

## Machine Design

### UNIT-I

Q.1 According to indian standards specifications, 100H6/g 5 means that the

- a) Actual size is 100 mm
- b) basic size is 100mm
- c) Difference between the actual size is 100mm
- d)None

Ans. b

Q.2 According to indian standards specification, total number of tolerance grades are

- a) 8
- b) 12
- c) 18
- d) 20

Ans. c

Q.3 According to indian standards specifications, 100H6/g 5 means that the

- a. tolerance grade for the hole is 6 and for the shaft is 5
- b. tolerance grade for the shaft is 6 and for the hole is 5
- c. tolerance grade for the shaft is 4 to 8 and for the hole is 3 to 7
- d. tolerance grade for the hole is 4 to 8 and for the shaft is 3 to 7

Ans. a

Q.4 The ratio of ultimate stress to design stress is known as

- a)elastic limit
- b)Strain
- c)factor of safety
- d)bulk modulus

Ans. c

Q.5 The factor of safety for steel and for steady load is

- a) 2
- b) 4
- c) 6
- d) 8

Ans. b

6. The Poisson's ratio for steel varies from

- a) 0.21 to .25
- b) 0.25 to .33
- c) 0.33 to .38
- d) 0.38 to .45

Ans. b

Q.7 The strain energy stored in a body, when loaded suddenly is ----- the strain energy stored when same load is applied gradually.

- a) equal to
- b) one – half
- c) twice
- d) four times

Ans. d

Q.8 The stress which varies from a minimum value to a maximum value of the same nature ( tensile or compressive) is called

- a) repeated stress
- b) yield stress
- c) fluctuating stress
- d) alternating stress

Ans. c

Q.9 The endurance or fatigue limit is defined as the maximum value of the stress which a polished standard specimen can withstand without failure, for infinite number of cycles, when subjected to

- a) Static load
- b) Dynamic load
- c) a and b.
- d) Completely reversed load.

Ans. c

Q.10 Failure of materials is called fatigue when it fails

- a) at elastic limit
- b) below the elastic limit
- c) at the yield point
- d) below the yield point

Ans. a

Q.11 The resistance to fatigue of a material is measured by

- a) elastic limit
- b) Young's modulus
- c) ultimate tensile strength
- d) endurance limit

Ans. d

Q.12 The yield point in static loading is ----- as compared to fatigue loading

- a) higher
- b) lower
- c) same
- d) both (a) & (b)

Ans. a

Q.13 Factor of safety for fatigue loading is the ratio of

- a) elastic limit to the working stress
- b) Young's modulus to the ultimate tensile strength
- c) endurance limit to working stress
- d) elastic limit to yield point

Ans. c

Q.14 When a material is subjected to fatigue loading, the ratio of the endurance limit to the ultimate tensile strength is

- a) 0.20
- b) 0.35

c) 0.50

d) 0.65

Ans. c

Q.15 The ratio of endurance limit in shear to endurance limit in flexure is

a) 0.25

b) 0.40

c) 0.55

d) 0.70

Ans. c

Q.16 If the size of the standard specimen for a fatigue testing machine is increased, the endurance limit for the material will

a) have same value as that of standard specimen b) increase

c) decrease

d) none

Ans. c

Q.17 The surface finish factor of a mirror polished material is

a) 0.45

b) 0.65

c) 0.85

d) 1

Ans. d

Q.18 Stress concentration factor is defined as the ratio of

a) maximum stress to the endurance limit b) nominal stress to the endurance limit

c) maximum stress to nominal stress

d) nominal stress to the maximum stress

Ans. c

Q.19 In static loading stress concentration is more serious in

- a) brittle materials
- b) ductile materials.
- c) a and b
- d) elastic material

Ans. a

Q.20 In cyclic loading stress concentration is more serious in

- a) brittle materials
- b) ductile materials.
- c) a and b
- d) elastic material

Ans. b

## UNIT-II

Q.1 The stress which vary from a minimum value to a maximum value of the same nature (i.e. tensile or compressive) is called

- a) repeated stress
- b) yield stress
- c) fluctuating stress
- d) alternating stress

Ans. (c)

Q.2 The endurance or fatigue limit is defined as the maximum value of the stress which a polished standard specimen can withstand without failure, for infinite number of cycles, when subjected to

- a) static load
- b) dynamic load
- c) static as well as dynamic load
- d) completely reversed load

Ans. (d)

Q.3 Failure of a material is called fatigue when it fails

- a) at the elastic limit
- b) below the elastic limit



c) 0.55

d) 0.70

Ans. (c)

Q.9 If the size of a standard specimen for a fatigue testing machine is increased, the endurance limit for the material will

a) have same value as that of specimen

b) increase

c) decrease

d) none

Ans. (c)

Q.10 The residual compressive stress by way of surface treatment of a machine member subjected to fatigue loading

a) improves the fatigue life

b) deteriorates the fatigue life

c) does not affect the fatigue life d) immediately fractures the specimen

Ans. (a)

Q.11 The surface finish factor for a mirror polished material is

a) 0.45

b) 0.65

c) 0.85

d) 1

Ans. (d)

Q.12 Stress concentration factor is defined as the ratio of

a) maximum stress to endurance limit

b) nominal stress to endurance limit

c) maximum stress to nominal stress

d) nominal stress to maximum stress

Ans. (c)

Q.13 In static loading, stress concentration factor is more serious in

a) brittle materials

b) ductile materials

c) brittle as well as ductile materials

d) elastic materials

Ans. (a)

Q.14 In cyclic loading, stress concentration factor is more serious in

- a) brittle materials
- b) ductile materials
- c) brittle as well as ductile materials
- d) elastic materials

Ans. (b)

Q.15 The notch sensitivity  $q$  is expressed in terms of fatigue stress concentration factor  $K_f$  and theoretical stress concentration factor  $K_t$ , as

- a)  $\frac{K_f + 1}{K_t + 1}$
- b)  $\frac{K_f - 1}{K_t - 1}$
- c)  $\frac{K_f + 1}{K_f + 1}$
- d)  $\frac{K_t - 1}{K_f - 1}$

Ans. (b)

Q.16 A shaft transmits 5kW at 1000 rpm. Using maximum shear strain energy theory, find the diameter of the shaft. Take yield point stress in tension as  $300\text{N/mm}^2$ , factor of safety as 2.0 and Poisson's ratio 0.25.

- a) 0.018m
- b) 0.142m
- c) 0.012m
- d) 0.364m

Ans. (c)

Q.17 A line shaft rotating at 200rpm, is to transmit 200kW. The allowable shear stress for the material of the shaft is 42Mpa. If the shaft carries a central load of 900N and is simply supported between bearings 3m apart, determine the diameter of the shaft. The maximum tensile or compressive stress is not to exceed 56MPa.

- a) 96mm
- b) 95mm
- c) 105mm
- d) 104mm

Ans. (c)



Q.18 A 50mm diameter shaft is made from carbon steel having ultimate tensile strength of 630MPa. It is subjected to a torque which fluctuates between 2000N-m to 800N-m. Using Soderberg method, calculate the factor of safety. Assume suitable values for any other data needed.

- a) 1
- b) 1.55
- c) 0.75
- d) 1.85

Ans. (d)

Q.19 A Circular rod made of ductile material has endurance strength of  $280\text{N/mm}^2$  and ultimate strength  $350\text{N/mm}^2$ . The member is subjected to a variable axial load varying from +700kN (tensile) to -300kN (compressive). Take fatigue stress concentration factor as 1.8 and factor of safety as 2.0. Find the suitable diameter of the Rod.

- a) 74.0mm
- b) 78.0mm
- c) 68.0mm
- d) 80.0mm

Ans. (b)

Q.20 Determine the size of the piston rod subjected to a total load having cycline fluctuation from 15kN in compression to 25kN in tension. The endurance limit is 360MPa and yield strength is 400Mpa. Take impact factor 1.25, factor of safety = 1.5, surface finish factor = 0.88 and stress concentration factor = 2.25.

- a) 25mm
- b) 20mm
- c) 21mm
- d) 19mm

Ans. (b)

### UNIT-III

Q.1 The taper on a rectangular sunk key is

- a) 1 in 16
- b) 1 in 32

c) 1 in 48

d) 1 in 100

Ans. (d)

Q.2 The usual proportion for the width of key is

a)  $d/8$

b)  $d/6$

c)  $d/4$

d)  $d/2$

$d =$  diameter of shaft

Ans. (c)

Q.3 When a pulley or other mating piece is required to slide along the shaft, a ..... sunk key is used.

a) square

b) rectangular

c) cubic

d) hexagonal

Ans. (c)

Q.4 A key made from a cylindrical disc having segmental cross-section, is known as

a) feather key

b) gib head key

c) woodruff key

d) flat saddle key

Ans. (d)

Q.5 A feather key is generally

a) loose in shaft and tight in hub b) tight in shaft and loose in hub

c) tight in both shaft and hub d) loose in both shaft and hub

Ans. (b)

Q.6 The type of stresses developed in the key is/are

a) shear stress alone

b) bearing stress alone

c) both stresses                                      d) shearing, bending & bearing stresses

Ans. (c)

Q.7 For a square key made of mild steel, the shear and crushing strengths are related as

a) shear strength = crushing strength   b) shear strength > crushing strength

c) shear strength < crushing strength   d) none of the above

Ans. (a)

Q.8 A keyway lowers

a) the strength of the shaft                                      b) the rigidity of the shaft

c) both the strength & rigidity      d) the ductility of material of the shaft

Ans. (c)

Q.9 The sleeve or muff coupling is designed as a

a) thin cylinder                                      b) thick cylinder

c) solid shaft    d) hollow shaft

Ans. (d)

Q.10 Oldham coupling is used to connect two shafts

a) which are perfectly aligned      b) which are not in exact alignment

c) which have lateral misalignment   d) whose axes intersect at a small angle

Ans. (c)

Q.11 The standard length of the shaft is

a) 5m    b) 6m

c) 7m    d) all of these

Ans. (d)

Q.12 Two shafts A and B are made of the same material. The diameter of the shaft A is twice as that of the shaft B. The power transmitted by the shaft A will be ..... of shaft B.

- a) twice
- b) four times
- c) eight times
- d) sixteen times

Ans. (c)

Q.13 Two shafts A and B of solid circular cross –section are identical except for their diameters  $d_A$  and  $d_B$ . The ratio of power transmitted by the shaft A to that of shaft B is

- a)  $d_A/d_B$
- b)  $(d_A)^2/(d_B)^2$
- c)  $(d_A)^3/(d_B)^3$
- d)  $(d_A)^4/(d_B)^4$

Ans. (c)

Q.14 Two shafts will have equal strength, if

- a) diameter of both the shafts is same
- b) angle of twist of both the shafts is same
- c) material of both the shafts is same
- d) twisting moment of both shafts is same

Ans. (d)

Q.15 A transmission shaft subjected to bending loads must be designed on the basis of

- a) maximum normal stress theory
- b) maximum shear stress theory
- c) maximum normal stress and shear stress theories
- d) fatigue strength

Ans. (a)

Q.16 Which of the following loading is considered for the design of axles?

- a) Bending moment only
- b) Twisting moment only
- c) Combined Bending moment & torsion
- d) Combined bending, twisting moment & axial

Ans. (a)

Q.17 The maximum shear stress theory is used for

- a) brittle material
- b) ductile material
- c) plastic material
- d) non-ferrous material

Ans. (b)

Q.18 The maximum normal stress theory is used for

- a) brittle material
- b) ductile material
- c) plastic material
- d) non-ferrous material

Ans. (a)

Q.19 The design of shafts made of brittle materials is based on

- a) Guest's theory
- b) Rankine's theory
- c) St. Venant's theory
- d) Von Mises theory

Ans. (b)

Q.20 When a shaft is subjected to a bending moment  $M$  and a twisting moment  $T$ , then the equivalent twisting moment is equal to

- a)  $M + T$
- b)  $M^2 + T^2$
- c)  $\sqrt{M^2 + T^2}$
- d)  $\sqrt{M^2 - T^2}$

Ans. (c)

UNIT-IV

Q.1 The largest diameter of an external or internal screw thread is known as

- a) minor diameter
- b) major diameter
- c) pitch diameter
- d) none of these

Ans. (b)

Q.2 The pitch diameter is the ..... diameter of an external or internal screw thread

- a) effective
- b) smallest
- c) largest
- d) medium

Ans. (a)

Q.3 A screw thread is specified by its

- a) major diameter
- b) minor diameter
- c) pitch diameter
- d) pitch

Ans. (a)

Q.4 The railway carriage coupling have

- a) square threads
- b) acme threads
- c) knuckle threads
- d) buttress threads

Ans. (d)

Q.5 The square threads are usually found on

- a) spindles of bench vices
- b) railway carriage couplings
- c) feed mechanism of machine tools
- d) screw cutting lathes

Ans. (c)

Q.6 A locking device in which the bottom cylindrical portion is recessed to receive the tip of the locking set screw, is called

- a) castle nut
- b) jam nut
- c) ring nut
- d) screw nut

Ans. (c)

Q.7 Which one is not a positive locking device?

- a) spring washer
- b) cotter pin
- c) Tongued washer
- d) Spring wire lock

Ans. (a)

Q.8 The washer is generally specified by its

- a) outer diameter
- b) hole diameter
- c) thickness
- d) mean diameter

Ans. (b)

Q.9 A locking device extensively used in automobile industry is a

- a) castle nut
- b) jam nut

c) ring nut

d) screw nut

Ans. (a)

Q.10 A bolt of M 24 x 2 means that

a) the pitch of the thread is 24mm and depth is 2mm

b) the cross-sectional area of the threads is  $24\text{mm}^2$

c) the nominal diameter of bolt is 24mm and the pitch is 2mm

d) the effective diameter of the bolt is 24mm and there are two threads per cm

Ans. (c)

Q.11 When a nut is tightened by placing a washer below it, the bolt will be subjected to

a) tensile stress

b) compressive stress

c) shear stress

d) none of these

Ans. (a)

Q.12 The eye bolts are used for

a) transmission of power

b) locking devices

c) lifting & transporting heavy machines

d) absorbing shocks & vibrations

Ans. (c)

Q.13 The shock absorbing capacity of a bolt may be increased by

a) increasing its shank diameter

b) decreasing its shank diameter

c) tightening the bolt properly

d) making shank diameter equal to core diameter of the thread

Ans. (b)

Q.14 The resilience of a bolt may be increased by



- a) increasing its shank diameter
- b) increasing its length
- c) decreasing its shank diameter
- d) decreasing its length

Ans. (b)

Q.15 A bolt of uniform strength can be developed by

- a) keeping the core diameter of threads equal to diameter of unthreaded portion of bolt
- b) keeping the core diameter of threads smaller than diameter of unthreaded portion of bolt
- c) keeping the nominal diameter of threads equal to diameter of unthreaded portion of bolt
- d) none of these

Ans. (a)

Q.16 A leaf spring in automobiles is used

- a) to apply forces
- b) to measure forces
- c) to absorb shocks
- d) to store strain energy

Ans. (c)

Q.17 In leaf springs, the longest leaf is known as

- a) lower leaf
- b) master leaf
- c) upper leaf
- d) none of these

Ans. (b)

Q.18 A spring used to absorb shocks and vibrations is

- a) closely-coiled helical spring
- b) open-coiled helical spring
- c) conical spring
- d) leaf spring

Ans. (d)

Q.19 The spring mostly used in gramophones is

- a) helical spring
- b) conical spring
- c) laminated spring
- d) flat spiral spring

Ans. (d)

Q.20 Which of the following spring is used in a mechanical wrist watch?

- a) Helical compression spring
- b) Spiral spring
- c) Torsion spring
- d) Bellevile spring

Ans. (c)