strength (max. load it can resist without failure) to the strength of the unpunched plate in

- (a) tension
- (b) compression
- (c) bearing
- (d) any one of the above
- (e) none of the above.

Ans: a

67. When two plates are butt together and riveted with cover plates with two rows of rivets, the joint is known as

- (a) lap joint
- (b) butt joint
- (c) single riveted single cover butt joint
- (d) double riveted double cover butt joint
- (e) single riveted double cover butt joint.

Ans: d

68. A riveted joint in which every rivet of a row is opposite to other rivet of the outer row, is known as

- (a) chain riveted joint
- (b) diamond riveted joint

- (c) criss-cross riveted joint
  - (d) zig-zag riveted joint
  - (e) none of the above.
- Ans: a

69. A riveted joint in which the number of rivets decrease from innermost to outer most row is called
- (a) chain riveted joint
  - (b) diamond riveted joint
  - (c) criss-cross riveted joint
  - (d) zig-zag riveted joint
  - (e) none of the above.
- Ans: b

70. If the rivets in adjacent rows are staggered and the outermost row has only one rivet, the arrangement of the rivets is called
- (a) chain riveting
  - (b) zig zag riveting
  - (c) diamond riveting
  - (d) criss-cross riveting
  - (e) none of the above.
- Ans: c

71. Diamond riveted joint can be adopted in the case of following type of joint
- (a) butt joint
  - (b) lap joint
  - (c) double riveted lap joints
  - (d) all types of joints
  - (e) none of the above.
- Ans: a

72. Rivets are made of following type of material
- (a) tough
  - (b) hard
  - (c) resilient
  - (d) ductile
  - (e) malleable.
- Ans: d

73. The weakest section of a diamond riveting is the section which passes through
- (a) the first row
  - (b) the second row
  - (c) the central row
  - (d) one rivet hole of the end row
  - (e) none of the above.
- Ans: d

74. The deformation of a bar under its own weight compared to the deformation of same body subjected to a direct load equal to weight of the body is
- (a) same
  - (b) double
  - (c) half
  - (d) four times
  - (e) one-fourth.
- Ans: c

75. The force acting along the circumference will cause stress in the walls in a direction

normal to the longitudinal axis of cylinder; this stress is called

- (a) longitudinal stress
- (b) hoop stress
- (c) yeiled stress
- (d) ultimate stress
- (e) none of the above.

Ans: b

76. A boiler shell 200 cm diameter and plate thickness 1.5 cm is subjected to internal pressure of 1.5 MN/m , then the hoop stress will be

- (a) 30 MN/m<sup>2</sup>
- (b) 50 MN/m<sup>2</sup>
- (c) 100 MN/m<sup>2</sup>
- (d) 200 MN/m<sup>2</sup>
- (e) 300 MN/m<sup>2</sup>.

Ans: c

77. A cylindrical section having no joint is known as

- (a) jointless section
- (b) homogeneous section
- (c) perfect section
- (d) manufactured section
- (e) seamless section.

Ans: e

78. Longitudinal stress in a thin cylinder is

- (a) equal to the hoop stress
- (b) twice the hoop stress
- (c) half of the hoop stress
- (d) one-fourth of hoop stress
- (e) four times the hoop stress.

Ans: c

79. The safe twisting moment for a compound shaft is equal to the

- (a) maximum calculated value
- (b) minimum calculated value
- (c) mean value
- (d) extreme value
- (e) none of the above.

Ans: b

80. The torsional rigidity of a shaft is expressed by the

- (a) maximum torque it can transmit
- (b) number of cycles it undergoes before failure
- (c) elastic limit up to which it resists torsion, shear and bending stresses
- (d) torque required to produce a twist of one radian per unit length of shaft
- (e) maximum power it can transmit at highest possible-speed.

Ans: d

81. The value of shear stress which is induced in the shaft due to the applied couple varies

- (a) from maximum at the center to zero at the circumference
- (b) from zero at the center to maximum at the circumference
- (c) from maximum at the center to mini-mum at the cricumference
- (d) from minimum at the centro to maxi-mum at the circumference
- (e) none of the above.

Ans: b

82. A key is subjected to side pressure as well as shearing forces. These pressures are called

- (a) bearing stresses
- (b) fatigue stresses
- (c) crushing stresses
- (d) resultant stresses
- (e) none of the above.

Ans: a

83. In a belt drive, the pulley diameter is doubled, the belt tension and pulley width remaining same. The changes required in key will be

- (a) increase key length
- (b) increase key depth
- (c) increase key width
- (d) double all the dimensions
- (e) none of the above.

Ans: c

84. Shear stress induced in a shaft subjected to tension will be

- (a) maximum at periphery and zero at center
- (b) maximum at center
- (c) uniform throughout
- (d) average value in center
- (e) none of the above.

Ans: e