

# **MACHINE METHODS**

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# MACHINE METHODS

*A Self-Teaching Introduction*

**M. Adithan, PhD**



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# MECHANICAL ENGINEERING DRAWING

*Choose the correct alternative:*

1. In isometric projection, two of the axes are:
  - (a) 15 degrees with the horizontal
  - (b) 30 degrees with the horizontal
  - (c) 60 degrees with the horizontal
  - (d) 120 degrees with the horizontal
2. The device most often used in measuring cross-sectional areas shown on an engineering drawing is a:
  - (a) Pantograph
  - (b) French curve
  - (c) Geodimeter
  - (d) Planimeter
3. For a sphere:
  - (a) any section will be an ellipse
  - (b) auxiliary views are necessary to fully describe the figure
  - (c) a bottom view will be necessary to adequately represent the object
  - (d) all views of the object are similar
4. The system of presenting views of an object generally used in engineering drafting is:
  - (a) Trimetric projection
  - (b) Oblique projection
  - (c) Isometric projection
  - (d) Orthographic projection

5. Of the following items, the one that is least likely to be found in the title block of an engineering drawing is the:
  - (a) number of hours required to make the drawing
  - (b) name of the designer
  - (c) scale of the drawing
  - (d) date of completion of the drawing
6. On a drawing of an object, the heaviest lines would usually be:
  - (a) invisible lines
  - (b) main dimension lines
  - (c) the outline
  - (d) the centerlines
7. If the front and top views of a solid object are circles of the same diameter, then the object would be a:
  - (a) Torus
  - (b) Ellipsoid
  - (c) Parallelopiped
  - (d) Sphere
8. A pictorial drawing, two of the axes of which are 30 degrees with the horizontal, is known as:
  - (a) a diametric drawing
  - (b) an isometric drawing
  - (c) a perspective drawing
  - (d) an oblique drawing
9. In the part drawing of a component, the symbol  $\nabla$  refers to the:
  - (a) class of fit
  - (b) finish on that surface
  - (c) type of knurl to be machined on that surface
  - (d) class of steel to be used for the component.
10. A detailed drawing of component from which the component is fabricated is known as a:
  - (a) perspective drawing
  - (b) contour drawing
  - (c) trilinear drawing
  - (d) shop drawing
11. The name of the instrument used to find the areas of irregular shapes is:
  - (a) Planimeter
  - (b) Micrometer
  - (c) Perthometer
  - (d) Vernier caliper
  - (e) Indicator

- 12.** An instrument consisting of four jointed pins forming a parallelogram used for copying drawings or maps to any desired scale is called a:
- (a) Proportional divider
  - (b) Beam compass
  - (c) Planimeter
  - (d) Pantograph
- 13.** On a drawing showing front, rear, and side elevations and plan, the projected views are most likely to be:
- (a) isogonic
  - (b) orthographic
  - (c) isographic
  - (d) isometric
- 14.** Of the following, the most important reason for checking an engineering drawing is to:
- (a) check accuracy of the scaling
  - (b) eliminate unnecessary sections
  - (c) rectify the errors or mistakes
  - (d) check for the time taken to complete the drawing
- 15.** An approved method of obtaining the area of an irregular figure is by means of a:
- (a) Slide caliper
  - (b) Micrometer
  - (c) Planimeter
  - (d) Pantograph
- 16.** On the part drawings of components which require machining, the symbol  $\nabla$  denotes:
- (a) type of steel to be used for the component
  - (b) finish required on that surface
  - (c) class of fit
  - (d) tolerance value on the dimension
  - (e) welding is to be done
- 17.** On a production drawing, the details of a Metric thread are specified as:  $M20 \times 1.0$ . In this 1.0 represents:
- (a) the depth of the thread in mm
  - (b) the pitch of the thread in mm

- (c) the diameter of the wire (in mm) used to measure the thread characteristics
- (d) the diameter of the thread, in mm

**18.** Surface roughness on a drawing is represented by:

- (a) Triangle
- (b) Rectangle
- (c) Square
- (d) Parallelogram

**19.** RMS value stands for:

- (a) Root minimum square value
- (b) Root mean square value
- (c) Root maximum square value

**20.** CLA value is used to represent:

- (a) Surface dimensions
- (b) Surface hardness
- (c) Surface roughness.

### 1. Answer Key

- |               |                |                |                |
|---------------|----------------|----------------|----------------|
| <b>1.</b> (b) | <b>6.</b> (c)  | <b>11.</b> (a) | <b>16.</b> (b) |
| <b>2.</b> (d) | <b>7.</b> (d)  | <b>12.</b> (d) | <b>17.</b> (b) |
| <b>3.</b> (d) | <b>8.</b> (b)  | <b>13.</b> (b) | <b>18.</b> (a) |
| <b>4.</b> (d) | <b>9.</b> (b)  | <b>14.</b> (c) | <b>19.</b> (b) |
| <b>5.</b> (a) | <b>10.</b> (d) | <b>15.</b> (c) | <b>20.</b> (c) |

# 2

## *APPLIED MECHANICS, STRENGTH OF MATERIALS, AND FLUID MECHANICS*

*Choose the correct alternative:*

1. The hydrostatic pressure in a 60 cm diameter ductile iron water main is  $5 \text{ kg/cm}^2$ . If the thickness of the pipe is 12.5 mm, then the tension in the pipe material due to the hydrostatic pressure, is most nearly equal to:  
(a)  $30 \text{ kg/cm}^2$                       (c)  $90 \text{ kg/cm}^2$                       (e)  $5 \text{ kg/cm}^2$  only  
(b)  $60 \text{ kg/cm}^2$                       (d)  $120 \text{ kg/cm}^2$
2. The compressibility of a substance may be found from:  
(a) the modulus of elasticity (E)  
(b) the reciprocal of the modulus of elasticity  
(c) the bulk modulus of elasticity (K)  
(d) the reciprocal of the bulk modulus of elasticity  
(e) the Poisson's modulus
3. Within the elastic limit the ratio as defined by *Unit lateral contraction* is called:  
Unit axial elongation  
(a) the modulus of elasticity (E)    (d) Young's modulus  
(b) the modulus of rigidity (N)    (e) an imaginary ratio  
(c) Poisson's ratio

4. In a  $6 \times 20$  wire rope, the No.6 indicates the:
  - (a) diameter of the wire rope in mm
  - (b) number of strands
  - (c) number of wires
  - (d) gauge number of the wire
  
5. A spring has a constant of 5 kg/cm. The total energy required to elongate it through a distance of 6 cm is:
  - (a) 30 kg. cm
  - (b) 180 kg. cm
  - (c) 360 kg. cm
  - (d) 90 kg. cm
  - (e) 150 kg. cm
  
6. Sleeves are used around anchor bolts that connect steel columns to footings primarily to:
  - (a) allow for minor lateral adjustments of anchor bolts
  - (b) provide better bearing of base plate on the footing
  - (c) provide greater bond between anchor bolt and footing
  - (d) allow the proper setting of the column as to elevation
  
7. A round rod with a right handed thread is to be coupled with another rod of the same diameter but with a left handed thread. Of the following attachments, the one which is most appropriate to use is a/an:
  - (a) Turnbuckle
  - (b) Thimble
  - (c) wing nut
  - (d) eyebolt
  
8. A spring with a uniform scale of 120 kg/cm of compression has a force of 600 kg applied to it. The work done on the spring is:
  - (a) 3000 kg. cm
  - (b) 6000 kg. cm
  - (c) 1500 kg. cm
  - (d) 72,000 kg. cm
  
9. A 100 kg block resting on a horizontal plane has a static coefficient of friction of 0.30 and is acted on by a horizontal force of 20 kg. Frictional resistance under the above conditions is:
  - (a) 20 kg
  - (b) 30 kg
  - (c) 50 kg
  - (d) 10 kg
  - (e) 100 kg

- 10.** A flywheel is used on rotating machinery to:
- (a) allow rapid acceleration
  - (b) store and release energy as required
  - (c) decrease the weight of the equipment
  - (d) balance the rotating parts
- 11.** Steel columns are tied to concrete foundations by:
- (a) grouting
  - (b) anchor bolts
  - (c) cement paste
  - (d) gunite
- 12.** A C.H.U (Centigrade-Heat-Unit) is an unit of:
- (a) force
  - (b) energy
  - (c) power
  - (d) temperature
- 13.** If two objects are weighed in planet Mercury and it is found that they both lose the same weight, then the two objects must have identical:
- (a) specific gravities
  - (b) weights in air
  - (c) volumes
  - (d) densities
  - (e) weights in Mercury
- 14.** The law of conservation of momentum states that:
- I the linear momentum of the system remains constant
  - II the angular momentum of the system remains constant
  - III the sum of the linear and angular momenta of the system remain constant
- Which of the above statement (s) is/are true?
- (a) Only I
  - (b) Only II
  - (c) Only III
  - (d) Only I and II
  - (e) All three statements are correct

15. An anchor block at a bend in a pipe line must be designed primarily to resist forces due to:
- (a) friction and acceleration
  - (b) friction and pressure
  - (c) pressure and acceleration due to gravity
  - (d) static head
  - (e) pressure and velocity
16. A pilot in an airplane observes that objects in the cabin are just floating when he is at the top of a loop. The radius of curvature of the loop is 100 meters. The speed of the plane is closest to:
- (a) 32 meters/sec
  - (b) 64 meters/sec
  - (c) 320 meters/sec
  - (d) 640 meters/sec
  - (e) none of these
17. Two bodies of identical shape are dropped from a helicopter. If the density of the two bodies is not the same then:
- (a) because of Stoke's law they will achieve the same terminal velocity and reach the ground at the same time
  - (b) the less dense one will arrive first
  - (c) the more dense one will arrive first
  - (d) it is not possible to predict which will arrive first
  - (e) they will become attracted to each other and arrive at the same time
18. If you double the speed of a centrifugal pump,
- I twice as much power is required to operate it
  - II the volumetric discharge is increased 4 times
  - III the head becomes 4 times as great
- Which of the above statement(s) is/are true?
- (a) all of the above statements are true
  - (b) only II and III
  - (c) only III
  - (d) only I
  - (e) only II



- 19.** In a loaded horizontal, homogenous rectangular beam, the horizontal shearing stress at any cross-section perpendicular to the neutral axis
- (a) has a maximum value at the outer fibers of the beam
  - (b) is equal to zero
  - (c) has a maximum value at the neutral axis and is equal to 1.5 times the average shearing stress at that section
  - (d) is constant across that section
  - (e) equals  $\frac{2}{3}$  the bending stress at the outer fibers
- 20.** Which of the following is true concerning St. Venant's Principle?
- (a) Deformations of all materials must be equal
  - (b) It is a method for determining the stress conditions at the end of the plates
  - (c) Stress conditions approach uniformity as the distance from the point of application of the force increases
  - (d) If left long enough, the stresses will tend to relieve themselves
- 21.** Under atmospheric conditions, the maximum height through which a fluid of specific gravity  $x$  may be siphoned is:
- (a)  $x/10$  meters
  - (b)  $(1 - x)/10$  meters
  - (c)  $10/(1 - x)$  meters
  - (d)  $10/x$  meters
  - (e)  $(1 + x)/10$  meters
- 22.** What unbalanced torque will produce an angular acceleration of  $2 \text{ rad/sec}^2$  in a 120-kg disc having a radius of gyration of 2 meters?
- (a) 960 m-kg
  - (b) 240 m-kg
  - (c) 48 m-kg
  - (d) 96 m-kg
  - (e) 480 m-kg
- 23.** If a longitudinal wave of frequency 1000 vibrations per second has a wave length of 10 meters, its speed of propagation is:
- (a) 100 meters/second
  - (b) 2500 meters/second
  - (c) 5000 meters/second
  - (d) 10,000 meters/second
  - (e) 20,000 meters/second

24. An impulse is a product of:
- (a) force and displacement
  - (b) force and velocity
  - (c) mass and velocity
  - (d) force and time
  - (e) mass and acceleration
25. A model airplane is made to an exact scale of  $1/6$  that of the prototype aircraft. If the model is to be flown in the same atmospheric conditions as the prototype, then the model must be flown—as fast as the prototype.
- (a) Twice
  - (b) One-half
  - (c) One-sixth
  - (d) Six times
  - (e) Thirty-six times
26. A Newton is the force required to give:
- (a) one kg mass an acceleration of 1 meter/ sec<sup>2</sup>
  - (b) one kg mass a velocity of 1 meter/sec
  - (c) one kg mass a velocity of 1 cm/sec
  - (d) one kg mass an acceleration of 10 meters/ sec<sup>2</sup>
27. If a power screw is being turned at 10 R.P.M. by a constant applied torque of 50 kg-cm, then the work done in one revolution is most nearly equal to—kg-cm.
- (a)  $25 \pi$
  - (b)  $50 \pi$
  - (c)  $100 \pi$
  - (d)  $150 \pi$
  - (e)  $200 \pi$
28. A lift cable will have its greatest tension when the lift cabin is moving:
- (a) down and is coming to rest
  - (b) upward at a constant speed
  - (c) upward and is coming to rest
  - (d) downward at a constant speed
  - (e) when it is at rest
29. The frequency of a vibrating string is:
- (a) inversely proportional to the square of the length
  - (b) directly proportional to the square of the tension
  - (c) inversely proportional to the square root of the mass per unit length
  - (d) inversely proportional to the diameter of the string
  - (e) directly proportional to the square root of the tension and inversely proportional to the mass per unit length

- 30.** In a system consisting of any number of concurrent, coplanar forces, the equilibrant consists of:
- (a) a couple
  - (b) a single force
  - (c) a single force plus a couple
  - (d) all of the above
  - (e) none of the above
- 31.** A body moves from rest with a constant acceleration of 5 meters/sec<sup>2</sup>. The distance covered in 5 seconds is most nearly:
- (a) 125 meters
  - (b) 62.5 meters
  - (c) 250 meters
  - (d) 36 meters
  - (e) 31.25 meters
- 32.** If absolute viscosity, kinematic viscosity, and density are denoted by  $u$ ,  $v$  and  $p$  respectively, the relationship between these parameters is:
- (a)  $v = pu$
  - (b)  $u = pv$
  - (c)  $v^2 = pu$
  - (d)  $u^2 = pv$
  - (e) none of these
- 33.** A flywheel on a motor goes from rest to 1000 R.P.M. in 6 seconds. The number of revolutions made is:
- (a) 1000
  - (b) 500
  - (c) 250
  - (d) 50
  - (e) 25
- 34.** Which statement is true concerning the laws of affinity for centrifugal pumps?
- (a) At constant impeller diameter the capacity is proportional to the square of the R.P.M.
  - (b) At constant impeller diameter the H.P. is proportional to the R.P.M.
  - (c) At constant R.P.M. the head is proportional to the cube of the impeller diameter
  - (d) At constant R.P.M. the H.P. is proportional to the square of the impeller diameter
  - (e) None of these
- 35.** A flywheel is accelerated from 220 R.P.M. to 380 R.P.M. in 100 revolutions. The time taken is:
- (a) 20 seconds
  - (b) 18 seconds
  - (c) 16 seconds
  - (d) 14 seconds
  - (e) 12 seconds

36. A plough-ox works at the rate of 1/10 H.P. for 10 hours. The calories used up is closest to:
- (a)  $640 \times 10^3$  (c)  $3.20 \times 10^3$  (e) 64.0  
(b)  $6.40 \times 10^3$  (d) 640
37. If a ball moves in a straight path down an inclined plane with constantly increasing speed, then which of the following statements are true?
- I Its acceleration is increasing  
II Its acceleration is constant  
III Its kinetic energy is increasing  
IV Its potential energy is decreasing
- (a) All four are correct (c) II, III and IV (e) I, II and III  
(b) I and II only (d) I, III and IV
38. A pipe 180 cm in diameter carries fluid at a pressure of 15 kg/ cm<sup>2</sup>. The pipe wall is 12 mm thick. What is the hoop stress in the pipe?
- (a) 112.5 kg/ cm<sup>2</sup> (c) 1125 kg/ cm<sup>2</sup> (e) 4500 kg/ cm<sup>2</sup>  
(b) 225 kg/ cm<sup>2</sup> (d) 2250 kg/ cm<sup>2</sup>
39. An electric vehicle is driven by a D.C. motor which receives power from a 100 Volt battery. The vehicle is required to exert a constant tractive force of 90 kg at 12 km.p.h. The overall efficiency is 75%. The current drawn from the battery is:
- (a) 2.70 Amp. (c) 40.0 Amp. (e) 400.0 Amp.  
(b) 27.0 Amp. (d) 270.0 Amp.
40. A rope is wrapped two full turns around an horizontal log. A weight  $W$  is hung on one end. The pull on the other end necessary to keep equilibrium is which of the following? (The coefficient of friction between the rope and the log is  $1/\pi$ ):
- (a)  $W/e^2 \pi$  (c) 1000 (e) none of these  
(b)  $W/e^4$  (d) 4000

41. The expression  $\frac{bd^3}{12}$  refers to:
- (a) The  $M$  of  $I$  of a rectangle about its base
  - (b) the  $M$  of  $I$  of a rectangle about an axis through its centroid
  - (c) the product of inertia of a rectangle about a diagonal
  - (d) the section modulus of a symmetrical channel
  - (e) the  $M$  of  $I$  of a triangle about an axis through its centroid
42. How is the frequency ( $f$ ) of a vibrating string is related to the mass/unit length of the string ( $m$ )?
- (a)  $f$  is proportional to  $m$
  - (b)  $f$  is proportional to  $1/m$
  - (c)  $f$  is proportional to  $\sqrt{m}$
  - (d)  $f$  is proportional to  $1/\sqrt{m}$
  - (e) none of these
43. Two men carry a log 20 m long weighing 300 kg and with its center of gravity 6 m from one end. One man is at the heavy end. Where must the other man be placed from the other end if each man carries 150 kg?
- (a) 12 m
  - (b) 8 m
  - (c) 6 m
  - (d) 11 m
  - (e) 9 m
44. The formula for the extreme fiber stress in a cylindrical shaft of radius  $R$  is  $S = TR/J$ . The term  $J$  is:
- (a) the  $M$  of  $I$  of the cross section about a diameter
  - (b) the polar  $M$  of  $I$  of the cross section about the longitudinal axis
  - (c) the polar  $M$  of  $I$  of the cross section about a diameter
  - (d) the product of inertia of the cross section about a diameter
  - (e) none of these
45. In the formula  $\frac{P}{A} = \frac{\pi^2 E^2}{(L/R)^2}$  for the design of columns,  $L/K$  is:
- (a) the stiffness ratio
  - (b) the rigidity factor
  - (c) the slenderness ratio
  - (d) Poisson's ratio
  - (e) Young's modulus

46. A long steel pipe 120 cm in diameter carries a fluid at a pressure of 7 kg/cm<sup>2</sup>. The pipe wall is 6 mm thickness. The hoop stress in the wall is:
- (a) 1400 kg/cm<sup>2</sup>                      (c) 350 kg/cm<sup>2</sup>                      (e) 2800 kg/cm<sup>2</sup>  
(b) 700 kg/cm<sup>2</sup>                      (d) 175 kg/cm<sup>2</sup>
47. The size or diameter of a shaft in any power transmission is proportional to:
- (a) speed of the shaft  
(b) torque to be transmitted  
(c) horse power to be transmitted  
(d) allowable shear stress of the shaft material
48. In riveted structural steel work, the type of member that usually connects a beam to a column is:
- (a) an angle                              (c) a gusset plate  
(b) a channel                              (d) a tee
49. The experimental discovery that the change in length of a solid is proportional to the force causing it is known as:
- (a) Maxwell's law                      (c) Hooke's law  
(b) Boyle's law                          (d) Charles's law
50. The ratio of stress to strain within the elastic limit is given the symbol  $E$  and is called:
- (a) the shear modulus                      (d) the reversible range  
(b) the modulus of rigidity                      (e) Hooke's constant  
(c) Young's modulus
51. A vertical rectangular steel bar of section 5 cm × 10 cm and 240 cm long carries a load of 8000 kg. The elongation in the bar in mm due to the load is closest to (Assume  $E = 2.10 \text{ kg/cm}^2$ ):
- (a) 0.01 mm                              (c) 0.10 mm                              (e) 1.00 mm  
(b) 0.02 mm                              (d) 0.20 mm

- 52.** In the design of riveted joints, Unwin's Rule gives the relationship between:
- (a) diameter of the rivet and the load
  - (b) thickness of the plate and the load
  - (c) thickness and crushing strength of joint
  - (d) diameter of rivet and thickness of plate
  - (e) number of rivets and size of rivet
- 53.** The joints used on underground CI pipes are generally:
- (a) Tongue and groove joints
  - (c) Bell and spigot joints
  - (b) Flanged joints
  - (d) Coupling joints
- 54.** The Brinell number refers to a material's:
- (a) Malleability
  - (d) Elasticity
  - (b) Melting point
  - (e) Hardness
  - (c) Piezo-electric constant
- 55.** The property of steel that makes it suitable for use in cables is its strength in:
- (a) compression
  - (c) shear
  - (b) tension
  - (d) torsion
- 56.** The Rockwell number of a metal generally measures its:
- (a) hardness
  - (c) ductility
  - (b) tensile strength
  - (d) malleability
- 57.** Of the following metals, the one that has the greatest specific gravity is:
- (a) Zinc
  - (c) Iron
  - (b) Lead
  - (d) Mercury
- 58.** The densest metal is:
- (a) Lead
  - (c) Uranium
  - (e) Titanium
  - (b) Osmium
  - (d) Tungsten

**59.** Strain is expressed in terms of:

- (a) N/mm<sup>2</sup> (c) kg/m<sup>2</sup>  
(b) a % (d) a ratio

**60.** *Statement:* For a very tough material the Izod hammer moves in a large swing after breaking the sample specimen. *Because*

Reason: A large amount of energy is used up in breaking tough specimen.

	<i>Statement</i>	<i>Reason</i>	<i>Reason Explains Statement</i>
(a)	True	True	Yes
(b)	True	True	No
(c)	True	False	No
(d)	False	True	No

**61.** Toughness of a material can be measured with the help of:

- (a) Rockwell Hardness Tests (c) Standard Spiral Tests  
(b) Notched-bar Tests (d) Brinell Hardness Tests

**62.** Notched-bar tests are frequently used for testing:

- (a) the impact strength of a material  
(b) the hardness of a material  
(c) the machinability of a metal  
(d) the corrosion resistance of the material

**63.** Lack of toughness in material is usually referred to as:

- (a) ductility (c) malleability (e) continuity.  
(b) brittleness (d) plasticity

**64.** In material testing laboratory, Izod's test measures the. .... characteristics of the material tested.

- (a) Hardness (c) Tensile strength  
(b) Toughness (d) Shear strength



- 65.** Steel reinforcing bars (reinforcements) are used in R.C.C. (Reinforced Cement Concrete) primarily because:
- (a) the concrete is weak in compression
  - (b) the concrete is weak in tension
  - (c) it increases the density of the concrete
  - (d) the quality of the cement used in concrete is uncertain
- 66.** Highway roads are banked around a curve because:
- (a) it facilitates the design of the road
  - (b) it aids in landscaping
  - (c) it prevents centrifugal force from throwing the vehicle away from the road
  - (d) it provides good visibility to the driver of the vehicle

## 2. Answer Key

- |                |                |                |                |                |
|----------------|----------------|----------------|----------------|----------------|
| <b>1.</b> (d)  | <b>15.</b> (e) | <b>29.</b> (c) | <b>43.</b> (b) | <b>57.</b> (d) |
| <b>2.</b> (d)  | <b>16.</b> (a) | <b>30.</b> (b) | <b>44.</b> (b) | <b>58.</b> (b) |
| <b>3.</b> (c)  | <b>17.</b> (a) | <b>31.</b> (b) | <b>45.</b> (c) | <b>59.</b> (d) |
| <b>4.</b> (b)  | <b>18.</b> (c) | <b>32.</b> (b) | <b>46.</b> (b) | <b>60.</b> (d) |
| <b>5.</b> (d)  | <b>19.</b> (c) | <b>33.</b> (d) | <b>47.</b> (c) | <b>61.</b> (b) |
| <b>6.</b> (a)  | <b>20.</b> (c) | <b>34.</b> (e) | <b>48.</b> (a) | <b>62.</b> (a) |
| <b>7.</b> (a)  | <b>21.</b> (d) | <b>35.</b> (a) | <b>49.</b> (c) | <b>63.</b> (b) |
| <b>8.</b> (c)  | <b>22.</b> (d) | <b>36.</b> (a) | <b>50.</b> (c) | <b>64.</b> (b) |
| <b>9.</b> (a)  | <b>23.</b> (d) | <b>37.</b> (c) | <b>51.</b> (d) | <b>65.</b> (b) |
| <b>10.</b> (b) | <b>24.</b> (d) | <b>38.</b> (c) | <b>52.</b> (d) | <b>66.</b> (c) |
| <b>11.</b> (b) | <b>25.</b> (d) | <b>39.</b> (c) | <b>53.</b> (c) |                |
| <b>12.</b> (b) | <b>26.</b> (a) | <b>40.</b> (b) | <b>54.</b> (e) |                |
| <b>13.</b> (c) | <b>27.</b> (c) | <b>41.</b> (b) | <b>55.</b> (b) |                |
| <b>14.</b> (d) | <b>28.</b> (a) | <b>42.</b> (d) | <b>56.</b> (a) |                |



## *FERROUS MATERIALS AND METALLURGY*

*Choose the correct alternative:*

1. A ferrous metal is one which:
  - (a) does not contain iron
  - (b) is an alloy
  - (c) is a mixture of copper and brass
  - (d) contains iron
  - (e) contains aluminium
2. An alloy is:
  - (a) any article made of pure metal
  - (b) a metal which has not yet been refined
  - (c) a mixture of two or more metals
  - (d) a mixture of two metals one of which must be aluminium
  - (e) a mixture of two metals one of which must be iron
3. Mild steel belongs to the category of:

(a) Low-carbon steel	(c) High-carbon steel
(b) Medium-carbon steel	(d) Tool steel
4. Steels whose Carbon content ranges from 0.05 to 0.30% are classified as:

(a) Low-Carbon steels	(c) High-Carbon steels
(b) Medium-Carbon steels	(d) Tool steels

5. In white cast iron, the Carbon is present in the form of:
 

(a) Austenite	(c) Eutectic	(e) Graphite
(b) Cementite	(d) Ferrite	
6. The important property of high Silicon (12-18%) cast iron is its:
 

(a) high brittleness	(d) high malleability
(b) high ductility	(e) high corrosion resistance
(c) high hardness	
7. Of the following types of pipes of the same diameter, the one that is least corrosion resistant is:
 

(a) Copper	(c) Wrought iron
(b) Steel	(d) Brass
8. Mild steel has got the following metallic structure:
 

(a) Face Centered Cubic structure
(b) Body Centered Cubic structure
(c) Close packed hexagonal structure
(d) Orthorhombic crystalline structure
9. Alpha Iron has got:
 

(a) B.C.C. crystalline structure
(b) F.C.C. crystal structure
(c) H.C.P. structure
(d) Orthorhombic crystalline structure
10. Carbon present in the chemically combined form in cast iron is known as:
 

(a) Austenite	(c) Ferrite	(e) Pearlite
(b) Cementite	(d) Martensite	
11. The temperature and Carbon content at which eutectic reaction occurs in Fe-C equilibrium diagram are:
 

(a) 723°C and 0.02%C	(d) 1130°C and 2.00%C
(b) 723°C and 0.80%C	(e) 1130°C and 4.30%C
(c) 738°C and 0.69%C	

**12.** The temperature and Carbon content at which eutectoid reaction occurs in Fe-C equilibrium diagram are:

- (a) 723°C and 0.02%C                      (c) 1130°C and 2.00%C  
(b) 723°C and 0.80%C                      (d) 1130°C and 4.30%C

**13.** In grey cast iron, the Carbon is in the form of:

- (a) Cementite                      (d) Spheroids  
(b) Flakes                      (e) Austenite  
(c) Nodular aggregates of graphite

**14.** The property of a high Silicon cast iron is:

- (a) its high brittleness  
(b) its high freezing temperature  
(c) its high hardness  
(d) its malleability

**15.** Malleable cast iron possesses ..... than ordinary grey cast iron.

- (a) higher compressive strength    (d) higher ductility  
(b) higher % C                      (e) lower ductility  
(c) higher ductility

**16.** The majority of Grey Iron castings will have a total % of Carbon varying from:

- (a) 6.0 – 8.0%                      (c) 0.5 – 1.0%  
(b) 2.5 – 4.5%                      (d) 0.02 – 0.04%

**17.** Gibb's phase rule is given by the expression  $F$  is equal to:

- (a)  $C + P$                       (c)  $C - P - 2$                       (e)  $C - P + 2$   
(b)  $C - P$                       (d)  $C + P - 2$

where  $F$  = no. of degrees of Freedom

$C$  = no. of Components, and

$P$  = no. of Phases

- 18.** An important product manufactured by the rolling process is:
- (a) Rollers
  - (b) Discs
  - (c) Metallic cans
  - (d) Metal rolls
  - (e) I-sections
- 19.** Seamless tubes in mass production are manufactured by the ..... process:
- (a) Metal rolling
  - (b) Extrusion
  - (c) Wire drawing
  - (d) Spinning
  - (e) Longitudinal welding
- 20.** In malleable iron, the Carbon is present in the form of:
- (a) nodular aggregates of graphite
  - (b) flakes
  - (c) spikes
  - (d) cementite
- 21.** Steel is made from cast iron by removing all excess:
- (a) Ferrous carbide
  - (b) Carbon
  - (c) Silicon
  - (d) Sulphur
  - (e) Oxygen
- 22.** The most important element which controls the physical properties of steel is:
- (a) Silicon
  - (b) Manganese
  - (c) Tungsten
  - (d) Carbon
  - (e) Chromium
- 23.** Machine steel or mild steel are the terms commonly used to describe the steel containing:
- (a) more than 0.40% Carbon
  - (b) less than 0.30% Carbon
  - (c) more than 0.50% Carbon
  - (d) more than 1.00% Carbon
- 24.** Large amounts of Silicon when added to steel will increase the ..... properties of the steel.
- (a) Mechanical
  - (b) Refractory
  - (c) Corrosive
  - (d) Magnetic

25. The steel used in cutting tools of high quality have a ..... grain structure.
- (a) fine
  - (b) medium
  - (c) coarse
  - (d) brittle
26. Steels containing low percentages of Nickel, Tungsten, or Chromium are classified as:
- (a) plain carbon steels
  - (b) alloy steels
  - (c) tool steels
  - (d) stainless steels
27. Steels containing high percentages of elements other than Carbon are classified as:
- (a) alloy steels
  - (b) stainless steels
  - (c) structural steels
  - (d) high carbon steels
28. High carbon tool steels are alloyed with ..... to increase their resistance to shock.
- (a) Carbon
  - (b) Tungsten
  - (c) Nickel
  - (d) Vanadium
  - (e) Chromium
29. A test commonly applied to steel of unknown quality for identification purposes is the:
- (a) Acid-etch test
  - (b) spark test
  - (c) fracture test
  - (d) dye-penetrant test
30. Two alloying elements of steel commonly used as purifiers or as cleaning agents are:
- (a) Manganese and Silicon
  - (b) Vanadium and Chromium
  - (c) Molybdenum and Nickel
  - (d) Tungsten and Chromium
31. An alloying element commonly used in steel to control its properties is:
- (a) Tungsten
  - (b) Silicon
  - (c) Nickel
  - (d) Magnesium
  - (e) Vanadium

- 32.** Hot working steels are alloy steels having a relatively:
- (a) Low Carbon content                      (c) Low Sulphur content
  - (b) High Carbon content                      (d) High Oxygen content
- 33.** The element most prominent in H.S.S. (High Speed Steel) is:
- (a) Carbon                                      (c) Chromium
  - (b) Tungsten                                      (d) Vanadium
- 34.** High Speed Steel (H.S.S.) which is commonly used in the manufacturing of cutting tools belongs to the category of:
- (a) Low-carbon steel                      (d) Alloy steel
  - (b) Medium-carbon steel                      (e) Stainless steel
  - (c) High-carbon steel
- 35.** Which one of the following metals would you use to make a pair of calipers?
- (a) H.S.S.                                      (c) Mild steel                                      (e) Brass
  - (b) CI                                      (d) Aluminium
- 36.** Which one of the following metals is used to make cold chisel?
- (a) Nickel silver                      (c) Zinc                                      (e) CI
  - (b) Mild steel                      (d) High-Carbon steel
- 37.** Good quality twist drills are made of:
- (a) CI
  - (b) Mild steel
  - (c) Stainless steel
  - (d) H.S.S (High Speed Steel)
  - (e) Zinc
- 38.** Which one of the following metals could not be forged?
- (a) Wrought Iron                      (d) High-Carbon steel
  - (b) Mild steel                      (e) CI
  - (c) High Speed Steel (H.S.S.)



- 39.** Stainless steel contains:
- (a) Chromium, Iron, and Nickel
  - (b) Chromium and Nickel
  - (c) Iron and Carbon
  - (d) Chromium, Nickel, Iron, and Carbon
- 40.** What is the material of the cutting tool generally used on a lathe?
- (a) Cast Iron
  - (b) Mild steel
  - (c) Low-Carbon steel
  - (d) High Speed Steel (H.S.S.)
  - (e) Brass
- 41.** An engineer's hammer should be made from:
- (a) Cast Iron
  - (b) High-Carbon steel
  - (c) Mild steel
  - (d) Case hardened mild steel
  - (e) H.S.S.(High Speed Steel)
- 42.** When observed unetched the Carbon in gray cast iron will be seen in the form of:
- (a) Austenite
  - (b) Cementite
  - (c) Ferrite
  - (d) Martensite
  - (e) Graphite
- 43.** Reinforcing steel used in R.C.C.:(Reinforced-Cement-Concrete) work is made of:
- (a) medium carbon steel
  - (b) alloy steel
  - (c) wrought iron
  - (d) tool steel
- 44.** Lead is poured into the joint between two pipes. The material composition of each pipe is most likely to be:
- (a) Cast iron
  - (b) Vitrified clay
  - (c) Asbestos cement
  - (d) Concrete
- 45.** Some of the elements found in ordinary structural steel are:
- (a) Silicon, Boron, and Nickel
  - (b) Carbon, Manganese, and Sodium

- (c) Carbon, Fluorine, and Tungsten
  - (d) Carbon, Silicon, and Manganese
- 46.** The frame and cover of a sewer man-hole is usually made of:
- (a) Stainless steel                      (c) Monel metal                      (e) Mild steel
  - (b) Cast iron                              (d) Structural steel
- 47.** The hardness of carbon tool steel will be increased when alloyed with ..... and Vanadium.
- (a) Tungsten                              (c) Silicon                              (e) Silver
  - (b) Chromium                              (d) Manganese
- 48.** The element when added to steel that will give the steel high strength and toughness is:
- (a) Magnesium                              (c) Phosphorous
  - (b) Manganese                              (d) Sulphur
- 49.** Among the following materials, the most suitable material for withstanding shock and vibration without danger of cracking is:
- (a) Chilled cast iron                      (c) Malleable iron
  - (b) Gray cast iron                              (d) White cast iron
- 50.** The maximum number of cubic structures which crystalline solids may assume is:
- (a) 10    (c) 8    (e) 5
  - (b) 2    (d) 3
- 51.** Ferrites are most likely to be found in which of the following?
- (a) Analogue computers                      (d) Key-punch machines
  - (b) Computer programs                      (e) Computer memories
  - (c) Computer output printers
- 52.** The property of material by virtue of which it can be drawn into fine wire is known as:
- (a) Elasticity                              (c) Ductility
  - (b) Malleability                              (d) Rigidity

- 53.** Which one of the following metals will readily fracture if hit with a hammer?
- (a) Mild steel                      (c) Bras                      (e) Lead  
(b) Nickel silver                  (d) Cast iron
- 54.** From which one of the following materials is a foundry crucible made?
- (a) Wood                      (c) Graphite                      (e) Lead  
(b) Polystyrene                  (d) Aluminium
- 55.** One of the following is not a structural steel shape?
- (a) H                      (c) V  
(b) T                      (d) I
- 56.** A special steel which has a temperature coefficient of almost zero and which is widely used for making measuring devices such as tapes is called:
- (a) Stainless steel                      (d) Invar steel  
(b) Platinum steel                      (e) Nickel-Chrome steel  
(c) Cobalt steel
- 57.** The unique property of cast iron is its:
- (a) high tensile strength                      (d) good damping characteristics  
(b) high ductility                      (e) good surface finish  
(c) high density
- 58.** Pearlite is a combination of:
- (a) Ferrite and Austenite                      (d) Ferrite and Cementite  
(b) Ferrite and Graphite                      (e) Cementite and Austenite  
(c) Graphite and Austenite
- 59.** In nodular iron, graphite is in the form of:
- (a) flakes                      (c) stars  
(b) spikes                      (d) spheroids
- 60.** Austenite consists of:
- (a) Cementite and Alpha-Iron                      (d) Cementite and Pearlite  
(b) Cementite and Beta-Iron                      (e) Graphite and Ferrite  
(c) Cementite and Gamma-Iron

**3. Key**

- |         |         |         |         |         |
|---------|---------|---------|---------|---------|
| 1. (d)  | 13. (b) | 25. (a) | 37. (d) | 49. (c) |
| 2. (c)  | 14. (c) | 26. (a) | 38. (e) | 50. (d) |
| 3. (a)  | 15. (d) | 27. (a) | 39. (d) | 51. (e) |
| 4. (a)  | 16. (b) | 28. (d) | 40. (d) | 52. (c) |
| 5. (b)  | 17. (e) | 29. (b) | 41. (b) | 53. (d) |
| 6. (e)  | 18. (e) | 30. (a) | 42. (e) | 54. (c) |
| 7. (b)  | 19. (b) | 31. (b) | 43. (a) | 55. (c) |
| 8. (b)  | 20. (a) | 32. (b) | 44. (a) | 56. (d) |
| 9. (a)  | 21. (b) | 33. (b) | 45. (d) | 57. (d) |
| 10. (b) | 22. (d) | 34. (d) | 46. (b) | 58. (d) |
| 11. (e) | 23. (b) | 35. (c) | 47. (a) | 59. (d) |
| 12. (b) | 24. (d) | 36. (d) | 48. (b) | 60. (c) |

# 4

## *NON-FERROUS MATERIALS*

*Choose the correct alternative:*

1. Brass is an alloy of two metals. They are:  
(a) Chromium and Carbon                      (d) Copper and Zinc  
(b) Tin and Aluminium                      (e) Zinc and Tin  
(c) Copper and Tin
2. The crystal structure of brass is:  
(a) F.C.C.  
(b) B.C.C.  
(c) H.C.P.  
(d) Orthorhombic crystalline structure  
(e) None of the above
3. Which one of the following metals would work-harden more quickly than the others?  
(a) Copper                      (c) Lead                      (e) Aluminium  
(b) Brass                      (d) Silver
4. Bronze is an alloy of:  
(a) Brass and Tin                      (d) Copper and Zinc  
(b) Zinc and Tin                      (e) Copper and Tin  
(c) Sulphur and Tin

5. Babbitt metal is used primarily in:  
(a) Ball bearings (d) Thermocouples  
(b) Roller bearings (e) Bridge construction  
(c) Sleeve bearings
6. A specimen of Aluminium metal when observed under microscope shows:  
(a) B.C.C. crystalline structure  
(b) F.C.C. crystal structure  
(c) H.C.P. structure  
(d) A complex cubic structure  
(e) Orthorhombic crystalline structure
7. Which one of the following metals is sufficiently ductile to enable it to be drawn into wire?  
(a) Tin (c) Lead  
(b) Copper (d) Zinc
8. Zinc has got the following crystal structure:  
(a) Face Centered Cubic structure  
(b) Body Centered Cubic structure  
(c) Hexagonal Close Packed structure  
(d) Orthorhombic crystalline structure
9. Powder Metallurgy (PM) techniques are used in the production of:  
(a) High Carbon Steel (c) Tungsten carbide tool bits  
(b) HSS tools (d) Twist drills
10. Asbestos is a:  
(a) mineral fiber (c) mixture of fiber and glass wool  
(b) fiber reinforced plastic (d) mixture of mica and fiber
11. Mica is:  
(a) a conductor of current (c) a mixture of plastic and rubber  
(b) an insulator (d) a petroleum by-product

- 12.** Vulcanizing is usually applied to:
- (a) plastic products
  - (b) rubber products
  - (c) mixture of plastic and rubber
- 13.** Poly-Vinyl-Chloride (PVC) is:
- (a) a compact form of mica
  - (b) a mixture of wool and cork
  - (c) a thermo-plastic material
  - (d) a thermo-setting plastic material
  - (e) a rubber product
- 14.** With reference to the plastics listed, which one of the following statements is true?
- |                          |                          |
|--------------------------|--------------------------|
| I. Polystyrene           | II. Poly-Vinyl-Chloride  |
| III. Phenol formaldehyde | IV. Tetra fluor-ethylene |
| V. Polyethylene          |                          |
- (a) All are thermoplastic materials
  - (b) All are thermosetting materials
  - (c) I and II are both thermoplastic materials
  - (d) Only III is thermosetting material
  - (e) I and III are both thermosetting materials
- 15.** The plastic material “teflon” is known primarily for its:
- (a) great mechanical strength
  - (b) extreme low coefficient of friction
  - (c) great heat resistance
  - (d) great hardness
  - (e) good electrical conductivity
- 16.** Which statement best describes thermoplastic materials?
- (a) they soften when cooled and harden when heated
  - (b) they become permanently hard when heated
  - (c) they relate to one particular trade name
  - (d) they soften when heated and harden when cooled
  - (e) they are phenol formaldehydes

17. In specifications containing the statement “Scrubbers are constructed of P.V.C.” the term P.V.C. refers to:  
(a) Plain Vitrified Clay                      (c) Patented Vanadium Copper  
(b) Poly Vinyl Chloride                      (d) Pliable Varnished Canvas
18. The soft material placed between two flanges of a CI water pipe to prevent leakage is called:  
(a) Gasket                                      (c) Plinth  
(b) Shim    (d) Spelter
19. A process commonly used to preserve wood against decay is:  
(a) Anodizing                                  (c) Grouting  
(b) Creosoting                                  (d) Guniting
20. Joints in cast iron water lines are generally sealed with:  
(a) mortar                                      (c) couplings  
(b) lead and jute fibers                      (d) quick setting cement mixture
21. The two important Copper base alloys are:  
(a) Monel and Brass                          (d) Cupronickel and Bell metal  
(b) Brass and Bronze                          (e) Tin and Phosphor bronze  
(c) Monel and Bronze
22. The Babbitt metals are used:  
(a) for dies and cutting tools              (c) in the manufacture of gears  
(b) for high speed shafts                      (d) as bearing metals
23. Aluminium is extracted from:  
(a) Anthracite ores                              (b) Bauxite ores  
(c) Hematite ores                                  (d) Magnesite ores
24. Monel metal is an alloy of:  
(a) Molybdenum and Aluminium  
(b) Chromium and Silicon



- (c) Nickel and Chromium
  - (d) Nickel and Copper
- 25.** Gun metal is an alloy of:
- (a) Copper and Zinc
  - (b) Copper and Tin
  - (c) Copper, Tin, and Phosphorus
  - (d) Copper, Tin, and Silicon
  - (e) Copper, Zinc, and Tin
- 26.** Phosphorus Bronze is an alloy of:
- (a) Phosphorus and Copper
  - (b) Phosphorus, Copper, and Tin
  - (c) Phosphorus, Copper, and Zinc
  - (d) Phosphorus, Tin, and Zinc
- 27.** A process of applying outside coating on aluminium is known as:
- (a) oxidizing
  - (b) anodizing
  - (c) galvanizing
- 28.** A process of coating zinc by hot dipping is called:
- (a) anodizing
  - (b) galvanizing
  - (c) brazing

#### 4. Answer Key

- |               |                |                |                |                |
|---------------|----------------|----------------|----------------|----------------|
| <b>1.</b> (d) | <b>7.</b> (b)  | <b>13.</b> (c) | <b>19.</b> (b) | <b>25.</b> (e) |
| <b>2.</b> (a) | <b>8.</b> (c)  | <b>14.</b> (d) | <b>20.</b> (b) | <b>26.</b> (b) |
| <b>3.</b> (b) | <b>9.</b> (c)  | <b>15.</b> (b) | <b>21.</b> (b) | <b>27.</b> (b) |
| <b>4.</b> (e) | <b>10.</b> (a) | <b>16.</b> (d) | <b>22.</b> (d) | <b>28.</b> (b) |
| <b>5.</b> (c) | <b>11.</b> (b) | <b>17.</b> (b) | <b>23.</b> (b) |                |
| <b>6.</b> (b) | <b>12.</b> (b) | <b>18.</b> (a) | <b>24.</b> (d) |                |



# 5

## FOUNDRY TECHNOLOGY

*Choose the correct alternative:*

1. The purpose of providing a draft allowance on the patterns is:
  - (a) to provide good draft of air in the sand moulding
  - (b) to provide for distortion that might take place
  - (c) to remove the pattern easily from the moulding
  - (d) to increase the strength of the mould walls
  - (e) to push the pattern easily into the moulding
2. Among the following materials the shrinkage allowance is more for:
  - (a) cast iron
  - (c) lead
  - (e) steel
  - (b) brass
  - (d) aluminium alloy
3. One of the important advantages of metal patterns over wooden patterns is that:
  - (a) it is readily available
  - (c) it is useful in machine moulding
  - (b) it is easy to make
  - (d) it is less costly
4. .... is an added projection on a pattern and forms a seat to support and locate the core in the mould.
  - (a) Mould print
  - (c) Drag
  - (e) Chaplet
  - (b) Core print
  - (d) Cope

5. The casting process which is probably responsible for the largest volume of castings produced is the..... process.
  - (a) Permanent mould casting
  - (b) Die casting
  - (c) Centrifugal casting
  - (d) Sand casting
  - (e) Ceramic moulding
  
6. The advantage of synthetic sand is .....
  - (a) It is less costly
  - (b) Its properties can be controlled easily
  - (c) It possesses high moisture
  - (d) It possesses high % of clay
  
7. The maximum quantity of moisture content in the moulding sand can be up to:
 

(a) 20%	(c) 8%
(b) 14%	(d) 2%
  
8. The sand which is used to keep the green sand from sticking to the pattern is known as:
 

(a) Moulding sand	(c) Pattern sand	(e) Permeable sand
(b) Core sand	(d) Parting sand	
  
9. Dilatometer is used to find:
  - (a) permeability of molding sand
  - (b) green compression strength
  - (c) fineness number of molding sand
  - (d) hot strength of molding sand
  - (e) moisture content of molding sand
  
10. Cope in foundry practice refers to:
  - (a) bottom half of molding box
  - (b) top half of molding box

- (c) middle portion of the molding box
  - (d) coating on the mold face
- 11.** The purpose of chaplets is:
- (a) just like chills to ensure directional solidification
  - (b) to provide efficient venting
  - (c) to support the cores
  - (d) same as that of cores
  - (e) to support the pattern
- 12.** Chills are metal inserts of steel that are placed at appropriate locations in the mold walls to:
- (a) decrease the freezing rate
  - (b) increase the freezing rate
  - (c) help directional solidification
  - (d) prevent directional solidification
  - (e) help progressive solidification
- 13.** In machine moulding, patterns are mounted on:
- (a) follow boards
  - (c) plastic plates
  - (e) cope and drag
  - (b) moulding boards
  - (d) match plates
- 14.** Two casting processes which normally use metal moulds are:
- (a) permanent moulding and investment casting
  - (b) investment casting and die casting
  - (c) permanent moulding and die casting
  - (d) sand casting and die casting
- 15.** The chief advantage of die casting is:
- (a) thick sections in small castings are possible
  - (b) casting of inserts are possible
  - (c) wide tolerances are possible
  - (d) high production rates are possible
  - (e) any material can be die cast easily

16. The main advantage of shell moulding is:
  - (a) that a metallic pattern is used
  - (b) that the moulds are stronger
  - (c) that thin sections can be easily obtained
  - (d) that thick sections can be easily obtained
17. In investment casting the pattern material is:
  - (a) Metal
  - (b) Thermosetting resin
  - (c) Wood
  - (d) Wax
  - (e) Synthetic sand
18. The pouring temperature for gray cast iron is:
  - (a) 1600°C
  - (b) 1400°C
  - (c) 1200°C
  - (d) 1000°C
19. The purpose of inoculation in foundry practice is:
  - (a) to clean the casting
  - (b) to decrease the melting temperature of a cast metal
  - (c) to alter the chemical composition of a cast metal
  - (d) to modify the structure and properties of cast metal
  - (e) to improve the finish of the castings
20. The length of spiral to which molten metal flows in a standard mold is an indication of:
  - (a) Shrinkage of the metal
  - (b) Segregation of the metal
  - (c) Fluidity of the metal
  - (d) Melting temperature of the metal
  - (e) Shrinkage allowance to be provided
21. The important factor which affects fluidity is:
  - (a) C content of molten metal
  - (b) Melting temperature of molten metal
  - (c) Inoculant addition

- (d) Pouring temperature of molten metal
  - (e) Finish on the mold
- 22.** There are several factors which affect fluidity. Two important factors are:
- (a) C content and melting temperature
  - (b) Inoculant addition and pouring temperature
  - (c) Metal composition and melting temperature
  - (d) Melting temperature and pouring temperature
  - (e) Metal composition and pouring temperature
- 23.** Aluminium has got a tendency to absorb—at high temperature.
- (a) Nitrogen
  - (c) Carbon-dioxide
  - (b) Silicon
  - (d) Hydrogen
- 24.** Copper has got tendency to absorb—at high temperature.
- (a) Nitrogen
  - (c) Carbon-dioxide
  - (b) Ammonia
  - (d) Hydrogen
- 25.** In the melting of aluminum and copper alloys the important precaution to be observed is:
- (a) to avoid deoxidation
  - (b) removal of dross from the molten metal
  - (c) to maintain correct melting and pouring temperature
  - (d) prevention of hydrogen pick-up by the molten metal
  - (e) prevention of iron pick-up by the molten metal
- 26.** Drossing in foundry practice refers to:
- (a) a method of cleaning the castings
  - (b) an inspection method for castings
  - (c) a method of deoxidation of molten metal
  - (d) the formation of oxides on the molten metal surface

- 27.** The chief advantage of induction furnace is:
- (a) alloys of exact composition can be melted
  - (b) vacuum can be set up if necessary
  - (c) it is less costly
  - (d) melting takes place slowly
  - (e) electromagnetic forces are set up in the bath
- 28.** During the freezing of a pure metal, the possible casting structure is:
- (a) columnar structure
  - (b) dendritic structure
  - (c) equiaxed grains structure
  - (d) partly columnar and partly equiaxed
  - (e) none of the above
- 29.** When an alloy solidifies over a short range of temperature, the resulting casting structure is:
- (a) dendritic
  - (b) partially columnar and partially equiaxed
  - (c) wholly columnar
  - (d) wholly equiaxed
  - (e) dendritic and columnar
- 30.** When an alloy solidifies over a wide range of temperature, the resulting casting structure is:
- (a) wholly equiaxed
  - (b) wholly columnar
  - (c) partially columnar and partially equi-axed
  - (d) dendritic
- 31.** The process in which the casting is removed from the mold is called:
- (a) dump out
  - (b) shake out
  - (c) vibrating
  - (d) trimming



- 32.** Flogging in foundry practice refers to:
- (a) a type of moulding method
  - (b) removal of sprues and risers
  - (c) a non-destructive testing method
  - (d) removal of slag during pouring
- 33.** The most frequently used method of repairing the defects of castings is by:
- (a) drawing
  - (c) welding
  - (e) soldering
  - (b) metal spraying
  - (d) brazing
- 34.** X-ray inspection of castings would be considered as ..... testing.
- (a) destructive
  - (c) non-destructive
  - (e) visual
  - (b) final
  - (d) magnetic
- 35.** By the method of ..... testing, the internal cracks in casting can be easily found out,
- (a) Magnetic particle inspection
  - (b) Fluorescent penetrant
  - (c) Ultrasonic
  - (d) Dye-penetrant
- 36.** Magnetic particle test is applicable to ..... materials only.
- (a) Ferrous
  - (c) Steel
  - (e) Non-magnetic
  - (b) Non-ferrous
  - (d) Magnetic
- 37.** To locate and detect surface and sub-surface cracks in non-magnetic alloys the following inspection method can be used:
- (a) X-ray testing
  - (b) Ultrasonic testing
  - (c) Magnetic particle inspection testing
  - (d) Dye-penetrant testing.

- 38.** “Drag” in foundry practice refers to:
- (a) the top-half of the molding box
  - (b) the middle portion of the molding box
  - (c) the bottom-half of the molding box
  - (d) the coating on the molding surface
- 39.** Sprigs in a mold are used to:
- (a) give a cushioning effect to the mold
  - (b) increase the hardness of the castings
  - (c) provide a good surface finish to the casting
  - (d) prevent solidification of the molten metal
  - (e) strengthen the weak portions of the mold
- 40.** Blackings in foundry practice refers to:
- (a) materials of the mold
  - (b) color of the castings
  - (c) methods of heat treatment of the castings
  - (d) painting of mold surfaces so as to get smooth surface on the casting
- 41.** The most effective inoculant used for production of ductile iron is
- (a) Graphite
  - (b) Ferrosilicon alloy
  - (c) Freon gas
  - (d) Oxygen
  - (e) Iron
- 42.** In foundry practice Shrink Rule is used for providing:
- (a) contraction allowance
  - (b) draft allowance
  - (c) distortion allowance
  - (d) rapping allowance
  - (e) machining allowance
- 43.** In salvage repair of casting, the most satisfactory method of rectifying the defect is by:
- (a) brazing and soldering
  - (b) metal spraying

- (c) painting
  - (d) galvanizing
  - (e) welding.
- 44.** What is the most suitable size for the coke that is charged into the blast-furnace?
- (a) 8 to 25 mm
  - (b) 25 to 75 mm
  - (c) 75 to 150 mm
  - (d) over 150 mm
- 45.** The cheapest method of disposing the blast-furnace slag is to pour it into:
- (a) a stream of water for granulation
  - (b) ladles and allow it to cool into slag balls
  - (c) ladles and tip into slag pits
  - (d) pits at the furnace
- 46.** Molten iron is desulphurized by adding to the ladle:
- (a) Carbon
  - (b) Ferromanganese
  - (c) Ferrosilicon
  - (d) Soda ash
- 47.** The instrument which is used for measuring the temperature of molten steel in the furnace is the:
- (a) Expansion Thermometer
  - (b) Dilatometer
  - (c) Carbon Analyzer
  - (d) Thermocouple
  - (e) Spectrometer
- 48.** The metal after processing from its ore is in the form of:
- (a) slabs
  - (b) billets
  - (c) ingots
  - (d) castings
- 49.** The long, thin, finger like crystals found in ingots are called:
- (a) chills
  - (b) columnar crystals
  - (c) equi-axed crystals
  - (d) eutectic crystals

- 50.** The length of the pipe formed in a killed steel ingot is minimized by the use of:
- (a) a feeder head (hot top)                      (c) a circular mould
  - (b) an intricate mould                              (d) screens and filters
- 51.** For casting a metal, the metal is heated to:
- (a) above its melting temperature
  - (b) its melting temperature only
  - (c) red hotness
  - (d) white hotness
- 52.** ..... is the flux added with cupola charge to form slag.
- (a) Lime    (c) Coke    (e) Scrap
  - (b) Sand    (d) Pig iron
- 53.** In an integrated iron and steel plant the cheapest form of iron and steel charged to the steel furnace is:
- (a) cold pig iron
  - (b) molten pig iron
  - (c) purchase scrap
  - (d) process scrap
- 54.** Which one of the following is *not* used to deoxidize steel?
- (a) Aluminium
  - (b) Manganese
  - (c) Phosphorus
  - (d) Silicon
- 55.** The normal ratio of scrap to hot metal in an L.D. (Linz-Donawitz) vessel is:
- (a) 5% scrap, 95% metal
  - (b) 10% scrap, 90% metal
  - (c) 25% scrap, 75% metal
  - (d) 40% scrap, 60% metal

- 56.** *Statement:* In continuous casting, slabs must be completely solid before they reach the cut-off section. *Because*

*Reason:* Cutting a slab with a molten core would result in discontinuity.

<i>Statement</i>	<i>Reason</i>	<i>Reason Explains Statement</i>
(a) True	True	Yes
(b) True	True	No
(c) True	False	No
(c) False	True	No

- 57.** Chills are often incorporated in molds so that they can:

- (a) provide reinforcement for the sand
- (b) provide an accurate position for the pattern in the mold
- (c) balance the rate of cooling between thin and thick sections of the casting
- (d) cool the molds

- 58.** The effect of inoculation in foundry practice is to:

- (a) clean the casting
- (b) improve the surface finish on the castings
- (c) decrease the melting temperature of the molten metal
- (d) increase the melting temperature of the molten metal
- (e) refine the grain size of the cast metal

- 59.** In foundry technology, hollows casting are mass produced by:

- (a) using hollow patterns
- (b) using cores
- (c) drilling out the inside portion of the casting
- (d) using light weight metals

- 60.** Long C.I. sewer line pipes are most commonly produced by:

- (a) CO<sub>2</sub> moulding method
- (b) Sand casting method
- (c) Pressure die casting method
- (d) Centrifugal casting method

**5. Answer Key**

<b>1.</b> (c)	<b>13.</b> (d)	<b>25.</b> (d)	<b>37.</b> (d)	<b>49.</b> (b)
<b>2.</b> (c)	<b>14.</b> (c)	<b>26.</b> (d)	<b>38.</b> (c)	<b>50.</b> (a)
<b>3.</b> (c)	<b>15.</b> (d)	<b>27.</b> (a)	<b>39.</b> (e)	<b>51.</b> (a)
<b>4.</b> (b)	<b>16.</b> (c)	<b>28.</b> (a)	<b>40.</b> (d)	<b>52.</b> (a)
<b>5.</b> (b)	<b>17.</b> (d)	<b>29.</b> (c)	<b>41.</b> (d)	<b>53.</b> (d)
<b>6.</b> (b)	<b>18.</b> (b)	<b>30.</b> (d)	<b>42.</b> (a)	<b>54.</b> (c)
<b>7.</b> (c)	<b>19.</b> (d)	<b>31.</b> (b)	<b>43.</b> (b)	<b>55.</b> (c)
<b>8.</b> (d)	<b>20.</b> (c)	<b>32.</b> (b)	<b>44.</b> (b)	<b>56.</b> (a)
<b>9.</b> (d)	<b>21.</b> (d)	<b>33.</b> (b)	<b>45.</b> (d)	<b>57.</b> (c)
<b>10.</b> (d)	<b>22.</b> (e)	<b>34.</b> (c)	<b>46.</b> (b)	<b>58.</b> (e)
<b>11.</b> (c)	<b>23.</b> (d)	<b>35.</b> (c)	<b>47.</b> (d)	<b>59.</b> (b)
<b>12.</b> (c)	<b>24.</b> (d)	<b>36.</b> (b)	<b>48.</b> (c)	<b>60.</b> (d)

# 6

## *HEAT TREATMENT OF STEELS*

*Choose the correct alternative:*

1. The main purpose of heat treatment is to change the:
  - (a) chemical composition of the metal
  - (b) mechanical properties of the metal
  - (c) corrosion properties of the metal
  - (d) surface finish on the material
2. An important process used in case-hardening steel is:
  - (a) Tempering
  - (b) Cyaniding
  - (c) Annealing
  - (d) Spherodizing
3. All parts which have been hardened must be ..... to relieve the hardening strains and to increase the toughness of the part.
  - (a) Annealed
  - (b) Carburized
  - (c) Tempered
  - (d) Anodized
  - (e) Galvanized
4. To anneal hard steel so that it can be machined, the steel must be heated above its critical temperature and then:
  - (a) cooled slowly
  - (b) cooled rapidly
  - (c) left in the furnace itself at the same temperature
  - (d) quenched in oil

5. It is necessary to temper all parts after hardening:
  - (a) to reduce the hardening strains
  - (b) to increase the hardness
  - (c) to reduce the hardness
  - (d) to increase the tensile strength
  - (e) to reduce the scale formation
  
6. .... can be hardened only by carburizing or cyaniding.
  - (a) Low carbon steel
  - (b) Medium carbon steel
  - (c) High carbon steel
  - (d) Alloy steel
  - (e) Tool steel
  
7. Carbon steels are hardened by heating the steel to its critical temperature and then:
  - (a) cooling it slowly
  - (b) quenching it in water
  - (c) leaving it in the furnace itself at the same temperature
  - (d) leaving it outside the furnace
  
8. The element in steel which directly affects the critical temperature of the steel to be heat-treated is:
  - (a) Sulphur
  - (b) Phosphorus
  - (c) Carbon
  - (d) Chromium
  
9. The highest rate of heat transfer, or the ability to heat metal most rapidly, is obtained in:
  - (a) Molten baths
  - (b) A fuel-fired furnace
  - (c) Electric furnaces
  - (d) Pit furnace
  
10. High alloy steels must be heated slowly and uniformly for hardening, to avoid:
  - (a) Scaling
  - (b) Shrinkage
  - (c) Warpage
  - (d) Segregation



- 11.** Overheating high alloy steel when pack hardening must be avoided to prevent:
- (a) Low hardness and shrinkage
  - (b) Extreme hardness and shrinkage
  - (c) Distortion
  - (d) Scale formation
- 12.** Localized hardening of jobs which require that only a small selected portion of the job be hardened, can be accomplished only by:
- (a) Flame and induction hardening
  - (b) Pack hardening
  - (c) Cyaniding
  - (d) Nitriding
- 13.** Case hardening is the only method suitable for hardening:
- (a) High alloy steel
  - (b) High-carbon steel
  - (c) Low-carbon steel
  - (d) High speed steel
- 14.** When hardening steel by the carburizing process, after the steel has been heated to the correct temperature and for the correct amount of time, the furnace is shut off and the steel is:
- (a) removed and quenched in water
  - (b) retained in the furnace itself to cool
  - (c) removed and cooled in air
  - (d) removed and quenched in oil
- 15.** Hardening strains created in steel after it has been heated and quenched must be removed by:
- (a) Tempering
  - (b) Annealing
  - (c) Normalizing
  - (d) Spherodizing

16. The heat-treatment process used to soften hard alloy and tool steels so that they can be more easily machined is called:  
(a) Carburizing (c) Normalizing  
(b) Annealing (d) Tempering
17. Carbon steels are generally classified as:  
(a) Air-hardening steels  
(b) Oil-hardening steels  
(c) Water-hardening steels  
(d) Hydrogen-hardening steels
18. Proper control of the ..... in a heat-treating furnace is necessary to prevent excessive scaling of parts being hardened.  
(a) Atmosphere (d) Air-fuel ratio  
(b) Temperature (e) Draft  
(c) Fuel
19. The temperature of furnace used for heat-treating steel is measured and controlled by an instrument called:  
(a) Hydrometer (d) Pyrometer  
(b) Thermometer (e) Orsat-Apparatus  
(c) Dilatometer
20. The product which results from annealing white cast iron is called:  
(a) Malleable iron (c) Spheroidal iron  
(b) Nodular iron (d) Grey cast iron
21. A more scientific and reliable method of measuring furnace temperatures is by an instrument called:  
(a) Thermometer  
(b) Voltmeter  
(c) Pyrometer  
(d) Planimeter

22. The element in steel which determines whether or not steel will harden when heated to its critical temperature and then quenched in oil or water is:
- (a) Iron (c) Vanadium (e) Oxygen  
(b) Carbon (d) Tungsten
23. The surface hardness in a low-carbon steel can be generally improved by the heat treatment process known as:
- (a) Hardening (c) Carburizing (e) Normalizing  
(b) Nitriding (d) Tempering
24. .... is a process in which an iron based alloy is heated to a temperature above the upper critical temperature range and subsequently cooled in air.
- (a) Hardening (c) Annealing (e) Normalizing  
(b) Tempering (d) Quenching
25. A process involving heating and cooling, usually applied to induce softening in steel is called:
- (a) Hardening (c) Austempering (e) Annealing  
(b) Tempering (d) Quenching
26. In nitriding steel components, the following atmosphere is generally used in the furnace:
- (a) Inert  
(b) Nascent Nitrogen  
(c) Liquid Nitrogen  
(d) Carbon  
(e) Ammonia
27. Galvanizing is the name of a process by which:
- (a) steel is coated with molten zinc  
(b) steel is coated with molten tin  
(c) copper is electroplated with silver  
(d) mild steel is coated with enamel paint  
(e) soldering irons are coated with solder

**28.** After annealing a non-ferrous metal, surface oxides formed on the metal are:

- (a) removed with coarse emery cloth
- (b) left on the metal to protect the surface
- (c) pickled in acid and then removed
- (d) hammered into the surface
- (e) polished to give a good color

**29.** Case hardening of mild steel is carried out in order to:

- (a) color the surface
- (b) enable it to resist wear
- (c) render it stainless
- (d) use it for cutting tools
- (e) make it malleable

**30.** Tempering is carried out on a part of high-carbon steel to:

- (a) color the metal
- (b) make the metal less brittle
- (c) make the metal harder
- (d) convert the metal to mild steel
- (e) allow the metal to be forged

**31.** When a part of high-carbon steel is made red hot, then plunged into cold water it will be:

- (a) Tempered
- (b) Hardened
- (c) Unaffected
- (d) Normalized
- (e) Case-hardened

**32.** To eliminate the brittleness which occurs due to welding of saw blades, the weld must be:

- (a) toughened
- (b) annealed
- (c) work hardened
- (d) forged

33. Slow-cooling of high carbon steels prevents the formation of ..... and the phase composition at room temperature is almost entirely pearlite.
- (a) Martensite                      (c) Ferrite                      (e) Carbide  
(b) Cementite                      (d) Austenite
34. If a high carbon steel (0.85%C) is cooled very slowly from 1000°C to room temperature, it will consist almost entirely of which one of the following?
- (a) Pearlite                      (c) Ferrite                      (e) Martensite  
(b) Austenite                      (d) Cementite
35. The softening of a metal component and the removal of internal stresses by heating the metal to its critical temperature and allowing it to cool very slowly is called:
- (a) Annealing                      (c) Planishing  
(b) Burnishing                      (d) Spheroidizing
36. After heating, carbon steels are generally quenched in the medium of:
- (a) water                      (c) air  
(b) oil                      (d) Hydrogen
37. The temperature to which steel must be heated so that it will harden when quenched is called the ..... temperature.
- (a) Eutectic                      (c) Critical  
(b) Eutectoid                      (d) Melting
38. If steel is galvanized, it is coated with:
- (a) Copper                      (c) Tin  
(b) Zinc                      (d) Lead
39. Galvanized iron is iron coated with:
- (a) Copper  
(b) Aluminium  
(c) Zinc  
(d) Tin

40. Which test is used to check the evenness of the coating on galvanized wire?

- (a) Copper Sulphate dip                      (c) Reverse bend test
- (b) Hydrochloric Acid dip                  (d) Wrapping test

41. The following list comprises individual steps in a Spheroidizing cycle for a carbon steel in a batch furnace:

1. Load the furnace and install inner cover
2. Heat to desired soak temperature
3. Cool to desired unloading temperature and unload
4. Fast cool followed by slow cool
5. Purge with atmosphere gas
6. Soak for desired time

The correct order of operation is:

- (a) 152643                                      (c) 126453
- (b) 124643                                      (d) 152463

42. Acids used in pickling tanks after their usage must be. .... before they are emptied into an open tank to prevent environmental pollution.

- (a) agitated with hot steam
- (b) cooled to room temperature
- (c) neutralized with iron sulphate
- (d) neutralized with lime

**6. Key**

- |                |                |                |                |
|----------------|----------------|----------------|----------------|
| <b>1.</b> (b)  | <b>12.</b> (a) | <b>23.</b> (c) | <b>34.</b> (a) |
| <b>2.</b> (b)  | <b>13.</b> (c) | <b>24.</b> (e) | <b>35.</b> (a) |
| <b>3.</b> (c)  | <b>14.</b> (b) | <b>25.</b> (e) | <b>36.</b> (a) |
| <b>4.</b> (a)  | <b>15.</b> (a) | <b>26.</b> (e) | <b>37.</b> (c) |
| <b>5.</b> (a)  | <b>16.</b> (b) | <b>27.</b> (a) | <b>38.</b> (b) |
| <b>6.</b> (a)  | <b>17.</b> (c) | <b>28.</b> (c) | <b>39.</b> (b) |
| <b>7.</b> (b)  | <b>18.</b> (b) | <b>29.</b> (b) | <b>40.</b> (a) |
| <b>8.</b> (c)  | <b>19.</b> (d) | <b>30.</b> (b) | <b>41.</b> (a) |
| <b>9.</b> (c)  | <b>20.</b> (a) | <b>31.</b> (b) | <b>42.</b> (d) |
| <b>10.</b> (c) | <b>21.</b> (c) | <b>32.</b> (b) |                |
| <b>11.</b> (c) | <b>22.</b> (b) | <b>33.</b> (a) |                |







5. Flux is used in soldering because the flux:
  - (a) melts after the solder
  - (b) fills up gaps left in a bad joint
  - (c) prevents oxides forming
  - (d) lowers the melting temperature of the solder
  - (e) washes away surplus solder
  
6. A soldering iron “bit” is made of:
 

(a) brass	(c) steel	(e) iron
(b) tin	(d) copper	
  
7. The soldering iron should be heated in a gas flame until:
  - (a) the “bit” is red hot
  - (b) the handle begins to feel warm
  - (c) the “bit” will burn a piece of paper
  - (d) the gas flame appears green in color
  - (e) the coating of borax on the “bit” turns black
  
8. An alloy of copper, zinc, and silver, often used in fabrication technique, is called:
 

(a) nickel silver	(c) soft solder	(e) silver solder
(b) bronze	(d) pewter	
  
9. Which one of the following is suitable for holding metal in place when making a silver soldered joint?
 

(a) galvanized iron wire	(c) aluminium wire
(b) soft iron wire	(d) copper wire
  
10. The usual composition of a soldering alloy is .....
  - (a) Tin and lead only
  - (b) Tin, lead, and small percentage of Antimony occasionally
  - (c) Tin, copper, and lead
  - (d) Tin and copper only
  - (e) Tin, lead, and silver

- 11.** Zinc chloride is used to carry out the following process:
- (a) Tempering                      (c) Brazing                      (e) Soft soldering  
(b) Annealing                      (d) Hardening
- 12.** Which one of the following precautions is necessary to produce a good soldered joint?
- (a) the soldering iron bit must first be made red hot  
(b) the joint area must be clean and close-fitting  
(c) Aluminium wire must be placed along the joint  
(d) a thin film of lubricating oil must be applied to the joint edges
- 13.** The temperature range in which soldering process is carried out is:
- (a) 30°C to 100°C                      (c) 600°C to 700°C  
(b) 180°C to 250°C                      (d) Around 1000°C

## 7. Key

- |               |                |                |
|---------------|----------------|----------------|
| <b>1.</b> (c) | <b>6.</b> (d)  | <b>11.</b> (e) |
| <b>2.</b> (c) | <b>7.</b> (d)  | <b>12.</b> (b) |
| <b>3.</b> (a) | <b>8.</b> (e)  | <b>13.</b> (b) |
| <b>4.</b> (c) | <b>9.</b> (b)  |                |
| <b>5.</b> (c) | <b>10.</b> (b) |                |



# 8

## *BRAZING*

*Choose the correct alternative:*

1. Entrapped fluxes, during brazing result in.....
  - (a) presence of gas pockets
  - (b) corrosion
  - (c) cracking
  - (d) distortion of joints
2. Spelter is same as:
  - (a) Tin
  - (b) Zinc
  - (c) Lead
  - (d) Silver
  - (e) Brass
3. A brazed joint may be satisfactorily used on an article made from:
  - (a) tinplate
  - (b) brass
  - (c) pewter
  - (d) copper
  - (e) aluminium
4. Brazing is the name given to the process of:
  - (a) heating a flat sheet of brass
  - (b) hard soldering using brass spelter
  - (c) casting in brass
  - (d) making steel look like brass
  - (e) working with brass in any form

5. When brazing is carried out:
- (a) a joint is made between two parts by molten spelter
  - (b) the edges of the joint melt and run together
  - (c) spelter forms an alloy with the flux
  - (d) flux prevents the work from melting
  - (e) flux acts as a cement
6. Which one of the following metals is a constituent of brazing spelter?
- (a) Mercury
  - (b) Lead
  - (c) Iron
  - (d) Zinc
7. Borax is used when brazing:
- (a) instead of flux
  - (b) to dissolve oxides when heating the work
  - (c) to accelerate the formation of oxides on the work
  - (d) to prevent the spelter from melting too quickly
8. Which of the following pairs of metals can be brazed together?
- (a) brass and tin
  - (b) copper and lead
  - (c) copper and steel
  - (d) aluminium and aluminium
9. Pewter is an alloy of:
- (a) copper and lead
  - (b) silver and copper
  - (c) copper and zinc
  - (d) tin and lead
  - (e) tin and copper
10. The commonly used flux for brazing is:
- (a) resin
  - (b) pewter
  - (c) borax
  - (d) soft iron
11. The brass used for making the joint in brazing is generally called:
- (a) Resin
  - (b) Borax
  - (c) Spelter
  - (d) Pewter
  - (e) Tinning

**12.** The temperature range in which brazing process is carried out is:

- (a) 180°C to 250°C
- (b) 350°C to 500°C
- (c) 700°C to 900°C
- (d) Above 1000°C

**13.** The chemical symbol for spelter (pewter) is:

- (a) Cu
- (b) Sn
- (c) Zn
- (d) Sp
- (e) Br

### 8. Key

- |        |         |         |
|--------|---------|---------|
| 1. (b) | 6. (d)  | 11. (c) |
| 2. (b) | 7. (b)  | 12. (c) |
| 3. (d) | 8. (c)  | 13. (c) |
| 4. (b) | 9. (d)  |         |
| 5. (a) | 10. (c) |         |





## WELDING TECHNOLOGY

*Choose the correct alternative:*

1. It is specified that “The steel framework for the addition to an existing hospital building shall be all welded.” Of the following, the best reason for this requirement is that welding:
  - (a) is easier to perform in the field than riveting
  - (b) produces a more rigid structure than riveting
  - (c) is quieter than riveting
  - (d) is a more flexible method, when tying into an existing structure
2. The weld most commonly used to permanently connect the end of a structural steel angle to a vertical plate is a:
  - (a) tack weld
  - (b) fillet weld
  - (c) butt weld
  - (d) plug weld
3. The holes in a light steel beam are generally made in a steel fabrication shop by:
  - (a) punching
  - (b) drilling
  - (c) burning
  - (d) broaching
4. In—welding the parts are heated to welding temperature and then the ends are forced to unite by mechanical pressure:
  - (a) T.I.G.
  - (b) M.I.G.
  - (c) rivet
  - (d) Atomic Hydrogen
  - (e) Forge

5. Post-heating in the control of weld quality is not desirable because:
  - (a) it affects the properties of the base metal of the parts
  - (b) it leads to warping and distortion
  - (c) it increases the cost of welding
  - (d) it decreases the fatigue strength of weldments
6. The welding of stainless steels is generally difficult because .....
  - (a) rust formation is prevented
  - (b) of the high melting temperature of stainless steel
  - (c) of the formation of oxide film
  - (d) of the formation of chromium carbide
  - (e) powerful fluxes have to be used
7. The most frequently used method of repairing the defects of castings is by .....
  - (a) drawing
  - (b) metal spraying
  - (c) welding
  - (d) brazing
  - (e) soldering
8. Distortion in welding is generally due to .....
  - (a) use of low hydrogen electrodes
  - (b) improper clamping methods
  - (c) use of wrong electrodes
  - (d) oxidation of weld pool
  - (e) improper welding current values
9. The distinguishing characteristic of Welder's safety shoes is:
  - (a) their color
  - (b) their height
  - (c) the use of spikes on the sole
  - (d) the use of a steel toe box
10. A specification for steel erection prohibits the use of heat in straightening material that was bent in transport. Of the following, the best reason for this requirement is that heating the steel may:
  - (a) ruin the coating of paint
  - (b) warp the piece thereby making it difficult to fit in place

- (c) affect the strength of the steel
  - (d) necessitate the use of special equipment thereby increasing the cost of the job
- 11.** To eliminate the brittleness which occurs due to welding of saw blades, the weld must be:
- (a) Toughened
  - (b) Annealed
  - (c) Work hardened
  - (d) Forged
- 12.** Acetylene gas used in gas welding is produced by .....
- (a) petroleum refining
  - (b) the action of alcohol on calcium carbide
  - (c) adding water to calcium carbide
  - (d) adding acetone to carbides
- 13.** Filler material should have .....
- (a) the same composition as the parent metal to be welded
  - (b) the same melting temperature as the parent metal to be welded
  - (c) the same composition and the same melting temperature as the parent metal to be welded
  - (d) different composition and melting temperature
- 14.** Fluxes protect the molten metal and the surfaces to be joined from:
- (a) oxidation
  - (b) carburizing
  - (c) dirt
  - (d) distortion
- 15.** In joining brass metal by gas welding, the flame adjustment should be such that the flame is .....
- (a) a reducing one
  - (b) an oxidizing one
  - (c) a neutral one
  - (d) none of the above; since brass can be welded only by arc welding

16. Oxidizing flame is used normally for welding the following metal:  
(a) brass (c) stainless steel  
(b) mild steel (d) copper
17. Flame cutting of stainless steel plates are performed by .....  
(a) using more fuel gas  
(b) increasing the length of flame  
(c) addition of iron powder  
(d) addition of stainless steel powder
18. In electric arc welding, the arc is approximately at a temperature of:  
(a) 800°C—1000° C (c) 3000°C (e) 5000°C  
(b) 2000°C (d) 4000°C
19. In--polarity, the electrodes forms the positive terminal and the workpiece forms the negative terminal:  
(a) direct (c) positive (e) zero  
(b) reversed (d) negative
20. When the electrode is connected positive and the work connected at negative, the arrangement is termed as:  
(a) straight polarity  
(b) reverse polarity  
(c) resistance welding  
(d) negative welding
21. Metal deposited on to the workpiece from the electrode:  
(a) is forced across the arc  
(b) falls because of gravity  
(c) is attracted towards the workpiece due to the positive polarity of the workpiece  
(d) is attracted towards the workpiece due to the negative polarity of the workpiece

- 22.** In arc welding operations the current value (Amperes) to be set depends on:
- (a) polarity of work material
  - (b) polarity of electrode
  - (c) voltage across the arc
  - (d) speed of travel
  - (e) size of the electrode
- 23.** In electric arc welding, the voltage at the start of the welding is .....
- (a) higher than the arc voltage during welding
  - (b) lower than the arc voltage during welding
  - (c) same as the arc voltage during welding
  - (d) zero only
- 24.** Weaving in arc welding refers to .....
- (a) side to side motion of electrode at right angles to the direction of the welding
  - (b) side to side motion of the electrode along the direction of the welding
  - (c) spiral motion given to electrode
  - (d) a technique of striking the arc
- 25.** Arc blow occurs in .....
- (a) gas welding
  - (b) arc welding when straight polarity is used
  - (c) arc welding when reverse polarity is used
  - (d) welding cast iron only
- 26.** Arc blow in electric arc welding is due to:
- (a) the high velocity flow of inert gas used
  - (b) the straight polarity used
  - (c) the reverse polarity used
  - (d) the improper skill of the welder

27. Low-hydrogen electrodes are baked prior to use, so that the welding .....

- (a) is not shabby
- (b) is free from arc blow
- (c) is free from moisture pick up
- (d) current required is minimum

28. The type of joint required for welding depends on:

- (a) the type of electrode available
- (b) the load conditions
- (c) the cost of preparation of joint
- (d) the diameter of the electrodes
- (e) the flux to be used

29. Stud welding belongs to the category of .....

- (a) gas welding
- (b) arc welding
- (c) resistance welding
- (d) pressure welding
- (e) thermit welding

30. Projection welding belongs to the category of .....

- (a) gas welding
- (b) arc welding
- (c) spot welding
- (d) resistance welding
- (e) pressure welding

31. Flash butt welding belongs to the category of .....

- (a) gas welding
- (b) arc welding with straight polarity
- (c) arc welding with reverse polarity
- (d) resistance welding
- (e) projection welding

- 32.** In resistance welding, the electrode material is.....
- (a) mild steel
  - (b) stainless steel
  - (c) copper
  - (d) same as the work material
  - (e) brass
- 33.** The electrodes commonly used in submerged arc welding are:
- (a) bare rods
  - (b) coated electrodes
  - (c) core wires
  - (d) copper electrodes
  - (e) stainless steel rods
- 34.** In submerged arc welding, the flux is in the form of.....
- (a) coating on the electrodes
  - (b) core wires
  - (c) granules
  - (d) an inert gas
- 35.** In atomic hydrogen welding, the arc is between.....
- (a) the parent metals
  - (b) consumable tungsten electrode and workpiece
  - (c) non-consumable tungsten electrode and workpiece
  - (d) consumable tungsten electrode and filler rod
  - (e) two tungsten electrodes
- 36.** In Tungsten-Inert-Gas (TIG) welding process, the following gas is used:
- (a) Acetylene
  - (b) Oxygen
  - (c) Hydrogen
  - (d) Argon
  - (e) Helium
- 37.** Thermit welding is generally used for:
- (a) welding brass only
  - (b) welding aluminium and aluminium alloys
  - (c) welding steel only
  - (d) welding magnesium only

- 38.** In Argon arc welding, the arc is between the .....
- (a) parent metals
  - (b) consumable tungsten electrode and workpiece
  - (c) non-consumable tungsten electrode and filler rod
  - (d) non-consumable tungsten electrode and workpiece
  - (e) consumable tungsten electrode and filler rod
- 39.** Tungsten Inert Gas (TIG) welding belongs to the category of .....
- (a) gas welding
  - (b) arc welding
  - (c) resistance welding
  - (d) pressure welding
  - (e) thermit welding
- 40.** In certain welding processes inert gases are used to:
- (a) bring the desired chemical reaction in the weld pool
  - (b) protect the weld pool from atmospheric contamination
  - (c) cool the joint
  - (d) strengthen the joint
- 41.** By the method of ... testing, the internal cracks in a welding can be easily found out.
- (a) Magnetic particle inspection
  - (b) Fluorescent penetrant
  - (c) Ultrasonic
  - (d) Dye penetrant
- 42.** To locate and detect surface and sub-surface cracks in non-magnetic alloys the following inspection method can be used:
- (a) X-ray testing
  - (b) ultrasonic testing
  - (c) magnetic particle inspection testing
  - (d) dye penetrant testing



- 43.** Magnetic particle test is applicable to ... materials only.
- (a) Ferrous
  - (b) Non-ferrous
  - (c) Steel
  - (d) Magnetic
  - (e) Non-magnetic
- 44.** X-ray inspection of welding would be considered as.....testing.
- (a) destructive
  - (b) final
  - (c) non-destructive
  - (d) magnetic
  - (e) visual
- 45.** Surface defects in weldments of magnetic materials can be detected by .....
- (a) X-ray method
  - (b) Ultrasonic flaw detection
  - (c) Magnaflux method
  - (d) Dye penetrant method
- 46.** Leaks in gas piping may be best located by the use of a:
- (a) cigarette lighter
  - (b) miner's lamp
  - (c) heated filament
  - (d) soapy water solution
- 47.** Undercuts in weldments are caused due to:
- (a) low welding current
  - (b) excessive welding current
  - (c) wrong selection of welding rods
  - (d) use of powerful fluxes
- 48.** A good welded joint should have .....
- (a) a good penetration
  - (b) welds of correct shape
  - (c) no inclusion of slag
  - (d) no cracks in the weld
  - (e) all the above
- 49.** While testing for the strength of welded joint by tensile testing, a good weld is denoted when:
- (a) fracture occurs on the welded joint
  - (b) fracture occurs outside the weld in parent metal
  - (c) no fracture occurs at all
  - (d) the specimen is subjected to eccentric loading

- 50.** Non-destructive testing of welds are done by .....
- (a) Magnaflux method
  - (b) Conducting a standard Tensile Test
  - (c) Conducting an Hardness test
  - (d) Conducting a shear test
- 51.** To locate surface cracks in the weldments of non-magnetic alloys the method used is:
- (a) X-ray test
  - (b) Ultrasonic flaw detection
  - (c) Magnaflux method
  - (d) Fluorescent test
- 52.** Destructive testing of welds are done by:
- (a) Magnaflux method
  - (b) Conducting a standard tensile test
  - (c) X-ray testing
  - (d) Ultrasonic testing
- 53.** The color code for a high-pressure Oxygen cylinder used in gas welding operations is:
- (a) Grey with a black color band
  - (b) Black with a grey color band
  - (c) Black without any color band
  - (d) Grey without a color band
- 54.** Spot welding and seam welding are good examples of:
- (a) Oxy-acetylene gas welding
  - (b) Electric arc welding
  - (c) Sub-merged arc welding
  - (d) Electric resistance welding

**9. Key**

- |                |                |                |                |
|----------------|----------------|----------------|----------------|
| <b>1.</b> (c)  | <b>15.</b> (b) | <b>29.</b> (c) | <b>43.</b> (d) |
| <b>2.</b> (b)  | <b>16.</b> (a) | <b>30.</b> (d) | <b>44.</b> (c) |
| <b>3.</b> (a)  | <b>17.</b> (c) | <b>31.</b> (d) | <b>45.</b> (c) |
| <b>4.</b> (e)  | <b>18.</b> (d) | <b>32.</b> (c) | <b>46.</b> (d) |
| <b>5.</b> (a)  | <b>19.</b> (b) | <b>33.</b> (a) | <b>47.</b> (b) |
| <b>6.</b> (c)  | <b>20.</b> (b) | <b>34.</b> (c) | <b>48.</b> (e) |
| <b>7.</b> (b)  | <b>21.</b> (a) | <b>35.</b> (e) | <b>49.</b> (b) |
| <b>8.</b> (b)  | <b>22.</b> (e) | <b>36.</b> (d) | <b>50.</b> (a) |
| <b>9.</b> (d)  | <b>23.</b> (a) | <b>37.</b> (c) | <b>51.</b> (d) |
| <b>10.</b> (c) | <b>24.</b> (a) | <b>38.</b> (d) | <b>52.</b> (b) |
| <b>11.</b> (b) | <b>25.</b> (b) | <b>39.</b> (b) | <b>53.</b> (c) |
| <b>12.</b> (c) | <b>26.</b> (b) | <b>40.</b> (b) | <b>54.</b> (d) |
| <b>13.</b> (c) | <b>27.</b> (c) | <b>41.</b> (c) |                |
| <b>14.</b> (a) | <b>28.</b> (b) | <b>42.</b> (d) |                |



# 10

## *HAND TOOLS AND SAWING PRACTICE*

*Choose the correct alternative:*

1. The proper type of file to be used when filing metals such as brass or bronze is:
  - (a) the smooth-cut file
  - (b) the second-cut file
  - (c) the coarse-cut or rough-cut file
  - (d) the double-cut file
  - (e) the single-cut file
2. The no. of teeth per inch on an hacksaw blade is called ... of the blade.
  - (a) the finish
  - (b) the module
  - (c) the twist
  - (d) the pitch
  - (e) the cut
3. A wrench which has one solid jaw and one movable jaw is called:
  - (a) a torque wrench
  - (b) a power wrench
  - (c) a screw wrench
  - (d) an Allen wrench
  - (e) an adjustable wrench

4. A power saw which employs a continuous looped blade which is driven by two wheels or pulleys is called:
- (a) a power hacksaw machine      (c) a filing machine  
(b) a circular saw machine      (d) a band saw machine
5. The no. of teeth/inch in a band saw blade is called as:
- (a) module of the blade      (c) finish of the blade  
(b) pitch of the blade      (d) twist of the blade
6. The cutting action of power-hacksaw blade is described as:
- (a) an oscillating motion  
(b) a reciprocating motion  
(c) a continuous circular motion  
(d) a simple Harmonic Motion
7. Band sawing of the parts to some irregular shape or form following a layout line is called:
- (a) In-line sawing      (c) Contour sawing  
(b) Out-line sawing      (d) Multiple sawing
8. Chipping is an operation wherein:
- (a) a reciprocating motion of a file is used  
(b) a chisel is used for metal removal  
(c) a mark is made with a center punch  
(d) a scraper is used for metal removal.

### 10. Key

- |        |        |        |
|--------|--------|--------|
| 1. (c) | 4. (d) | 7. (c) |
| 2. (d) | 5. (b) | 8. (b) |
| 3. (e) | 6. (b) |        |

## SHAPERS

*Choose the correct alternative:*

1. The cutting action of the shaper occurs only on the ... stroke of the ram.
  - (a) feed movement
  - (b) forward
  - (c) return or backward
  - (d) middle
  - (e) end
2. The primary function of the shaper is to:
  - (a) produce slots
  - (b) cut angles
  - (c) cut key ways
  - (d) produce a flat machined surface
  - (e) cut dovetail
3. Shaper size is determined by the:
  - (a) Maximum weight of the workpiece that can be mounted
  - (b) H.P. of the motor
  - (c) Diameter of the bull wheel
  - (d) Maximum stroke length of the ram
4. For proper seating of the work in a shaper vise for machining, the work should be supported on:
  - (a) jaws
  - (b) clamps
  - (c) shims
  - (d) parallels
  - (e) flats

5. Vee blocks are commonly used as work holding devices for ... shafts which require shaping:
 

(a) square	(c) elliptical
(b) splined	(d) cylindrical
  
6. To obtain an equal spacing of splines around the circumference of a shaft by shaping, the shaft is mounted between .....
 

(a) live centers	(c) differentials
(b) dead centers	(d) indexing centers
  
7. Shapers equipped with a table that can be swivelled for angle cutting are referred to as .....
 

(a) Vertical shapers	(d) Hydraulic shapers
(b) Universal shapers	(e) Rotary shapers
(c) Gear shapers	
  
8. Rotary tables for circular cuts are standard equipment on a:
 

(a) Vertical shaper	(c) Rotary shaper
(b) Universal shaper	(d) Hydraulic shaper
  
9. Shapers equipped with universal table are preferred when performing operations such as:
 

(a) vertical shaping	(c) slotting
(b) angle cutting	(d) form cutting of gear teeth
  
10. The hinged part on the front face of a shaper tool head on which the tool post is mounted is called a:
 

(a) Box tool	(c) Parallel
(b) Clapper box	(d) Vise
  
11. To prolong the life of shaper tools after they are ground, they should be .....
 

(a) Lapped	(c) Stoned
(b) Sanded	(d) Hardened



- 12.** The smoothly finished square or rectangular bars used as work seat support when shaping work in a vise are called:
- (a) Clamps
  - (b) Height adjusters
  - (c) Jaws
  - (d) Parallels
- 13.** What work holding device would be recommended for use when shaping a key-way in a cylindrical shaft?
- (a) a V-block
  - (b) an angle plate
  - (c) a dividing head
  - (d) a shaper vise
- 14.** To shape splines in a shaft which must be accurately spaced, the work is mounted:
- (a) in a shaper vise
  - (b) between indexing centers
  - (c) in V-blocks
  - (d) in a special fixture
  - (e) in an independent chuck
- 15.** The factor to be considered in determining shaper size is:
- (a) The overall height of the machine
  - (b) The table size with which the machine is equipped
  - (c) The maximum table feed movement
  - (d) The maximum stroke length of the ram
- 16.** Whitworth mechanism is used in:
- (a) a shaping machine (Mechanical type)
  - (b) an hydraulic shaper
  - (c) a milling machine
  - (d) a grinding machine
  - (e) a broaching machine
- 17.** In the case of a shaper equipped with Whitworth mechanism:
- (a) The cutting stroke is faster than the return stroke
  - (b) the return stroke is faster than the cutting stroke
  - (c) both the cutting stroke and the return stroke take the same time
  - (d) the return stroke is slower than the cutting stroke

- 18.** The cutting speed of the tool in mechanical shaper is:
- (a) maximum at the beginning of the cutting stroke
  - (b) maximum at the end of the cutting stroke
  - (c) maximum at the middle of the cutting stroke
  - (d) minimum at the middle of the cutting stroke
- 19.** The velocity of the cutting tool (or cutting speed) is uniform throughout the cutting stroke in the case of:
- (a) a mechanical shaper equipped with Whitworth mechanism
  - (b) an hydraulic shaper
- 20.** The feeding of the job in a shaper is done by:
- (a) movement of the clapper box
  - (b) table movement
  - (c) V-block
  - (d) ram movement
  - (e) tool movement
- 21.** In the case of a shaping machine, feeding of the job is done:
- (a) at the beginning of the cutting stroke
  - (b) at the middle of the cutting stroke
  - (c) at the end of the cutting stroke
  - (d) at the end of the return stroke
- 22.** The feed rate in a shaping operation is usually expressed as:
- (a) mm/stroke
  - (b) mm/double stroke
  - (c) mm/treble stroke
  - (d) mm
  - (e) m/minute
- 23.** In a mechanical shaper, the lifting of the tool during the idle stroke is ensured by:
- (a) tool head
  - (b) ram adjustment

- (c) bull wheel movement
  - (d) ratchet and pawl mechanism
  - (e) clapper box mechanism
- 24.** More than one tool head can be put into operation in the case of:
- (a) a planing machine
  - (b) a shaping machine
  - (c) a slotting machine

### 11. Key

- |               |                |                |                |
|---------------|----------------|----------------|----------------|
| <b>1.</b> (b) | <b>7.</b> (b)  | <b>13.</b> (a) | <b>19.</b> (b) |
| <b>2.</b> (d) | <b>8.</b> (a)  | <b>14.</b> (b) | <b>20.</b> (b) |
| <b>3.</b> (d) | <b>9.</b> (b)  | <b>15.</b> (d) | <b>21.</b> (d) |
| <b>4.</b> (d) | <b>10.</b> (b) | <b>16.</b> (a) | <b>22.</b> (b) |
| <b>5.</b> (d) | <b>11.</b> (a) | <b>17.</b> (b) | <b>23.</b> (e) |
| <b>6.</b> (d) | <b>12.</b> (d) | <b>18.</b> (c) | <b>24.</b> (a) |



## *TURNING AND LATHE WORK*

*Choose the correct alternative:*

1. Turning of metals in a machine shop is usually performed on a:  
(a) radial drill press                      (d) shaper  
(b) lathe                                      (e) cylindrical grinding machine  
(c) milling machine
2. A lathe bed is usually made of:  
(a) mild steel                              (c) cast iron  
(b) high-carbon steel                      (d) aluminium
3. With HSS tools, highest cutting speed can be employed while machining .....  
(a) Cast iron                              (d) Bronze  
(b) Mild steel                              (e) Aluminium  
(c) Brass
4. The cutting speed in any machining operation is usually expressed in:  
(a) revolutions per minute of workpiece  
(b) mm/min.  
(c) surface meters/min.  
(d) mm/revolution of job

5. The surface speed in meters/minute of a workpiece of diameter  $D$  mm rotating at  $N$  R.P.M. is given by.....
- (a)  $\pi DN$  (d)  $DN/1000$   
(b)  $\pi DN/1000$  (e)  $1000/DN$   
(c)  $1000/\pi DN$
6. The form of chip produced when machining a hard and brittle metal like cast iron is the:
- (a) Continuous chip  
(b) Discontinuous chip  
(c) Continuous chip with built-up-edge (B.U.E)  
(d) No chips are produced.
7. Powdery chips are produced while machining or drilling:
- (a) Mild steel (d) Stainless steel  
(b) Hardened Tool Steel (e) High Speed Steel (HSS)  
(c) Cast Iron
8. The “feed rate” in lathe operations is usually expressed in:
- (a) R.P.M. of workpiece (c) surface meters/minute  
(b) mm/minute (d) mm/revolution of job
9. Turret lathes which are constructed such that long turning cuts are made by moving the saddle along the bedways of the machine are classified as:
- (a) drum type turret lathes  
(b) ram type turret lathes  
(c) saddle type turret lathes  
(d) automatic screw machines
10. External and internal tapers are machined on turret lathes:
- (a) by using formed tools  
(b) by using taper turning attachment  
(c) by off-setting the tailstock center  
(d) by setting the compound rest at an angle

11. On automatic screw machines having vertical and cross slides, the vertical slide is normally used for ... operations.
  - (a) thread cutting
  - (b) turning
  - (c) drilling
  - (d) parting-off
12. Turret lathes equipped with spindles which can be fitted with a universal 3-jaw chuck are referred to as ..... machines
  - (a) drum type
  - (b) saddle type
  - (c) chucking
  - (d) universal lathe
13. The important difference between ordinary center lathes and turret lathes is that:
  - (a) center lathes are cheaper and simpler
  - (b) turret lathes are costly and very complicated
  - (c) tungsten carbide tools are used in turret lathes
  - (d) turret lathes are constructed and tooled so that several different operations can be performed at the same time
14. On bar-type turret lathes, work to be machined is held or gripped in ..... chucks.
  - (a) three-jaw
  - (b) four-jaw
  - (c) pneumatic
  - (d) collet
15. Automatic screw machines capable of machining more than one workpiece at a time are classified as:
  - (a) single spindle automatic machines
  - (b) multi-spindle automatic machines
  - (c) drum type machines
  - (d) ram-type machines
  - (e) bar turners

- 16.** Angles which are ground on the top surface or face of a lathe tool bit and which slant downward from the side cutting edge of the tool are called:
- (a) Positive side rake angles
  - (b) Negative side rake angles
  - (c) Side clearance angles
  - (d) End cutting edge angles
- 17.** Which one of the following arrangements places the metals in correct order of turning speeds, starting with the slowest?
- (a) mild steel, aluminium, brass
  - (b) mild steel, brass, aluminium
  - (c) brass, mild steel, aluminium
  - (d) aluminium, brass, mild steel
- 18.** When taking a finish cut, the lathe should be operated at:
- (a) a lower cutting speed
  - (b) a medium cutting speed
  - (c) a higher cutting speed
  - (d) any cutting speed
- 19.** The unit of a lathe which houses the lathe spindle and control levers for speed selection is called a:
- (a) head stock
  - (b) tail stock
  - (c) feed box
  - (d) carriage
  - (e) tool post
- 20.** During drilling work on a lathe, mount the drill in the spindle of the:
- (a) Headstock
  - (b) Tool post
  - (c) Tailstock
  - (d) Carriage
  - (e) Gear box



21. Work which cannot be held in a lathe chuck can be clamped to: a ..... mounted on the headstock spindle.
- (a) Camplate
  - (b) Faceplate
  - (c) Carriage
  - (d) Tailstock
  - (e) Surface plate
22. To take up wear on the cross slide or compound rest, the adjustable ..... must be tightened.
- (a) jigs
  - (b) plates
  - (c) gibs
  - (d) pins
  - (e) screws
23. The angle on the face or top surface of a lathe tool which slants downward from the side cutting edge is called:
- (a) Side rake angle
  - (b) Back rake angle
  - (c) Front clearance angle
  - (d) Side clearance angle
  - (e) Side cutting edge angle
24. The angle on the face of a tool which slants backward from the nose of the tool is called:
- (a) Side rake angle
  - (b) Back rake angle
  - (c) Side clearance angle
  - (d) Front clearance angle
  - (e) End Cutting Edge Angle (ECEA)
25. The angles which are ground on the sides of a lathe tool bit are called:
- (a) Rake angles
  - (b) Clearance angles or relief angles
  - (c) Cutting edge angles
  - (d) Point angles

- 26.** During facing work in a lathe, it is important that the point of the tool be set:
- (a) on the exact center of the workpiece
  - (b) below the center of the workpiece
  - (c) above the center of the workpiece
  - (d) any where on the workpiece
- 27.** A round nose tool ground without an ..... can be used as a right or left hand tool
- (a) Back rake angle
  - (b) Side rake angle
  - (c) Front clearance angle
  - (d) Side clearance angle
  - (e) End cutting edge angle
- 28.** Work which cannot be chucked because of its shape can be mounted on a ..... for facing.
- (a) collet
  - (c) V-block
  - (b) vise
  - (d) faceplate
- 29.** For a turning operation, the tool bit should be set:
- (a) slightly below the center of the workpiece
  - (b) slightly above the center of the workpiece
  - (c) exactly at the center of the workpiece
  - (d) at an angle
- 30.** Which one of the lathe parts mentioned below is provided with a power feed?
- (a) Carriage
  - (c) Cross slide
  - (b) Compound rest
  - (d) Feed screw
- 31.** Parts having a square or irregular shape to be machined on a lathe can only be mounted in:
- (a) Universal chucks
  - (c) collet chucks
  - (b) independent chucks
  - (d) Cam lock chucks

32. The preferred chuck for mounting small cylindrical work to be turned is .....
- (a) the Cam lock chuck
  - (b) the Universal chuck
  - (c) the 4-jaw chuck
  - (d) the collet chuck
33. Tail stock centers which do not revolve with the workpiece are referred to as .....
- (a) Revolving centers
  - (b) Dead centers
  - (c) Live centers
  - (d) Independent centers
  - (e) Magnetic centers.
34. To refinish the points of lathe centers which have become worn, grind them to an included angle of:
- (a)  $30^\circ$
  - (b)  $60^\circ$
  - (c)  $90^\circ$
  - (d)  $120^\circ$
  - (e)  $118^\circ$
35. The dovetail surfaces of the compound rest, the carriage, and the cross slide are provided with adjustable ..... to take up wear.
- (a) screws
  - (b) plates
  - (c) gibs
  - (d) jigs
  - (e) pins
36. Work to be faced in a lathe chuck requires that:
- (a) the compound rest be set at a certain angle
  - (b) the tip of the tool is set exactly on the work center line
  - (c) the tip of the tool be set below the work centerline
  - (d) the tool be set slightly above the work center
37. During plain turning of a shaft mounted between lathe centers:
- (a) Set the compound rest parallel to the work axis
  - (b) Use a lubricant

- (c) Set the tool bit slightly above the work centerline
  - (d) Set the tool bit below the work centerline
- 38.** The included thread angle of a standard form of thread is:
- (a) 30 degrees
  - (b) 45 degrees
  - (c) 60 degrees
  - (d) 90 degrees
  - (e) 120 degrees
- 39.** The width of the tool bit point for cutting a ..... thread should be ground to half-the-pitch of the thread.
- (a) ACME-
  - (b) SQUARE-
  - (c) V-
  - (d) STANDARD-
- 40.** Taper turning on a lathe can be done by:
- (a) One method only
  - (b) Two different methods
  - (c) Three different methods
  - (d) Four different methods
- 41.** Taper turning can be performed on a lathe when work is mounted between centers by off-setting the ..... center.
- (a) Headstock
  - (b) Tail stock
  - (c) Live
  - (d) Drill
- 42.** To machine a 60-degree included angle on a lathe center with the compound rest, the compound rest must be set at ..... to the work centerline.
- (a) 15 degrees
  - (b) 30 degrees
  - (c) 60 degrees
  - (d) 120 degrees
- 43.** The operation of producing an accurately-sized hole in a lathe using a tool bit is called:
- (a) Drilling
  - (b) Reaming
  - (c) Boring
  - (d) Burnishing

44. The use of a ..... tap when large size holes are threaded, eliminates the need to reverse the rotation of the lathe spindle when withdrawing the tap from the hole.
- (a) Square (c) Hand  
(b) Solid (d) Collapsible
45. “The lead of any thread is always the same as the pitch.” The above statement is true:
- (a) in the case of single-thread screw only  
(b) in the case of double-thread screw only  
(c) in the case of multiple-thread screw only  
(d) under all conditions
46. The only automatic screw machine having sliding .....which can be actuated longitudinally is the Swiss-type.
- (a) Carriage (c) Compound rest  
(b) Tailstock (d) Spindle
47. The setting of the lathe gear box levers in thread-cutting operations is determined by the.....
- (a) Pitch of threads to be cut  
(b) Material being threaded  
(c) Length of the thread to be cut  
(d) R.P.M. of the lathe spindle
48. While cutting a standard V-thread the compound rest of the lathe must be set at an angle of.....
- (a) 14.5 degrees (c) 45 degrees  
(b) 29 or 30 degrees (d) 60 degrees
49. A good lubricant to use in thread-cutting operations is:
- (a) Graphite (c) Mineral Lard oil  
(b) White lead (d) Water soluble oil

- 50.** A lubricant is not needed when cutting threads in:
- (a) Tungsten carbide
  - (b) Mild steel
  - (c) Titanium
  - (d) Brass or cast iron
  - (e) High Speed Steel (H.S.S.)
- 51.** What would be the finish depth of a square thread having a pitch of 4 mm?
- (a) 16 mm
  - (b) 4 mm
  - (c) 2 mm
  - (d) 1 mm
  - (e) 8 mm
- 52.** Short or sharp angle tapers are machined using:
- (a) a taper attachment
  - (b) the compound rest
  - (c) the tailstock set over method
  - (d) a form tool ground to the taper angle
- 53.** On single-spindle automatics, stock cut off operations are normally performed from the .....
- (a) Vertical tool slide
  - (b) Rear tool post
  - (c) Square Turret
  - (d) Hexagonal turret
  - (e) Cross slide
- 54.** The movement of the various slides as well as the feeding of the stock is entirely automatic on screw machines and is obtained by ..... action.
- (a) gear
  - (b) collet
  - (c) roller
  - (d) spring
  - (e) cam
- 55.** Long turning cuts are made on ..... type turret lathes by longitudinal movement of the saddle along the bedways of the machine.
- (a) Drum
  - (b) Saddle
  - (c) Universal
  - (d) Chucking

- 56.** A tool which is mounted in the hexagonal turret when taking heavy turning cuts at high speeds is called a .....
- (a) Box type of tool
  - (b) Bar turner
  - (c) Chaser
  - (d) Heavy turning attachment.
- 57.** Square or irregular shaped workpiece for turning is usually mounted in:
- (a) Three jaw chuck
  - (b) Independent chuck
  - (c) Collet chuck
  - (d) Bar chuck
  - (e) Mandrel
- 58.** A device which is fastened to the headstock end of work to be turned between centers is called a:
- (a) face plate
  - (b) lathe dog
  - (c) vise
  - (d) work-steady
  - (e) independent chuck
- 59.** Previously drilled and reamed parts can be turned between centers by mounting such parts on a:
- (a) Three jaw chuck
  - (b) Four jaw chuck
  - (c) Steady
  - (d) Mandrel
  - (e) Faceplate
- 60.** The angles ground into the face or top surface of lathe tool bits are referred to as:
- (a) Clearance angles
  - (b) Relieving angles
  - (c) Rake angles
  - (d) Side/Face Cutting Edge Angles
- 61.** The angles which are ground on the sides of a lathe tool bit are called:
- (a) Rake angles
  - (b) Clearance angles
  - (c) Side Cutting Edge Angles (SCEA)
  - (d) Point angles

- 62.** Which of the following lathe operations requires that the cutting edge of a tool bit be placed exactly on the work centerline?
- |              |                |
|--------------|----------------|
| (a) Boring   | (d) Turning    |
| (b) Drilling | (e) Chamfering |
| (c) Facing   |                |
- 63.** All moving elements used in a machining operation on a screw machine are positioned for cuts automatically by ..... action.
- |            |            |
|------------|------------|
| (a) Gear   | (d) Roller |
| (b) Collet | (e) Cam    |
| (c) Spring |            |
- 64.** On screw machines having cross and vertical slides, cutting off operations are usually performed from the .....
- |                      |                               |
|----------------------|-------------------------------|
| (a) Horizontal slide | (c) Cross-slide               |
| (b) Vertical slide   | (d) Cross-drilling attachment |
- 65.** Drill chucks when used for drilling operations in a lathe are mounted in the ..... spindle
- |               |                |
|---------------|----------------|
| (a) Tool post | (c) Head stock |
| (b) Carriage  | (d) Tailstock  |
- 66.** The automatic performance of all operations on screw machines is obtained by:
- |            |             |
|------------|-------------|
| (a) Dowels | (c) Bushes  |
| (b) Cams   | (d) Fillets |
- 67.** When machining internal or external tapers on a turret lathe .....is used.
- |                              |
|------------------------------|
| (a) Face turning attachment  |
| (b) Taper turning attachment |
| (c) Sliding attachment       |
| (d) Morse Taper attachment   |



- 68.** In lathe work, the cutting speed is usually expressed in:
- (a) R.P.M.
  - (b) mm/min.
  - (c) m/min.
  - (d) cm/min.
  - (e) mm/rev.
- 69.** In lathe work, the cutting tool feed is expressed in:
- (a) R.P.M.
  - (b) m/min.
  - (c) m/rev.
  - (d) inches/min.
  - (e) mm/rev.
- 70.** Discontinuous chips are normally obtained when turning metals such as:
- (a) Mild steel
  - (b) Aluminium
  - (c) Cast Iron
  - (d) High Speed Steel (H.S.S.)
- 71.** Continuous chips are normally produced when turning:
- (a) Ductile metals
  - (b) Brittle metals
  - (c) Brass
  - (d) Diamond
- 72.** In a taper turning exercise on a lathe, the following details are given on the component drawing:
- (i) The amount of taper is 1/20
  - (ii) The difference in the diameters of big end and small end of the tapered portion is 8 mm.
- What is the length of the tapered portion?
- (a) 160 mm
  - (b) 320 mm
  - (c) 80 mm
  - (d) 2.5 mm
  - (e) 5 mm
- 73.** A lathe tool is considered as a:
- (a) single point cutting tool
  - (b) multi-point cutting tool
  - (c) single edged cutting tool
  - (d) multi-edged cutting tool

**74.** A shaft 1000 mm long has a taper of 1 : 100 for a length of 300 mm. The maximum diameter of the tapered portion is 75 mm. What is the minimum diameter of the tapered portion?

- (a) 81 mm                                      (d) 69 mm  
 (b) 78 mm                                      (e) 66 mm  
 (c) 72 mm

## 12. key

*(Please try to answer the questions/test items on your own before looking at the answers given below).*

- |                |                |                |                |                |
|----------------|----------------|----------------|----------------|----------------|
| <b>1.</b> (b)  | <b>16.</b> (a) | <b>31.</b> (b) | <b>46.</b> (d) | <b>61.</b> (b) |
| <b>2.</b> (c)  | <b>17.</b> (b) | <b>32.</b> (d) | <b>47.</b> (a) | <b>62.</b> (c) |
| <b>3.</b> (e)  | <b>18.</b> (c) | <b>33.</b> (b) | <b>48.</b> (a) | <b>63.</b> (e) |
| <b>4.</b> (c)  | <b>19.</b> (a) | <b>34.</b> (b) | <b>49.</b> (c) | <b>64.</b> (b) |
| <b>5.</b> (b)  | <b>20.</b> (c) | <b>35.</b> (c) | <b>50.</b> (d) | <b>65.</b> (d) |
| <b>6.</b> (b)  | <b>21.</b> (b) | <b>36.</b> (b) | <b>51.</b> (c) | <b>66.</b> (b) |
| <b>7.</b> (c)  | <b>22.</b> (c) | <b>37.</b> (a) | <b>52.</b> (b) | <b>67.</b> (b) |
| <b>8.</b> (d)  | <b>23.</b> (a) | <b>38.</b> (c) | <b>53.</b> (a) | <b>68.</b> (c) |
| <b>9.</b> (c)  | <b>24.</b> (b) | <b>39.</b> (b) | <b>54.</b> (e) | <b>69.</b> (e) |
| <b>10.</b> (b) | <b>25.</b> (b) | <b>40.</b> (c) | <b>55.</b> (b) | <b>70.</b> (c) |
| <b>11.</b> (d) | <b>26.</b> (a) | <b>41.</b> (b) | <b>56.</b> (b) | <b>71.</b> (a) |
| <b>12.</b> (c) | <b>27.</b> (b) | <b>42.</b> (b) | <b>57.</b> (b) | <b>72.</b> (a) |
| <b>13.</b> (d) | <b>28.</b> (d) | <b>43.</b> (c) | <b>58.</b> (b) | <b>73.</b> (a) |
| <b>14.</b> (d) | <b>29.</b> (b) | <b>44.</b> (d) | <b>59.</b> (d) | <b>74.</b> (c) |
| <b>15.</b> (b) | <b>30.</b> (b) | <b>45.</b> (a) | <b>60.</b> (c) |                |

# 13

## *DRILLING, REAMING, THREADING, AND BORING PRACTICE*

*Choose the correct alternative:*

1. The tool used to scribe a circle in laying out a hole is called:  
(a) a scriber (c) a compass  
(b) a divider (d) a combination set
2. Center punches are used in layout work to locate and mark the centers of:  
(a) shafts (c) slides  
(b) holes (d) bearings
3. The most common method of originating a hole in a metallic workpiece is by .....  
(a) shearing  
(b) punching  
(c) countersinking  
(d) drilling  
(e) boring
4. Cylindrical job should always be clamped on a ..... for drilling.  
(a) collet (d) vise  
(b) socket (e) V-block  
(c) jaw

5. The cutting edges of a standard twist drill are called .....
  - (a) flutes
  - (b) lips
  - (c) wedges
  - (d) flanks
  - (e) conical points
  
6. The helical grooves which extend to the full length of the drill body are called:
  - (a) Lips
  - (b) Cutting edges
  - (c) Margins
  - (d) Flutes
  - (e) Shanks
  
7. The number of helical grooves which are present in a standard twist drill is usually:
  - (a) one
  - (b) two
  - (c) three
  - (d) four
  
8. The important purpose of flutes in a drill is:
  - (a) they enable the cutting fluid to enter the working zone
  - (b) they enable the chips to come out
  - (c) they increase the strength of the drill at the cutting point
  - (d) they reduce the weight of the drill used
  - (e) they enable the cutting edges to be formed
  
9. The “depth-of-cut” in a drilling operation is equal to:
  - (a) length of hole drilled
  - (b) the feed rate used
  - (c) diameter of the drill used
  - (d) 1/2 the diameter of the drill used
  - (e) 1/4 the diameter of the drill used
  
10. The usual point angle of the drill is:
  - (a) 90°
  - (b) 98°
  - (c) 118°
  - (d) 135°
  - (e) same as the helix angle of the drill

11. The point angles and clearance angles of drills must be varied by grinding depending on the:
  - (a) Drill Diameter
  - (b) Material to be drilled
  - (c) R.P.M. of the drill
  - (d) Depth of the hole to be drilled
12. To drill free machining stainless steel at a cutting speed of 15 m/minute with a 15 mm diameter drill, the drill must rotate at a speed of:
  - (a) 320 R.P.M.
  - (b) 640 R.P.M.
  - (c) 1000 R.P.M.
  - (d) 3.1416 R.P.M.
  - (e) 32 R.P.M.
13. A hole which does not go entirely through a workpiece is referred to in the shop as:
  - (a) an inclined hole
  - (b) a blind hole
  - (c) a through hole
  - (d) a countersink hole
  - (e) a pilot hole
14. All straight-shanked drills used in drill press work must be held.....
  - (a) directly into the spindle of the drill press
  - (b) in a key type drill chuck
  - (c) in a tapers sleeve
  - (d) in a vise
15. To provide a positive drive, all tapershanked drills are provided with a ..... to prevent them from slipping under a cutting load:
  - (a) sleeve
  - (b) socket
  - (c) tang
  - (d) neck
16. The purpose of the.....on a taper shank drill is to prevent drill slipping and to ensure a positive drive.
  - (a) sleeve
  - (b) socket
  - (c) neck
  - (d) tang
  - (e) flutes

17. To reduce the feeding pressure needed for drilling larger holes, it is a good practice first to .....
- (a) anneal the workpiece
  - (b) drill a countersink hole
  - (c) drill a small pilot hole
  - (d) drill a stepped hole
18. A drill having flat sides and two cutting edges for drilling large holes is called a .....
- (a) Micro-drill
  - (b) Spade drill
  - (c) Boring tool
  - (d) Counter-boring tool
19. A cutting fluid need not be used when drilling or reaming.....
- (a) Aluminium
  - (b) Brass
  - (c) Bronze
  - (d) Mild Steel
  - (e) Cast Iron
20. Kerosene is a good cutting fluid to use when drilling.....
- (a) Cast Iron
  - (b) Mild steel
  - (c) Aluminium
  - (d) Brass
  - (e) Bronze
21. The taper usually employed in drill sleeves is known as:
- (a) Girling Taper
  - (b) Morse Taper
  - (c) Brown & Sharp taper
  - (d) 1: 1 Taper
22. A taper shank drill is removed from the drill spindle by:
- (a) tapping the drill by a hammer
  - (b) a screw driver
  - (c) a draft
  - (d) a drift
  - (e) a tang
23. Oversized holes in drilling are caused by:
- (a) equal lengths of lips
  - (b) unequal length of lips
  - (c) larger helix angle
  - (d) smaller helix angle
  - (e) wornout drills

24. The operation of providing a smooth seat or bearing surface around a previously drilled hole for a washer or nut is called:  
(a) boring (c) counter sinking  
(b) counterboring (d) spot-facing
25. The operation of making a recess at the top of a drilled hole for a flat-head machine screw is called:  
(a) Boring (c) Micro-boring  
(b) Counter sinking (d) Reaming
26. A cutting tool used to make a recess at the top of a drilled hole for a flat head machine screw is called .....  
(a) a Core drill (d) an end mill  
(b) a Spade drill (e) a countersink tool  
(c) a reamer
27. .... is the only drilling machine not equipped with power feeds:  
(a) The Sensitive drill press  
(b) The Multiple spindle drilling machine  
(c) The Radial drilling machine  
(d) The Gang drilling machine
28. When a number of single spindle drilling machine columns are placed side by side on a common work table, the machine is known as:  
(a) Radial drilling machine  
(b) Gang drilling machine  
(c) Multiple-spindle drilling machine  
(d) Universal drilling machine  
(e) Pillar type drilling machine
29. The machine which is used to drill a number of holes simultaneously on a tractor engine housing is called:  
(a) Sensitive drilling machine  
(b) Radial drilling machine

- (c) Universal drilling machine
- (d) Gang drilling machine
- (e) Multi-spindle drilling machine

**30.** Reaming is done

- (a) for making a hole initially
- (b) to enlarge the diameter of the hole
- (c) to improve the finish in the hole
- (d) to achieve correct diameter

**31.** When reaming holes with solid reamers, mount the reamer in .....

- (a) a rigid holder
- (b) a floating holder
- (c) a semi-rigid holder
- (d) a Collet

**32.** A tool used to finish drilled holes accurately to size is called:

- (a) an end mill
- (b) a tap
- (c) a die
- (d) a twist drill
- (e) a reamer

**33.** ..... is the operation of sizing and finishing a hole accurately with a very little metal removal

- (a) Drilling
- (b) Tapping
- (c) Piercing
- (d) Reaming
- (e) Turning

**34.** To provide a close tolerance and a fine finish in a drilled hole, the hole must be .....

- (a) drilled again
- (b) tapped
- (c) sheared
- (d) reamed

**35.** The cutting speed to be used in reaming a hole .....

- (a) should be same as the cutting speed used in drilling that hole
- (b) should be more than the cutting speed used in drilling that hole
- (c) should be less than the cutting speed used in drilling that hole
- (d) could be any speed
- (e) should be as large as possible



- 36.** The operation of threading a drilled hole is called:
- |             |               |
|-------------|---------------|
| (a) Lapping | (c) Broaching |
| (b) Reaming | (d) Tapping   |
- 37.** A fluted tool used to cut internal threads is called:
- |             |                 |
|-------------|-----------------|
| (a) a tap   | (c) a die       |
| (b) a drill | (d) an end mill |
- 38.** Hand-tapping is an operation for generation of internal threads. The number of taps generally used for completing this operation is:
- (a) 1
  - (b) 2
  - (c) 3
  - (d) 4
  - (e) depends on the diameter of the hole
- 39.** A tool used in threading a hole is called:
- |           |                   |
|-----------|-------------------|
| (a) a tap | (c) an end mill   |
| (b) a die | (d) a twist drill |
- 40.** Taps are used for:
- (a) generating internal threads
  - (b) generating external threads
  - (c) drilling holes
  - (d) enlarging the holes
- 41.** A tool used in cutting an external thread is called a:
- |                 |         |
|-----------------|---------|
| (a) twist drill | (c) die |
| (b) tap         | (d) nut |
- 42.** Dies are used for:
- |                                 |                         |
|---------------------------------|-------------------------|
| (a) generating internal threads | (c) drilling holes      |
| (b) generating external threads | (d) enlarging the holes |

43. In a double-start thread the lead is equal to .....
- (a) 12 pitch
  - (b) pitch
  - (c) twice the pitch
  - (d) Thrice the pitch
  - (e) 4 times the pitch
44. “Point thinning” a drill:
- (a) reduces the point angle of the drill
  - (b) makes the drill to produce an oversize hole
  - (c) reduces the effort needed to make the drill cut
  - (d) help the chips to come out easily
45. A twist drill has been ground so that the cutting edges are of unequal length. The effect of this in use will be to produce:
- (a) a hole larger in diameter than the drill
  - (b) an increase in the life of the drill
  - (c) breakage due to the over loading of the longer cutting edge
  - (d) softening due to overheating the drill
46. A drill is found to machine always an “oversize” hole. Which one of the following is the cause of this fault?
- (a) the drill is too large in diameter
  - (b) the cutting edges are of unequal length
  - (c) the drill has been allowed to get hot
  - (d) considerable amount of wear has occurred on the drill
47. For which one of the following purposes are screw-cutting taps used?
- (a) to cut internal threads
  - (b) to clean out blind holes
  - (c) for light riveting
  - (d) to cut external threads
  - (e) to enlarge undersize holes

- 48.** Screw threads may be cut on a 10 mm dia, steel rod by using:
- (a) a circular split die
  - (b) a set of taps
  - (c) a drill and a reamer
  - (d) knurling tool
- 49.** The machining process which makes a cone-shaped recess at the top of a drilled hole for a flathead machine screw is called:
- (a) counter-boring
  - (b) die-sinking
  - (c) counter-sinking
  - (d) taper drilling
  - (e) micro-boring
- 50.** The groove in the body of the drill which allows the chips to come out is known as:
- (a) the chip breaker
  - (b) the lip
  - (c) the flute
  - (d) the margin
  - (e) chip follower
- 51.** For a given work material, a large sized drill must rotate.....than a small sized drill to maintain the same cutting speed (surface speed).
- (a) faster
  - (b) at a lower R.P.M.
  - (c) at an higher R.P.M.
- 52.** A standard twist drill may be considered as a:
- (a) single point cutting tool
  - (b) multi-point cutting tool
  - (c) single edged cutting tool
- 53.** The workpiece motion and tool motion required respectively, in a horizontal boring machine are:
- (a) rotational and translational
  - (b) stationary and rotational
  - (c) stationary and rotational with translation

- 54.** A boring tool used for boring a hole over a large length should have:
- (a) one tool bit on a bar
  - (b) 2 tool bits fitted on diametrically opposite sides
  - (c) 4 tool bits
- 55.** Boring is:
- (a) enlargement of an existing hole
  - (b) finishing of an existing hole
  - (c) changing the shape of a hole
- 56.** A Jig boring machine resembles in appearance to:
- (a) vertical milling machine
  - (b) vertical boring machine
  - (c) horizontal boring machine

### 13. Key

- |                |                |                |                |
|----------------|----------------|----------------|----------------|
| <b>1.</b> (b)  | <b>15.</b> (c) | <b>29.</b> (e) | <b>43.</b> (c) |
| <b>2.</b> (b)  | <b>16.</b> (d) | <b>30.</b> (c) | <b>44.</b> (c) |
| <b>3.</b> (d)  | <b>17.</b> (c) | <b>31.</b> (b) | <b>45.</b> (a) |
| <b>4.</b> (e)  | <b>18.</b> (b) | <b>32.</b> (e) | <b>46.</b> (b) |
| <b>5.</b> (b)  | <b>19.</b> (e) | <b>33.</b> (d) | <b>47.</b> (a) |
| <b>6.</b> (d)  | <b>20.</b> (c) | <b>34.</b> (d) | <b>48.</b> (a) |
| <b>7.</b> (b)  | <b>21.</b> (b) | <b>35.</b> (a) | <b>49.</b> (c) |
| <b>8.</b> (e)  | <b>22.</b> (d) | <b>36.</b> (d) | <b>50.</b> (c) |
| <b>9.</b> (d)  | <b>23.</b> (b) | <b>37.</b> (a) | <b>51.</b> (b) |
| <b>10.</b> (c) | <b>24.</b> (d) | <b>38.</b> (c) | <b>52.</b> (b) |
| <b>11.</b> (b) | <b>25.</b> (b) | <b>39.</b> (a) | <b>53.</b> (c) |
| <b>12.</b> (a) | <b>26.</b> (e) | <b>40.</b> (a) | <b>54.</b> (b) |
| <b>13.</b> (b) | <b>27.</b> (a) | <b>41.</b> (c) | <b>55.</b> (a) |
| <b>14.</b> (b) | <b>28.</b> (b) | <b>42.</b> (b) | <b>56.</b> (a) |

## MILLING MACHINES

*Choose the correct alternative:*

1. To produce a smooth, flat surface on a workpiece you will generally use a:
  - (a) lathe
  - (b) arbor press
  - (c) milling m/c
  - (d) drill press.
2. A milling machine which has a table that can be swivelled and set at any angle to the column face is called a:
  - (a) plain knee-and-column type milling machine
  - (b) universal knee-and-column type milling machine
  - (c) bed-type milling machine
  - (d) drum-type milling machine
3. The operation of milling two sides of a workpiece simultaneously is called:
  - (a) gang milling
  - (b) climb milling
  - (c) square milling
  - (d) straddle milling
  - (e) end milling

4. A ..... must be used in gear milling operations to obtain equal spacing of teeth in gear blank.
- (a) Index plate
  - (b) Gear tooth vernier
  - (c) Pitch gauge
  - (d) Dividing head
5. Climb milling operation should never be used when milling ..... parts because the hard surface scale on the parts will dull the cutter.
- (a) Magnesium
  - (b) Cast Iron
  - (c) Steel
  - (d) Non-ferrous
6. When milling the teeth of a spur gear, the gear blank is mounted on ..... held between dividing head centers.
- (a) a chuck
  - (b) a face plate
  - (c) a mandrel
  - (d) a collet
7. The position of the ..... is considered in classifying a milling machine as to horizontal or vertical type.
- (a) spindle
  - (b) workpiece
  - (c) milling cutter
  - (d) work table or bed
8. When performing angular indexing, one complete crank turn is required to index the work through .....
- (a) 360°
  - (b) 180°
  - (c) 90°
  - (d) 9°
9. To obtain fine finish cuts in milling .....
- (a) the cutting speed should be decreased and the feed increased
  - (b) the cutting speed should be increased and the feed decreased
  - (c) both the cutting speed and feed should be decreased
  - (d) both the cutting speed and feed should be increased
10. The rigidity and the power rating of the milling machine must be adequate when the milling operation is performed using .....
- (a) carbide-tipped milling cutters
  - (b) cast-alloy milling cutters

- (c) H.S.S. milling cutters
  - (d) High carbon steel cutters
- 11.** Helical gear milling operations can be performed only on a:
- (a) Plain horizontal milling machine
  - (b) Vertical milling machine
  - (c) Universal milling machine
  - (d) Drum type milling machine
- 12.** To cut 20 teeth on a gear blank, the index crank of the dividing head must be turned....., to rotate the work in to position for milling each tooth.
- (a) 1/2 a turn
  - (b) one complete turn
  - (c) two complete turns
  - (d) 1/40 of a turn (or 9 degrees)
  - (e) 80 turns
- 13.** Discontinuous or powdery chips are normally obtained when milling metals such as:
- (a) Mild steel
  - (c) Cast Iron (CI)
  - (b) Tungsten
  - (d) High Speed Steel (HSS)
- 14.** Continuous chips are normally produced when milling:
- (a) Ductile materials
  - (c) Brass
  - (b) Brittle materials
  - (d) Diamond
- 15.** The attachment used on milling machines for indexing purposes is called a:
- (a) Face plate
  - (c) Dial indicator
  - (b) V-block
  - (d) Dividing head.
- 16.** The number of index crank turns required after each cut to mill 8 equally spaced slots in a round shaft is:
- (a) 320
  - (c) 8
  - (e)  $21\frac{1}{2}$
  - (b) 40
  - (d) 5

17. A universal dividing head must be used to perform a milling operation by:
 

(a) Plain indexing	(c) Differential indexing
(b) Direct indexing	(d) Compound indexing
  
18. To rotate the work mounted on a dividing head through one complete turn, the index crank must be rotated through:
 

(a) 40 complete turns	(d) 1 complete turns
(b) 20 complete turns	(e) 1/40th of turn
(c) 10 complete turns	
  
19. While sharpening milling cutters by grinding, the width of the land can be reduced, by grinding a:
 

(a) Primary clearance angle	(c) Rake angle
(b) Secondary clearance angle	(d) Suitable nose radius
  
20. The cutters designed for straddle milling operations are called ..... cutters.
 

(a) Side milling	(c) Plain milling
(b) Face milling	(d) Dovetail milling
  
21. The operation of a dovetail milling cutter is similar to the operation of .....
 

(a) a plain milling cutter	(c) an end milling cutter
(b) a side milling cutter	(d) a shaping tool
  
22. A quick and accurate way to mill a perfect square on the end of a round shaft is to mount the shaft in ..... so that the shaft can be indexed.
 

(a) a differential	(c) an index plate
(b) a compound rest	(d) a dividing head
  
23. The cutting tool material capable of withstanding the highest cutting speeds is the:
 

(a) Stellite tipped cutters	(b) Tungsten-carbide tipped cutters
-----------------------------	-------------------------------------



- (c) High-speed steel cutters
  - (d) High carbon steel milling cutters.
- 24.** In helical milling, the ratio of the circumference of the gear blank to the lead of the helix gives the:
- (a) angle setting of the machine table
  - (b) speed to use
  - (c) feed and depth of cut required
  - (d) no. of teeth to be cut
- 25.** ..... of the index crank is/are required when indexing, to rotate the workpiece one complete turn.
- (a) 1/40 turn (9 degrees)
  - (b) 1 turn
  - (c) 40 turns
  - (d) depends on the no. of holes in the index plate
- 26.** One complete turn of the index crank will turn the workpiece by:
- (a) 9 degrees
  - (b) 18 degrees
  - (c) 90 degrees
  - (d) 180 degrees
  - (e) 1/40th of a degrees
- 27.** The accurate spacing of teeth in a gear blank requires the use of:
- (a) a dividing head
  - (b) an index plate
  - (c) a gear tooth vernier
  - (d) a differential mechanism
- 28.** The cutting of helical gears requires the use of a ..... milling machine.
- (a) vertical
  - (b) horizontal
  - (c) universal
  - (d) drum-type
- 29.** How is the feed rate expressed in the case of milling operation?
- (a) mm/tooth
  - (b) R.P.M. of the milling cutter
  - (c) meters/minute
  - (d) strokes/minute

**30.** Milling cutter are mounted on a part called the ..... of the milling machine.

- (a) Bracket or Brace
- (b) Arbor
- (c) Shaft
- (d) Horizontal support
- (e) Table

**31.** Milling cutters are considered as:

- (a) single point cutting tools
- (b) multi-point cutting tools
- (c) single-edged cutting tools

#### 14. Key

- |               |                |                |                |
|---------------|----------------|----------------|----------------|
| <b>1.</b> (c) | <b>9.</b> (b)  | <b>17.</b> (c) | <b>25.</b> (c) |
| <b>2.</b> (b) | <b>10.</b> (a) | <b>18.</b> (c) | <b>26.</b> (a) |
| <b>3.</b> (d) | <b>11.</b> (c) | <b>19.</b> (c) | <b>27.</b> (a) |
| <b>4.</b> (d) | <b>12.</b> (c) | <b>20.</b> (a) | <b>28.</b> (c) |
| <b>5.</b> (b) | <b>13.</b> (a) | <b>21.</b> (c) | <b>29.</b> (c) |
| <b>6.</b> (c) | <b>14.</b> (a) | <b>22.</b> (d) | <b>30.</b> (b) |
| <b>7.</b> (a) | <b>15.</b> (d) | <b>23.</b> (b) | <b>31.</b> (b) |
| <b>8.</b> (d) | <b>16.</b> (d) | <b>24.</b> (a) |                |

## CUTTING TOOL MATERIALS

*Choose the correct alternative:*

1. .... are harder and more wear resistant than tungsten carbide but are weaker in tension.  
(a) low carbon steel tools                      (c) H.S.S. tools  
(b) high carbon steel tools                      (d) Ceramic tools
2. Stellite tools are formed by ..... process.  
(a) Sintering                      (c) Machining                      (e) Casting  
(b) Forging                      (d) Cold rolling
3. Cermic tips are prepared from ..... powder.  
(a) Tungsten                      (d) Silicon carbide  
(b) Carbon                      (e) any metal  
(c) Aluminium Oxide
4. .... are cast alloys containing tungsten and chromium carbides in a matrix of cobalt and chromium.  
(a) Mechanites  
(b) Tungsten Carbides  
(c) Bakelilte  
(d) Stellites

5. Carbide tips are fixed to the shanks of cutting tools by:
 

(a) forging	(c) welding	(e) brazing
(b) sintering	(d) soldering	
  
6. The most wear-resistant grade of carbide used for cutting tools is the straight .....
 

(a) Iron carbide	(c) Tungsten carbide
(b) Calcium carbide	(d) Nickel carbide
  
7. Which one of the following must be considered while selecting the proper grade of carbide tool to use?
 

(a) the type of operation to be done
(b) the type of work material to be machined
(c) the finish requirements of the machined part
(d) the speeds to be used in turning the part
  
8. During grinding of carbide tool bits, ..... wheel is generally used.
 

(a) Aluminium Oxide	(d) Cobalt
(b) Silicon Carbide	(e) High Speed Steel. (HSS)
(c) Diamond	
  
9. Powder Metallurgy (PM) techniques are used in the production of:
 

(a) High carbon steel tools	(c) Tungsten carbide tools
(b) HSS tools	(d) Twist drills
  
10. What is the material of the cutting tool generally used on a lathe?
 

(a) C.I	(d) High Speed Steel (H.S.S.)
(b) Mild steel	(e) Brass
(c) Low-carbon steel	
  
11. Among the following abrasives, the hardest one is .....
 

(a) $Al_2O_3$ (Aluminium Oxide)	(d) CBN (Cubic Boron Nitride)
(b) Si C (Silicon Carbide)	(e) Diamond
(c) $B_4C$ (Boron Carbide)	

12. The hardness of carbon tool steels will be increased when alloyed with ..... and vanadium.
- (a) Tungsten                      (c) Silicon                      (e) Silver  
(b) Chromium                      (d) Manganese
13. The type of wear which occurs on the rake face of tool bits is referred to as:
- (a) Flank wear                      (c) Tip wear                      (e) Radius wear  
(b) Crater wear                      (d) End wear
14. What is the approximate % range of Carbon content in the High Speed Steel (H.S.S.) tool material?
- (a) 0.6 - 1.0%                      (c) 10 - 18%  
(b) 4 - 6%                      (d) 18 - 42%
15. What is the approximate % content of Vanadium in H.S.S. (High Speed Steel) cutting tool material?
- (a) 16                      (c) 0.1  
(b) 4                      (d) 1
16. The usual % of Tungsten content in the High Speed Steel (H.S.S.) cutting tool material is:
- (a) 18%                      (c) 1%  
(b) 4%                      (d) 0.6%
17. The approximate percentage content of Chromium in H.S.S. (High Speed Steel) cutting tool material is:
- (a) 1%                      (c) 18%  
(b) 4%                      (d) 0.6%
18. In metal cutting operations, when the cutting speed is increased, the life of the cutting tool:
- (a) remains the same                      (c) increases  
(b) decreases                      (d) gets doubled

**15. Key**

**1.** (d)

**2.** (e)

**3.** (c)

**4.** (d)

**5.** (e)

**6.** (c)

**7.** (b)

**8.** (c)

**9.** (c)

**10.** (d)

**11.** (e)

**12.** (b)

**13.** (b)

**14.** (e)

**15.** (a)

**16.** (d)

**17.** (a)

**18.** (b)

**19.** (b)

## GRINDING PRACTICE

*Choose the correct alternative:*

1. In grinding operation, the actual cutting action is done by:
  - (a) resin
  - (b) abrasives
  - (c) rubber
  - (d) void spaces
  - (e) steel
2. The grinder which is used to produce flat ground surfaces is called a:
  - (a) flexible shaft grinder
  - (b) surface grinding machine
  - (c) cylindrical grinding machine
  - (d) centerless grinding machine
  - (e) internal grinding machine
3. The depth of cut on a surface grinder is regulated by raising or lowering the .....
  - (a) work table
  - (b) wheel head
  - (c) workpiece
  - (d) magnetic base
  - (e) Diamond dresser

4. In centerless grinding operation the regulating wheel and the grinding wheel:
  - (a) must always rotate at the same speed as the work speed
  - (b) must always rotate at different speeds, but in the same direction
  - (c) must always rotate at the same speed, but in opposite direction
  - (d) must always rotate at different speeds, and in opposite direction
5. Grinding machines equipped with rotating work tables are classified as:
  - (a) tool and cutter grinders
  - (b) cylindrical grinders
  - (c) surface grinders
  - (d) centerless grinding machines
  - (e) internal grinding machines
6. The operation of sharpening a grinding wheel is called:
  - (a) truing
  - (b) dressing
  - (c) aligning
  - (d) wheel balancing
7. Surface grinders are usually equipped with a ..... for holding the work to be ground.
  - (a) pneumatic chuck
  - (b) fluid chuck
  - (c) mechanical chuck (three-jaw chuck)
  - (d) magnetic chuck
8. In centerless grinding operation, the workpiece is made to rotate:
  - (a) by the grinding wheel
  - (b) by the regulating wheel
  - (c) by the work rest
  - (d) directly by the electric motor
9. Among the following abrasives, the hardest one is:
  - (a) aluminium oxide
  - (b) silicon carbide
  - (c) diamond
  - (d) cubic boron nitride
10. When grinding wheels become loaded or glazed, they may be dressed, to restore sharpness, with a:
  - (a) pumice stone dresser
  - (b) tool steel dresser
  - (c) diamond dresser
  - (d) sharp edged H.S.S. cutter



- 11.** The grinding wheels employed in surface grinding operations are classified as:
- (a) plain grinding wheels
  - (b) cup wheels
  - (c) Dished or saucer wheels
  - (d) grinding points
- 12.** In center-type cylindrical grinding operations when the work is mounted between centers, the work is made to rotate by:
- (a) using a live or rotating center in the head stock spindle
  - (b) the frictional drive of a regulating wheel
  - (c) the same general method used to rotate work mounted between centers on a lathe
  - (d) the movement of the grinding wheel itself
- 13.** When grinding wheels become loaded or glazed, they must be:
- (a) balanced properly
  - (b) aligned accurately
  - (c) trued
  - (d) dressed
- 14.** A center-type cylindrical grinder that permits swivelling the wheel head and head stock at an angle to the table ways is called a:
- (a) Tool and cutter grinder
  - (b) Surface grinder
  - (c) Internal grinding machine
  - (d) Bench grinder
  - (e) Universal grinder
- 15.** In cylindrical grinding operations, the work is always rotated:
- (a) at a much slower speed than that of the grinding wheel
  - (b) at a much faster speed than that of the grinding wheel
  - (c) at the same speed as the grinding wheel
  - (d) at 30 R.P.M.
- 16.** The peripheral speed of a 150 mm diameter grinding wheel rotating at 300 R.P.M. is:
- (a) 20 m/min.
  - (b) 1415 m/min.
  - (c) 450 m/min.
  - (d)  $\pi (150) (3000)/60$  m/min.

17. A slight taper is to be ground on the full length of a long shaft mounted between centers on a universal cylindrical grinder. This can be accomplished by:
- (a) Off-setting the tail stock
  - (b) Swivelling the table on its base
  - (c) Swivelling the wheel head
  - (d) Swivelling the workpiece
18. To grind the  $60^\circ$  on the end of a machine center point on a universal cylindrical grinder:
- (a) the table is swivelled to  $30^\circ$
  - (b) the headstock is swivelled to  $60^\circ$
  - (c) the headstock is swivelled to  $30^\circ$
  - (d) the work piece is swivelled to  $30^\circ$
  - (e) the headstock is swivelled to  $120^\circ$
19. Plunge ..... cut grinding is accomplished on a cylindrical grinder by:
- (a) Traversing the table
  - (b) Using the table cross feed
  - (c) Feeding the grinding wheel into the work while the table remains stationary
  - (d) Feeding the workpiece into the grinding wheel while the grinding wheel remains stationary
20. The correct setting of the height of the work in ..... operations is obtained by the setting of the work rest blade.
- (a) cylindrical grinding
  - (b) surface grinding
  - (c) centerless grinding
  - (d) internal grinding
  - (e) ball grinding
21. In centerless grinding operations, the work is rotated and fed past the face of the grinding wheel by the .....
- (a) work rest
  - (b) regulated wheel
  - (c) table
  - (d) electric motor directly

22. Holes in parts which have been hardened by heat treatment can be finished to accurate size only by:
- (a) Drilling
  - (b) Boring
  - (c) Internal grinding
  - (d) Reaming
23. The surface speed of the smaller grinding wheels used for internal grinding operations ranges from:
- (a) 15–30 meters/min.
  - (b) 300–1000 meters/min.
  - (c) 1200–2000 meters/min.
  - (d) 10,000–20,000 meters/min.
24. The approximate cutting speed for surface grinding operations is generally:
- (a) 15 meters/min.
  - (b) 100 meters/min.
  - (c) 600 meters/min.
  - (d) 1800 meters/min.
  - (e) 20,000 meters/min.
25. The grit size of the abrasives used in the grinding wheels is usually specified by:
- (a) the Hardness number
  - (b) the size of the wheel
  - (c) the softness or hardness of the abrasive
  - (d) the Mesh number
26. In grinding practice, the term “grade of the wheel” refers to:
- (a) the fineness of the abrasives used
  - (b) the strength of the bond of the wheel
  - (c) the finish that can be obtained
  - (d) the hardness of the abrasives used in the manufacturing of the wheel
  - (e) the structure of the wheel

- 27.** In the standard marking system used for specifying the grinding wheel, the grade of the wheel is usually represented by:
- (a) a Number
  - (b) a Letter of the English Alphabet
  - (c) the Hardness of the abrasives
  - (d) the finish of the wheel
- 28.** In grinding practice, the term “Hardness of the wheel” refers to:
- (a) the hardness of the abrasives used
  - (b) the strength of the bond of the wheel
  - (c) the finish of the wheel
  - (d) the hardness of the workpiece that can be machined with the grinding wheel
- 29.** In Centerless grinding operation, the regulating wheel is usually:
- (a) bigger than the grinding wheel
  - (b) smaller than the grinding wheel
  - (c) of the same size as the grinding wheel
  - (d) smaller than the diameter of the workpiece.
- 30.** Lapping, honing, and superfinishing are basically:
- (a) slow speed abrasive machining processes
  - (b) high speed abrasive machining processes
  - (c) grinding processes
  - (d) material removal processes wherein large quantity of material is machined
- 31.** Which one of the following processes removes maximum amount material out of a workpiece?
- (a) honing
  - (b) lapping
  - (c) grinding
  - (d) superfinishing

32. For achieving extremely smooth surface finish at bearing surfaces, the process of machining generally employed is:
- (a) milling
  - (b) shaping
  - (c) drilling
  - (d) grinding
33. Grinding operation is used for:
- (a) forming
  - (b) shaping
  - (c) dressing
  - (d) finishing
34. For grinding shafts, spindles, and bolts use:
- (a) tool and cutter grinding
  - (b) cylindrical grinding
  - (c) thread grinding
  - (d) surface grinding
35. For grinding flat surfaces use:
- (a) internal grinding
  - (b) thread grinding
  - (c) cylindrical grinding
  - (d) surface grinding
36. The highest cutting speed is used in:
- (a) surface grinding
  - (b) centerless grinding
  - (c) internal grinding
  - (d) cylindrical grinding
37. Grinding ratio may be defined as:
- (a) Wear of grinding wheel/Volume of metal removed
  - (b) Volume of metal removed/Wear of grinding wheel
  - (c)  $\text{Wear of grinding wheel} \div \text{Volume of metal removed}$
  - (d) None of the above
38. Surface speed (in m/min) of the grinding wheel in centerless grinding is:
- (a) 15–16
  - (b) 100–500
  - (c) 1000–1500
  - (d) 1500–1800
39. Workpiece is supported as follows in centerless grinding:
- (a) on magnetic chuck
  - (b) in universal chuck
  - (c) in collet chuck
  - (d) none of the above

- 40.** The workpiece advances in centerless grinding due to:
- (a) Machine drive
  - (b) Effort applied by operator
  - (c) Force exerted by regulating wheel
  - (d) Force exerted by grinding wheel
- 41.** Artificial abrasives are:
- (a) Sandstone, Emery, Diamond, Quartz
  - (b) Silicon carbide, Aluminium oxide, Boron carbide
  - (c) Garnet
  - (d) Corundum
- 42.** For grinding work materials like bronze, brass, copper, aluminium, etc., the abrasives used is:
- (a) Silicon carbide
  - (c) Aluminium oxide
  - (b) Garnet
  - (d) Corundum
- 43.** for softer materials, the grain of abrasives used is:
- (a) Coarse grain
  - (c) Medium grain
  - (b) Fine grain
  - (d) Both (b) and (c)
- 44.** If condition of machine is such that it produces vibrations, then use:
- (a) Hard grade abrasive
  - (c) Both (a) and (b)
  - (b) Soft grade abrasive
  - (d) Something else
- 45.** For harder materials, the grain of abrasives used is:
- (a) Coarse grain
  - (c) Medium grain
  - (b) Fine grain
  - (d) Both (a) and (c)
- 46.** Majority of the grinding wheels use the following type of bond:
- (a) Resinoid
  - (b) Silicate
  - (c) Rubber
  - (d) Vitrified

47. In finish grinding, the grinding ratio is kept as:
- (a) 5–10
  - (b) 10–25
  - (c) 25–50
  - (d) 50–100
48. Grade of a wheel, i.e., strength of a bond is designated from A to Z, where:
- (a) A is very soft
  - (b) Z is very hard
  - (c) Z is very soft
  - (d) both (a) and (b) are true
49. If a grinding wheel is designated as 30 A 36 H 6 VB then the letter H indicates:
- (a) Grade of bond
  - (b) Type of bond
  - (c) Structure
  - (d) Abrasive
50. In the above question, the letter ‘V’ indicates:
- (a) Type of abrasive
  - (b) Type of bond
  - (c) Type of structure
  - (d) Grade of bond
51. A grinding wheel is said to be glazed:
- (a) when it becomes unbalanced
  - (b) when the abrasive grains have been replaced
  - (c) when the abrasive grains become dull and stop cutting
  - (d) when some lubricant is added to the abrasive grains
52. Truing of grinding wheel is done by:
- (a) Glazing the wheel
  - (b) Dressing the wheel
  - (c) Loading the wheel
  - (d) Balancing the wheel
53. Grinding wheels are balanced ..... by shifting weights on one flange of the wheel mount.
- (a) Statically
  - (b) Dynamically
  - (c) Both statically and dynamically

- 54.** Which operation should be performed in the last in connection with grinding wheel?
- (a) Balancing (c) Truing  
(b) Dressing (d) Glazing
- 55.** Which of the following grinding processes has highest possible speeds?
- (a) Internal grinding (c) Cylindrical grinding  
(b) Surface grinding (d) Cutting off operations

### 16. Key

- |                |                |                |                |
|----------------|----------------|----------------|----------------|
| <b>1.</b> (b)  | <b>15.</b> (a) | <b>29.</b> (b) | <b>43.</b> (a) |
| <b>2.</b> (b)  | <b>16.</b> (b) | <b>30.</b> (a) | <b>44.</b> (a) |
| <b>3.</b> (b)  | <b>17.</b> (c) | <b>31.</b> (c) | <b>45.</b> (b) |
| <b>4.</b> (b)  | <b>18.</b> (c) | <b>32.</b> (d) | <b>46.</b> (d) |
| <b>5.</b> (c)  | <b>19.</b> (c) | <b>33.</b> (d) | <b>47.</b> (c) |
| <b>6.</b> (b)  | <b>20.</b> (c) | <b>34.</b> (b) | <b>48.</b> (d) |
| <b>7.</b> (d)  | <b>21.</b> (b) | <b>35.</b> (d) | <b>49.</b> (a) |
| <b>8.</b> (b)  | <b>22.</b> (c) | <b>36.</b> (d) | <b>50.</b> (b) |
| <b>9.</b> (c)  | <b>23.</b> (c) | <b>37.</b> (b) | <b>51.</b> (c) |
| <b>10.</b> (c) | <b>24.</b> (d) | <b>38.</b> (d) | <b>52.</b> (b) |
| <b>11.</b> (a) | <b>25.</b> (d) | <b>39.</b> (d) | <b>53.</b> (a) |
| <b>12.</b> (c) | <b>26.</b> (b) | <b>40.</b> (c) | <b>54.</b> (a) |
| <b>13.</b> (d) | <b>27.</b> (b) | <b>41.</b> (b) | <b>55.</b> (d) |
| <b>14.</b> (e) | <b>28.</b> (b) | <b>42.</b> (a) |                |



## *LAPPING, HONING, AND SUPER FINISHING*

*Chose the correct alternative:*

1. Ball bearing races are
  - (a) lapped
  - (b) honed
  - (c) buffed
  - (d) ground
2. In which of the following processes, least material is removed?
  - (a) grinding
  - (b) lapping
  - (c) honing
  - (d) superfinishing
3. The process of precision grinding of workpiece with loose dust type abrasive is known as:
  - (a) honing
  - (b) lapping
  - (c) buffing
  - (d) polishing
4. Pressure applied on workpiece in case of lapping operation is:
  - (a)  $0.05 \text{ kg/cm}^2$
  - (b)  $0.1 \text{ kg/cm}^2$
  - (c)  $1.0 \text{ kg/cm}^2$
  - (d)  $5 \text{ kg/cm}^2$
5. Which of the following process is used for finishing cylindrical holes?
  - (a) lapping
  - (b) honing
  - (c) polishing
  - (d) buffing

6. Which abrasive particle is held in the form of sticks in honing process?
  - (a)  $\text{Al}_2\text{O}_3$  or SiC
  - (b) Corundum
  - (c) Quartz
  - (d) Diamond
7. Buffing is:
  - (a) a finishing operation after honing
  - (b) a process of electroplating
  - (c) the process of bringing out the luster
  - (d) process of covering a metal with soft material
8. Honing is used to correct:
  - (a) Ovality
  - (b) Waviness of axis
  - (c) Non-parallelism of cylindrical features
  - (d) All of the above
9. Honing operation produces a quality of finish (CLA value) of the order of:
  - (a) 0.01–0.08 micron
  - (b) 0.08–0.2 micron
  - (c) 0.2–0.4 micron
  - (d) 0.4–0.8 micron
10. Which of the following processes would remove least material?
  - (a) honing
  - (b) lapping
  - (c) superfinishing
11. Honing operation:
  - (a) cannot be used to change the location of hole or correct shaped condition of a hole
  - (b) cannot correct ovality
  - (c) cannot correct waviness of axis

### 17. Key

- |        |        |        |         |
|--------|--------|--------|---------|
| 1. (a) | 4. (b) | 7. (c) | 10. (c) |
| 2. (d) | 5. (b) | 8. (d) | 11. (a) |
| 3. (b) | 6. (a) | 9. (c) |         |

## GEARS

*Choose the correct alternative:*

1. In the case of a spur gear, if  $N$  is number of teeth and  $D$  is the diameter of the pitch circle, then the diametral pitch is given by
  - (a)  $D/N$
  - (b)  $\pi D/N$
  - (c)  $N/D$
  - (d)  $ND/\pi$
2. The working depth or the depth of engagement of two gears is equal to:
  - (a) sum of their addendums
  - (b) sum of their dedendums
  - (c) addendum – dedendum
  - (d) dedendum + clearance
3. The height by which a gear tooth projects beyond the pitch circle or pitch line is known as:
  - (a) circular pitch
  - (b) addendum
  - (c) dedendum
  - (d) clearance
4. Bevel gears are used to transmit rotary motion from one shaft to the other whose axes intersect at:
  - (a) right angles
  - (b) any angle
  - (c) 45 degrees only
  - (d) 180 degrees only

5. Theoretical minimum number of teeth on a pinion for avoiding interference in any gearing device could be:

- (a) 10–12 (c) 25–30 (e) around 50  
(b) 18–20 (d) 32–40

6. Pitch circle diameter (in mm) of a gear wheel is given by the expression .....

- (a)  $\frac{m}{z}$  (c)  $mz$  (e)  $\frac{m+1}{z}$   
(b)  $\frac{z}{m}$  (d)  $mz + 1$

where  $m = \text{module of gear}$  and  $z = \text{number of teeth in the gear wheel}$

7. The term “module” in gear technology refers to:

- (a) diametral pitch  
(b) no. of teeth/pitch circle diameter  
(c) pitch circle diameter/no. of teeth  
(d) pitch of gear teeth  
(e) no. of teeth

8. When measuring gear teeth for size with a gear tooth vernier caliper, the reading for chordal tooth thickness is obtained from the ..... of the caliper.

- (a) Vertical scale (c) Circular scale  
(b) Horizontal scale (d) Counter

9. The module of a gear, having 36 teeth and a pitch diameter of 225 mm, is:

- (a) 0.16 mm (c) 12.50 mm  
(b) 25.00 mm (d) 6.25 mm

10. To find the module of a gear, divide the pitch circle diameter by the .....

- (a) addendum (d) number of teeth  
(b) dedendum (e) (number of teeth + 1)  
(c) 1/2 the number of teeth

11. The measurement from center-to-center of adjacent gear teeth taken on the arc of the pitch circle, is called the .....
- (a) Circular pitch                      (c) Diametral pitch  
(b) Chordal pitch                      (d) Tooth thickness
12. A gear-tooth vernier caliper is used to measure the.....and chordal thickness of gear teeth.
- (a) Addendum                      (d) Module  
(b) Dedendum                      (e) Diametral pitch  
(c) circular pitch
13. The common pressure angles in involute gears are .....
- (a) 14 1 2, 21 1 2 degrees                      (d) 14, 20 degrees  
(b) 14 1 2, 20 degrees                      (e) 14, 21 degrees  
(c) 14 1 2, 20 1 2 degrees

### 18. Key

- |        |         |         |
|--------|---------|---------|
| 1. (c) | 6. (c)  | 11. (a) |
| 2. (a) | 7. (c)  | 12. (a) |
| 3. (b) | 8. (b)  | 13. (b) |
| 4. (b) | 9. (d)  |         |
| 5. (b) | 10. (d) |         |



## JIGS AND FIXTURES

Choose the correct alternative:

1. The work holding device commonly used when machining a keyway in a cylindrical shaft on a shaper is:
  - (a) an angle plate
  - (b) a vise
  - (c) a V-block
  - (d) a mandrel
2. .... are used to locate and guide cutting tools such as twist drills, reamers and counter boring cutters.
  - (a) Drill jigs
  - (b) Jig bushes
  - (c) Metal pins
  - (d) V-blocks
3. A ..... can hold the work, locate the work and guide the drill at the desired position.
  - (a) drill bush
  - (b) drill fixture
  - (c) metal locator
  - (d) drill jig
4. Typical locating devices used in Jigs and Fixtures construction are:
  - (a) Drill Jigs
  - (b) V-blocks
  - (c) Mandrels
  - (d) Angle plates

5. Cylindrical job should always be clamped in a ..... for drilling.
- |            |          |             |
|------------|----------|-------------|
| (a) Collet | (c) Jaw  | (e) V-block |
| (b) Socket | (d) Vise |             |
6. The important property to be considered in the selection of a suitable material for the manufacturing of locating pins used in Jigs and Fixtures construction is:
- |                      |                                     |
|----------------------|-------------------------------------|
| (a) Shear strength   | (d) Wear resistance                 |
| (b) Tensile strength | (e) Sharpness of the locating pins. |
| (c) Elasticity       |                                     |
7. In the selection of a suitable material for the manufacturing of a drill jig bush, the critical property to be considered is:
- |                      |                     |
|----------------------|---------------------|
| (a) Tensile strength | (c) Wear Resistance |
| (b) Elasticity       | (d) Shear strength  |
8. The device in which a component is held and located for a specific machining operation in such a way that it will guide one or more cutting tools during machining is known as:
- |           |              |
|-----------|--------------|
| (a) Jig   | (c) Fixture  |
| (b) Gauge | (d) Template |
9. The production tooling equipment which locates and holds the component for a specific operation (but it does not guide the cutting tool) is known as:
- |              |             |
|--------------|-------------|
| (a) Template | (c) Fixture |
| (b) Gauge    | (d) Jig     |
10. Devices designed for locating and holding cutting tools are usually called:
- |              |                  |
|--------------|------------------|
| (a) Gauges   | (c) Templates    |
| (b) Fixtures | (d) Tool-holders |
11. A workpiece in space free to move in any direction can have:
- |                          |                           |
|--------------------------|---------------------------|
| (a) 3 degrees of freedom | (c) 9 degrees of freedom  |
| (b) 6 degrees of freedom | (d) 12 degrees of freedom |



- 12.** The application of jigs and fixtures:
- (a) Increases the production
  - (b) Widens the technological capacity of machine tools
  - (c) Either fully or partly automates the machine tools
  - (d) All of the above
- 13.** The work holding device commonly used while machining a key way in a cylindrical shaft on a shaper is:
- (a) A vice
  - (b) A mandrel
  - (c) V-block
  - (d) An angle plate
- 14.** Most of the locating and clamping devices are made up of:
- (a) H.S.S.
  - (b) Aluminium
  - (c) C.I
  - (d) Hardened Steel
- 15.** Clamping should always be arranged:
- (a) Directly above the points supporting the work
  - (b) Directly above the points supporting the tool
  - (c) Directly below the points supporting the work
  - (d) None of the above
- 16.** If the diameter of the hole is subject to considerable variation, then use:
- (a) Conical location
  - (b) Vee-block
  - (c) Cylindrical Pin
- 17.** For drilling holes in a long strip, use:
- (a) Channel jig
  - (b) Plate jig
  - (c) Leaf jig
  - (d) Box jig
- 18.** The simplest type of jig is:
- (a) Leaf jig
  - (b) Plate jig
  - (c) Template jig
  - (d) Box jig

- 19.** To drill a series of holes on a circular face of the workpiece, use:
- (a) Leaf jig
  - (b) Box jig
  - (c) Pot jig
  - (d) Index jig
- 20.** Cylindrical job should always be clamped in a ..... for drilling:
- (a) Collet
  - (b) Jaw
  - (c) Vice
  - (d) V-block

### 19. Key

- |               |                |                |
|---------------|----------------|----------------|
| <b>1.</b> (c) | <b>8.</b> (a)  | <b>15.</b> (a) |
| <b>2.</b> (b) | <b>9.</b> (c)  | <b>16.</b> (a) |
| <b>3.</b> (d) | <b>10.</b> (d) | <b>17.</b> (b) |
| <b>4.</b> (b) | <b>11.</b> (d) | <b>18.</b> (c) |
| <b>5.</b> (e) | <b>12.</b> (d) | <b>19.</b> (d) |
| <b>6.</b> (d) | <b>13.</b> (c) | <b>20.</b> (d) |
| <b>7.</b> (c) | <b>14.</b> (d) |                |

## *BROACHING*

*Tick the most correct response:*

1. The surface finish obtained in broaching operation is of the order of:  
(a) 8 microns (c) 0.08 micron  
(b) 0.8 micron (d) 0.008 micron
2. The maximum depth of cut which the tooth of a broach cuts is:  
(a) 1 mm (c) 0.01 mm  
(b) 0.15 mm (d) 0.5 mm
3. A broach has:  
(a) roughing teeth, semifinishing teeth, and finishing teeth  
(b) roughing teeth, and finishing teeth only  
(c) only finishing teeth  
(d) normally 30 teeth
4. The pitch for teeth of internal broaches is given by the relation:  
(a) 0.35 times length of cut in mm.  
(b) 1.25 to 1.5 times length of cut in mm  
(c) 4 times length of cut in mm  
(d) None of the above

5. For proper broaching, at least the following number of teeth should be engaged in the work at a time:
- (a) 1
  - (b) 2
  - (c) 3
  - (d) 4
6. In broaching:
- (a) the job is completed in one stroke of the machine
  - (b) the tooling cost is high
  - (c) the rate of production is very slow
7. The finishing teeth of a broaching tool are provided with:
- (a) large amount of land
  - (b) smaller amount of land
  - (c) no land
8. The range of hardness of the material which can be broached is:
- (a) 10 to 20 Rockwell C
  - (b) 25 to 40 Rockwell C
  - (c) 60 to 80 Rockwell C
9. Broaching is primarily done for:
- (a) better finish
  - (b) cylindrical jobs
  - (c) mass production
  - (d) hard materials
10. The broaching operation in which the tool moves past the stationary work is:
- (a) push broaching
  - (b) pull broaching
  - (c) continuous broaching
  - (d) surface broaching
11. Broaching operation is frequently used in automobile industry as:
- (a) it is less costly machine
  - (b) it is a mass production machine
  - (c) operation is completed in one stroke

- 12.** The front teeth of a broach:
- (a) remove minimum metal
  - (b) remove maximum metal
  - (c) remove no metal

**20. Key**

- |               |               |                |
|---------------|---------------|----------------|
| <b>1.</b> (b) | <b>5.</b> (c) | <b>9.</b> (c)  |
| <b>2.</b> (b) | <b>6.</b> (b) | <b>10.</b> (d) |
| <b>3.</b> (a) | <b>7.</b> (b) | <b>11.</b> (b) |
| <b>4.</b> (b) | <b>8.</b> (b) | <b>12.</b> (b) |



## *MACHINE TOOL TECHNOLOGY*

*Choose the correct alternative:*

1. Norton type gear box is an example of:  
(a) Speed gear box                      (c) Infinitely variable drive  
(b) Feed gear box                      (d) Mechanical friction drive
2. The chief advantage of stepless drives in machine tools is:  
(a) the drive is positive without slip  
(b) the speed change from one speed to another is very smooth  
(c) limited speed variation  
(d) they are very cheap
3. For lathes, boring machines and milling machines the desirable speed range ratio is .....  
(a) between 5–10                      (c) between 50–100  
(b) between 10–30                      (d) between 100–200
4. Gear boxes used in turret lathes provide .....  
(a) No variation of speed  
(b) Stepped variation of speed  
(c) Stepless variation of speed  
(d) Infinite variation of speed

5. The *synchronous speed* of a motor having 2 pairs of poles in the stator at a supply frequency of 50 Hz is .....  
(a) 500 R.P.M. (c) 1500 R.P.M. (e) 2500 R.P.M.  
(b) 1000 R.P.M. (d) 2000 R.P.M.
6. Stepless regulation of speed for machine tools is usually achieved by .....  
(a) cone pulley drive  
(b) change gear drive  
(c) gear boxes provided with clutches  
(d) mechanical friction drive
7. Ward-Leonard system of speed regulation used in machine tools is:  
(a) basically an hydraulic system  
(b) basically an electronic system  
(c) basically an electrical system  
(d) essentially a mechanical friction drive system.
8. The spindle speeds available in machine tools are usually arranged in .....  
(a) Arithmetic progression (c) Logarithmic progression  
(b) Geometric progression (d) Harmonic progression
9. Very large speed ranges are required for .....  
(a) Shaping machines  
(b) Planing machines  
(c) Semi-automatic and automatic turrets  
(d) Grinding machines  
(e) Drilling machines
10. The phenomenon of stick-slip is more predominant when the sliding speed is:  
(a) zero  
(b) low  
(c) high  
(d) equal to the cutting speed



- 11.** The range of speed regulation in a machine tool is defined as:
- (a) max. speed/min. speed
  - (b) min. speed/max. speed
  - (c) max. speed – min. speed
  - (d) (max. speed/min. speed) – 1
  - (e) No. of speeds obtainable between min. and max. speed
- 12.** The use of elastic rubber supports in machine tool foundations is mainly:
- (a) to increase the speed of the machine
  - (b) to increase the capacity of the machine
  - (c) to prevent electrical shocks
  - (d) to suppress the vibrations
- 13.** An important disadvantage of broaching process is:
- (a) the broaching tools are always longer in length
  - (b) that only simple shapes can be obtained
  - (c) the return stroke is always idle
  - (d) the process is suitable only for high volume production
- 14.** Broaching tools are usually made of:
- (a) high carbon steel
  - (b) High Speed Steel (H.S.S.)
  - (c) ceramics
  - (d) tungsten carbide
- 15.** The person who is responsible for listing the sequence of operations or machine movements needed to complete the machining of a part on a numerically controlled machine tool (NCMT) is called a:
- (a) machine operator
  - (b) set-up man
  - (c) tooling assistant
  - (d) programmer
  - (e) job analyzer

16. A knowledge of ..... is essential for any one wanting to learn how to service or maintain numerically controlled machine tools (NCMT)
- (a) Chemistry
  - (b) Thermodynamics
  - (c) Psychology
  - (d) Electronics
  - (e) Automobile Engineering
17. The full load speed of a 12 pole *synchronous* motor operating at 50 Hz is:
- (a) Just less than 500 R.P.M.
  - (b) Exactly 500 R.P.M.
  - (c) Just less than 600 R.P.M.
  - (d) Exactly 600 R.P.M.
  - (e) just less than 1000 R.P.M.
18. The rotor speed of a 12 pole *induction* motor operating at 50 cps and at full rated load is:
- (a) just less than 1000 R.P.M.
  - (b) exactly 1000 R.P.M.
  - (c) Just less than 500 R.P.M.
  - (d) exactly 500 R.P.M.
  - (e) exactly 600 R.P.M.
19. The machining operation of cutting a key-way inside a drilled hole is known as:
- (a) reaming
  - (b) broaching
  - (c) boring
  - (d) tapping
20. The machine tool in which the point-to-point numerical control system is applied is the:
- (a) Drilling machine
  - (b) Grinding machine
  - (c) Milling Machine
  - (d) Lathe
  - (e) Shaping machine.
21. The machine tool in which the system of continuous path numerical control is applied is the:
- (a) Shaping machine
  - (b) Grinding machine
  - (c) Milling machine
  - (d) Drilling machine

22. The numerical control system which is applicable to a milling machine is called the:
- (a) Point-to-point system
  - (b) Continuous path system
  - (c) Zig-Zag machining system
  - (d) Straight-cut-system
23. The person who prepares a program which shows the sequence of operations to be performed by a NCMT (Numerically Controlled Machine Tool) is called a:
- (a) machine tool setter
  - (b) part programmer
  - (c) design-assistant
  - (d) tool designer
  - (e) skilled machinist
24. The point-to-point system of numerical control can be applied only to:
- (a) conventional drilling machine or jig boring operations
  - (b) conventional milling operations
  - (c) conventional shaper operations
  - (d) conventional lathes
25. The vertical movement of the work table on a conventional milling machine is represented in the Cartesian Coordinate System as a movement parallel to:
- (a) the X-axis
  - (b) the Y-axis
  - (c) the O-axis
  - (d) the Z-axis
26. The cross feed movement of a conventional milling machine tool is represented in the Cartesian coordinate system as a movement parallel to the:
- (a) X-axis
  - (b) Y-axis
  - (c) Z-axis
  - (d) O-axis
27. In the Cartesian Coordinate System, the longitudinal table movement of a conventional milling machine can be considered as a movement in the:
- (a) O-axis
  - (b) Z-axis
  - (c) Y-axis
  - (d) X-axis

28. Programming a contouring cut on a milling machine is accomplished faster when a ..... is used.
- (a) punched tape
  - (b) tabulator
  - (c) desk calculator
  - (d) computer
  - (e) punched card
29. The surface speed in meters/minute of a workpiece of diameter  $D$  mm rotating at  $N$  R.P.M. is given by:
- (a)  $\pi DN$
  - (b)  $\pi DN/1000$
  - (c)  $1000/\pi DN$
  - (d)  $DN/1000$
  - (e)  $1000/DN$
30. Which of the following spindle speeds (R.P.M.) are most likely to be incorporated in the main gear box of a lathe according to the Preferred Number (PN) theory?
- (a) 50, 100, 150, 200, 250, 300, 350, 400, 450 R.P.M.
  - (b) 63, 127, 254, 381, 512 R.P.M.
  - (c) 14, 20, 28, 40, 56, 80, 112, 160, 224, 320, 448 R.P.M.
  - (d) 17, 51, 102, 204, 408, 512 R.P.M.
  - (e) 36, 72, 288, 1728 R.P.M.
31. The phenomenon of stick-slip is predominant:
- (a) at low speeds
  - (b) at high speeds
  - (c) when the sliding speed is zero
  - (d) when the sliding speed exceeds cutting speed
  - (e) when the sliding speed is less than the cutting speed
32. The hardening of machine tool guideways is usually done by:
- (a) Induction hardening
  - (b) Vacuum hardening
  - (c) Salt bath furnaces
  - (d) Flame hardening process

**33.** The main advantage of the plastic guideways is:

- (a) their low coefficient of friction
- (b) their high coefficient of friction
- (c) their better appearance
- (d) the reduction in the self-weight of the machine tool

## 21. Key

- |               |                |                |                |
|---------------|----------------|----------------|----------------|
| <b>1.</b> (d) | <b>10.</b> (b) | <b>19.</b> (b) | <b>28.</b> (d) |
| <b>2.</b> (b) | <b>11.</b> (a) | <b>20.</b> (a) | <b>29.</b> (b) |
| <b>3.</b> (b) | <b>12.</b> (d) | <b>21.</b> (c) | <b>30.</b> (c) |
| <b>4.</b> (b) | <b>13.</b> (d) | <b>22.</b> (b) | <b>31.</b> (a) |
| <b>5.</b> (c) | <b>14.</b> (b) | <b>23.</b> (b) | <b>32.</b> (d) |
| <b>6.</b> (b) | <b>15.</b> (d) | <b>24.</b> (a) | <b>33.</b> (a) |
| <b>7.</b> (c) | <b>16.</b> (d) | <b>25.</b> (d) |                |
| <b>8.</b> (b) | <b>17.</b> (b) | <b>26.</b> (b) |                |
| <b>9.</b> (d) | <b>18.</b> (c) | <b>27.</b> (d) |                |



## *NUMERICALLY CONTROLLED MACHINE TOOLS*

*Choose the correct alternative:*

1. The instruction on the tape of the NC machine is prepared in:
  - (a) numeric form
  - (b) coded form
  - (c) binary coded decimal form
2. Numerical control machine tool is operated by:
  - (a) Feedback system
  - (b) Numerical controls
  - (c) A series of code instructions
3. Numerical control can be applied to:
  - (a) lathe
  - (b) drilling machine
  - (c) milling machine
  - (d) all of the above
4. The numerical control machines are controlled by the tape where width is:
  - (a) 20 mm
  - (b) 30 mm
  - (c) 50 mm

5. In an NC machine, programmed instructions are stored on:
  - (a) punched tape
  - (b) head box
  - (c) graphic terminal
6. Which of the following term is associated with NC machines?
  - (a) Machining center
  - (b) Precision
  - (c) Mass production
7. Based on control system features, NC machines can be classified as:
  - (a) point-to-point system and straight-line system
  - (b) straight-line system and continuous-path system
  - (c) point-to-point system, straight-line system, and continuous-path system
8. The machine tool in which point-to-point numerical control system is applied is the:
  - (a) Drilling machine
  - (b) Grinding machine
  - (c) Milling machine

## 22. Key

- |        |        |        |
|--------|--------|--------|
| 1. (c) | 4. (a) | 7. (c) |
| 2. (c) | 5. (a) | 8. (a) |
| 3. (d) | 6. (a) |        |



## MODERN MACHINING METHODS

*Choose the correct alternative:*

1. Spark erosion machining method can be used for the machining of:
  - (a) Conducting materials only:
  - (b) Non-conducting materials only
  - (c) Semi-conductors only
  - (d) Both conducting and non-conducting materials
2. In spark erosion machining, for drilling deep holes of small diameters, the tool material should preferably be made of:
  - (a) Copper wire
  - (b) Brass wire
  - (c) Tungsten Carbide wire
  - (d) Tungsten wire
3. For machining to take place in spark erosion:
  - (a) the tool must be immersed in the dielectric fluid
  - (b) the work must be immersed in the dielectric fluid
  - (c) both tool and work must be immersed in the dielectric fluid
  - (d) no dielectric fluid is to be used
4. In spark erosion machining process, removal of metal takes place during:
  - (a) Charging of the capacitor
  - (b) Discharging of the capacitor
  - (c) all times
  - (d) alternate cycles only

5. In spark erosion machining if the dielectric is air:
- (a) the work piece particles will adhere to the tool
  - (b) the tool particles will adhere to the work piece
  - (c) the adherence of particles do not occur
  - (d) no machining takes place
6. In spark machining, erosion takes place:
- (a) on the job
  - (c) on both job and tool
  - (b) on the tool
  - (d) on the dielectric itself
7. Electro-discharge machining and electro-chemical machining processes ..... be used for machining ceramics and plastics.
- (a) can
  - (b) cannot
8. Surface integrity of finished workpiece is considerably ..... for electro-discharge machining process when compared to that of electro-chemical machining process.
- (a) poor
  - (c) very good
  - (b) good
  - (d) excellent
9. In Electro-chemical machining process metal is removed by .....
- (a) highly accelerated electron flow owing to ionization of the fluid medium
  - (b) anodic dissolution
  - (c) etchant solution
  - (d) stimulated emission of radiation
10. Tooling cost is ..... for Electro-chemical machining process compared to that of Electro-discharge machining process.
- (a) very high
  - (c) medium
  - (b) very low
  - (d) practically nil
11. In Electro-chemical machining, metal removal rate depends upon:
- (a) The hardness of tool materials
  - (b) The hardness of job material

- (c) Independent of the hardness of tool and work material
  - (d) The difference between the hardness of tool and work material
- 12.** In Electro-chemical machining, the metal is removed:
- (a) By the mechanical pressure of tool on job
  - (b) By the mechanical pressure of job on tool
  - (c) By atom by atom-dissolving of metal from the job
  - (d) By the stimulated emission of radiation
- 13.** In Electro-chemical machining, best surface finish is obtained:
- (a) with low current density
  - (b) with high current density
  - (c) with slow rate of metal removal
  - (d) with high rate of metal removal
- 14.** Electrolyte used in Electro-chemical machining process is:
- (a) Brine solution
  - (b) Kerosene
  - (c) Transformer oil
  - (d) Water
  - (e) Air
- 15.** For the machining of tungsten carbide by ultrasonic machining which abrasive is used for maximum machining rate?
- (a) Silicon carbide
  - (b) Boron carbide
  - (c) Aluminium oxide
  - (d) Glass
- 16.** In Ultrasonic drilling process, the tool is usually given:
- (a) the Rotary motion
  - (b) the Reciprocating motion
  - (c) the Linear motion
  - (d) Both the rotary motion and the reciprocating motion
- 17.** Diamond powder is mostly used in ultrasonic machining for the cutting of:
- (a) Glass
  - (b) Germanium
  - (c) Boron carbide
  - (d) Diamond

18. In ultrasonic machining process which part of the machine converts electric impulses to mechanical vibrations?
- (a) The trunk (c) The transducer (e) The workpiece  
(b) The oscillator (d) The abrasives
19. Which is the most suitable work material that can be machined by Ultrasonic Machining?
- (a) Mild steel (c) Cast Iron  
(b) Brass (d) Glass
20. The work material that can be successfully machined by all the three processes (viz. Spark erosion machining, Ultrasonic machining, and Electrochemical Machining) is .....
- (a) Glass (d) Diamond  
(b) Tungsten carbide (e) High Speed Steel (HSS)  
(c) Ceramic
21. The electrodes used in the Electro-Chemical Machining process must be made of .....
- (a) Semi-conductor (d) an insulating material  
(b) an anodic material (e) an electrically conducting material  
(c) a dielectric
22. Both the electrodes and the workpiece must be submerged in a dielectric fluid when machining the work piece by the:
- (a) USM process (d) AJM process  
(b) ECM process (e) LBM process  
(c) EDM process

(**Note.** USM refers to Ultrasonic Machining

ECM refers to Electro-chemical Machining

EDM refers to Electro-Discharge Machining

AJM refers to Abrasive Jet Machining

LBM refers to Laser Beam Machining.)

23. The electrodes used in the electro-chemical machining process differ from those used in the EDM process in that the ECM electrodes:
- (a) are hollow
  - (b) are made of conducting materials
  - (c) are made of insulating materials
  - (d) are insulated at the sides
24. In the ECM process, machining is accomplished by feeding ..... through the gap between the electrically charged electrode and the workpiece.
- (a) a dielectric fluid
  - (b) an electrolytic solution
  - (c) Kerosene
  - (d) Water
  - (e) plasma effluent
25. The part of an ultrasonic machine tool which causes the tool to vibrate at a rate of 20,000 cycles/second is called the:
- (a) Workpiece holder
  - (b) Abrasive slurry pump
  - (c) Water Jacket
  - (d) Transducer
  - (e) Feeding Device
26. In spark erosion machining process, the gap between tool and workpiece is filled with:
- (a) a photo etchant
  - (b) brine solution
  - (c) acid solution
  - (d) a liquid dielectric
  - (e) an electrolytic solution
27. In the electro-discharge machining process, the workpiece and the electrode are submerged in:
- (a) a dielectric fluid
  - (b) an abrasive slurry
  - (c) an electrolytic solution
  - (d) vacuum
  - (e) chemical reagents

28. The cutting tool used in the spark erosion machining process is called:
- (a) an Arc (c) an Electrode (e) a Servo  
(b) a Capacitor (d) a Dielectric
29. The machining process where the metal of a workpiece is dissolved into an electrolyte solution is called .....
- (a) electro-discharge machining  
(b) ultrasonic machining  
(c) electro-chemical machining  
(d) chemical machining  
(e) Laser machining
30. The machining method in which an abrasive slurry is used is called:
- (a) Electro-discharge machining  
(b) Laser machining  
(c) Plasma Arc Machining  
(d) Ultrasonic Machining  
(e) Chemical machining
31. In the electrolytic grinding process generally ..... is used
- (a) an aluminium oxide grinding wheel  
(b) a silicon carbide grinding wheel  
(c) a tungsten carbide grinding wheel  
(d) a diamond grinding wheel  
(e) a buffing wheel
32. Chemical reagents and etchants are used in ..... machining method
- (a) Electrochemical (c) Ultrasonic (e) Laser  
(b) Plasma Arc (d) Chemical
33. In spark erosion machining process which is used for diesinking, the usual tool material is:
- (a) High Speed Steel (c) Tungsten Carbide  
(b) Brass (d) Diamond

- 34.** The modern machining process working on Faraday's laws of electrolysis is known as:
- (a) EDM
  - (b) EBM
  - (c) ECM
  - (d) LBM
- 35.** In ECM, the current density in the discharge of channel is of the order of:
- (a) 10,000 Amperes per  $\text{cm}^2$
  - (b) 1000 Amperes per  $\text{cm}^2$
  - (c) 100 Amperes per  $\text{cm}^2$
  - (d) 10 Amperes per  $\text{cm}^2$
- 36.** A complicated contour is to be made exactly in a carbide plate. Which process will be used?
- (a) ECM
  - (b) EDM
  - (c) LBM
  - (d) USM
- 37.** Dielectric is a must in:
- (a) EDM process
  - (b) ECM process
  - (c) USM process
  - (d) LBM process
- 38.** In EDM process the workpiece is generally connected to:
- (a) positive terminal
  - (b) negative terminal
  - (c) earth
  - (d) any of the above.
- 39.** Metal removal rate (MRR) in USM is more for:
- (a) larger grain size of abrasives
  - (b) smaller grain size of abrasives
  - (c) medium grain size of abrasives
  - (d) none of the above

**23. Key**

- |         |         |         |         |
|---------|---------|---------|---------|
| 1. (a)  | 11. (c) | 21. (e) | 31. (d) |
| 2. (d)  | 12. (c) | 22. (c) | 32. (d) |
| 3. (c)  | 13. (d) | 23. (d) | 33. (b) |
| 4. (b)  | 14. (a) | 24. (b) | 34. (c) |
| 5. (b)  | 15. (b) | 25. (d) | 35. (c) |
| 6. (c)  | 16. (b) | 26. (d) | 36. (b) |
| 7. (b)  | 17. (d) | 27. (a) | 37. (a) |
| 8. (a)  | 18. (c) | 28. (c) | 38. (a) |
| 9. (b)  | 19. (d) | 29. (c) | 39. (a) |
| 10. (a) | 20. (b) | 30. (d) |         |



## *NON-FERROUS MATERIALS*

*Choose the correct alternative:*

1. Brass is an alloy of two metals. They are:
  - (a) Chromium and Carbon
  - (b) Tin and Aluminium
  - (c) Copper and Tin
  - (d) Copper and Zinc
  - (e) Zinc and Tin
2. The crystal structure of brass is:
  - (a) F.C.C.
  - (b) B.C.C.
  - (c) H.C.P.
  - (d) Orthorhombic crystalline structure
  - (e) None of the above
3. Which one of the following metals would work-harden more quickly than the others?
  - (a) Copper
  - (b) Brass
  - (c) Lead
  - (d) Silver
  - (e) Aluminium

4. Bronze is an alloy of:  
(a) Brass and Tin (d) Copper and Zinc  
(b) Zinc and Tin (e) Copper and Tin  
(c) Sulphur and Tin
5. Babbitt metal is used primarily in:  
(a) Ball bearings (d) Thermocouples  
(b) Roller bearings (e) Bridge construction  
(c) Sleeve bearings
6. A specimen of Aluminium metal when observed under microscope shows:  
(a) B.C.C.crystalline structure  
(b) F.C.C. crystal structure  
(c) H.C.P. structure  
(d) A complex cubic structure  
(e) Orthorhombic crystalline structure
7. Which one of the following metals is sufficiently ductile to enable it to be drawn into wire?  
(a) Tin (c) Lead  
(b) Copper (d) Zinc
8. Zinc has got the following crystal structure:  
(a) Face Centered Cubic structure  
(b) Body Centered Cubic structure  
(c) Hexagonal Close Packed structure  
(d) Orthorhombic crystalline structure
9. Powder Metallurgy (PM) techniques are used in the production of:  
(a) High Carbon Steel (c) Tungsten carbide tool bits  
(b) HSS tools (d) Twist drills
10. Asbestos is a:  
(a) mineral fiber (c) mixture of fiber and glass wool  
(b) fiber reinforced plastic (d) mixture of mica and fiber

- 11.** Mica is:
- (a) a conductor of current
  - (b) an insulator
  - (c) a mixture of plastic and rubber
  - (d) a petroleum by-product
- 12.** Vulcanizing is usually applied to:
- (a) plastic products
  - (b) rubber products
  - (c) mixture of plastic and rubber
- 13.** Poly-Vinyl-Chloride (PVC) is:
- (a) a compact form of mica
  - (b) a mixture of wool and cork
  - (c) a thermo-plastic material
  - (d) a thermo-setting plastic material
  - (e) a rubber product
- 14.** With reference to the plastics listed, which one of the following statements is true? I. Polystyrene II. Poly-Vinyl-Chloride III. Phenol formaldehyde IV. Tetra fluor-ethylene V. Polyethylene
- (a) All are thermoplastic materials
  - (b) All are thermosetting materials
  - (c) I and II are both thermoplastic materials
  - (d) Only III is thermosetting material
  - (e) I and III are both thermosetting materials
- 15.** The plastic material “teflon” is known primarily for its:
- (a) great mechanical strength
  - (b) extreme low coefficient of friction
  - (c) great heat resistance
  - (d) great hardness
  - (e) good electrical conductivity

16. Which statement best describes thermoplastic materials?
  - (a) they soften when cooled and harden when heated
  - (b) they become permanently hard when heated
  - (c) they relate to one particular trade name
  - (d) they soften when heated and harden when cooled
  - (e) they are phenol formaldehydes
17. In specifications containing the statement “Scrubbers are constructed of P.V.C.” the term P.V.C. refers to:
  - (a) Plain Vitrified Clay
  - (b) Poly Vinyl Chloride
  - (c) Patented Vanadium Copper
  - (d) Pliable Varnished Canvas
18. The soft material placed between two flanges of a CI water pipe to prevent leakage is called:
  - (a) Gasket
  - (b) Shim
  - (c) Plinth
  - (d) Spelter
19. A process commonly used to preserve wood against decay is:
  - (a) Anodizing
  - (b) Creosoting
  - (c) Grouting
  - (d) Guniting
20. Joints in cast iron water lines are generally sealed with:
  - (a) mortar
  - (b) lead and jute fibers
  - (c) couplings
  - (d) quick setting cement mixture
21. The two important Copper base alloys are:
  - (a) Monel and Brass
  - (b) Brass and Bronze
  - (c) Monel and Bronze
  - (d) Cupronickel and Bell metal
  - (e) Tin and Phosphor bronze

- 22.** The Babbitt metals are used:
- (a) for dies and cutting tools
  - (b) for high speed shafts
  - (c) in the manufacture of gears
  - (d) as bearing metals
- 23.** Aluminium is extracted from:
- (a) Anthracite ores
  - (b) Bauxite ores
  - (c) Hematite ores
  - (d) Magnesite ores
- 24.** Monel metal is an alloy of:
- (a) Molybdenum and Aluminium
  - (b) Chromium and Silicon
  - (c) Nickel and Chromium
  - (d) Nickel and Copper
- 25.** Gun metal is an alloy of
- (a) Copper and Zinc
  - (b) Copper and Tin
  - (c) Copper, Tin, and Phosphorus
  - (d) Copper, Tin, and Silicon
  - (e) Copper, Zinc, and Tin
- 26.** Phosphorus Bronze is an alloy of:
- (a) Phosphorus and Copper
  - (b) Phosphorus, Copper, and Tin
  - (c) Phosphorus, Copper, and Zinc
  - (d) Phosphorus, Tin, and Zinc
- 27.** A process of applying outside coating on aluminium is known as:
- (a) oxidizing
  - (b) anodizing
  - (c) galvanizing

**28.** A process of coating zinc by hot dipping is called:

- (a) anodizing
- (b) galvanizing
- (c) brazing

#### **24. Answer Key**

- |               |                |                |                |
|---------------|----------------|----------------|----------------|
| <b>1.</b> (d) | <b>8.</b> (c)  | <b>15.</b> (b) | <b>22.</b> (d) |
| <b>2.</b> (a) | <b>9.</b> (c)  | <b>16.</b> (d) | <b>23.</b> (b) |
| <b>3.</b> (b) | <b>10.</b> (a) | <b>17.</b> (b) | <b>24.</b> (d) |
| <b>4.</b> (e) | <b>11.</b> (b) | <b>18.</b> (a) | <b>25.</b> (e) |
| <b>5.</b> (c) | <b>12.</b> (b) | <b>19.</b> (b) | <b>26.</b> (b) |
| <b>6.</b> (b) | <b>13.</b> (c) | <b>20.</b> (b) | <b>27.</b> (b) |
| <b>7.</b> (b) | <b>14.</b> (d) | <b>21.</b> (b) | <b>28.</b> (b) |

## *WORKSHOP MEASURING INSTRUMENTS (METROLOGY)*

*Choose the correct alternative:*

1. Layout work for drilling operation must be performed on a ..... to ensure an accurate layout.
 

(a) work bench	(c) surface plate
(b) milling machine table	(d) wooden block
  
2. .... can be used to scribe lines parallel to the edges of a part.
 

(a) Vernier calipers	(d) Hermaphrodite caliper
(b) Screw gauge	(e) Combination set
(c) Divider	
  
3. A surface gauge is used:
 

(a) in levelling the surface plate
(b) in finding the surface finish
(c) in laying out the work accurately
(d) in finding the depth of the surface
  
4. Work which must be held in a vertical position for laying out should be clamped to:
 

(a) surface plate	(c) a V-block
(b) an angle plate	(d) a machine bed

5. A precision instrument used in measuring angles to an accuracy of five minutes is called a .....
- (a) Taper gauge
  - (b) Combination set
  - (c) Vernier Caliper
  - (d) Vernier Bevel protractor
  - (e) Indexing head
6. To check accurately whether the workpiece is properly centered in a four-jaw chuck, a ..... is used.
- (a) Combination Set
  - (b) Dial indicator
  - (c) Micrometer
  - (d) Vernier caliper
  - (e) Slip gauge
7. The accuracy of a Vernier bevel protractor used in machine shop practice is usually:
- (a) One second
  - (b) Five seconds
  - (c) One minute
  - (d) Five minutes
  - (e) One degree
8. The diameter of a finish turned shaft must be checked for size with:
- (a) a Combination Set
  - (b) Slip gauges
  - (c) a taper gauge
  - (d) a micrometer
  - (e) a dial indicator
9. The metric system of engineering measurements used in machine shop practice is based on a length unit called the:
- (a) millimeter
  - (b) centimeter
  - (c) meter
  - (d) micron
  - (e) decimal system
10. Extremely accurate centering of work mounted in an independent chuck can be determined only by using a:
- (a) center gauge
  - (b) height gauge
  - (c) dial indicator
  - (d) surface gauge
  - (e) micrometer



11. The protractor head on a combination set is designed to measure or check ..... in the machine shop.  
(a) Length (c) Thickness  
(b) Diameter (d) Angles
12. To determine the size of a bored hole by using a telescopic gauge, the gauge setting must be checked with:  
(a) a Vernier Caliper (c) slip gauges  
(b) a micrometer (d) an alignment telescope
13. A precision measuring instrument designed especially for depth measurement of holes, slots, and recesses is called a:  
(a) vernier caliper (c) depth gauge  
(b) micrometer (d) radius gauge
14. Internal tapers are checked for accuracy using:  
(a) slip gauges (d) a Taper plug gauge  
(b) a Micrometer (e) a Surface gauge  
(c) a Telescopic gauge
15. To check the diameter of a twist drill with a micrometer, the measurement must be taken across.....  
(a) the margins of the drill (d) the lips of the drill  
(b) the flutes of the drill (e) the web of the drill  
(c) the cutting edges of the drill
16. To check accurately the run-out of a lathe spindle, a ..... is used.  
(a) slip gauge (c) dial indicator  
(b) micrometer (d) spirit level
17. To find the straightness of the lathe spindle bore, a ..... is required.  
(a) slip gauge (c) spirit level  
(b) feeler gauge (d) test mandrel

18. Circumferential error of spindle location in center lathes can be checked with the help of:
- (a) a spirit level
  - (b) a block level
  - (c) a dial gauge
  - (d) a micrometer
19. To obtain an accurate measurement using ....., the machinist must develop a keen sense of touch.
- (a) Vernier Calipers
  - (b) Micrometer
  - (c) Slip gauges
  - (d) Vernier Bevel Protractor
20. Dial indicators can be used only to:
- (a) Determine the actual size of a part
  - (b) Determine the maximum size of a part
  - (c) Determine the minimum size of a part
  - (d) Determine the variation in size of a part
21. A micrometer is usually used to:
- (a) Measure an outside diameter
  - (b) Measure the distance between two points on a plane surface
  - (c) Check a class of thread
  - (d) Determine the center of a circle
22. The finish depth of an external V-thread form is most accurately measured by:
- (a) the 3-wire system
  - (b) the 2-wire system
  - (c) a thread ring gauge
  - (d) a thread plug gauge
  - (e) a thread micrometer
23. The thickness of light gauge sheet steel can be best checked with a:
- (a) finely divided steel scale
  - (b) depth gauge
  - (c) hermaphrodite caliper
  - (d) Micrometer

24. The least count of a metric vernier calliper having 25 divisions on vernier scale, matching with 24 divisions of main scale (1 m.s. division = 0.5 mm) is:  
(a) 0.05 mm (c) 0.02 mm  
(b) 0.01 mm (d) 0.001 mm
25. A vernier having a least count of 0.01 mm, has a zero error of + 0.03 mm, while measuring shows a reading of 24.08 mm. The actual value of measurement will be:  
(a) 24.08 mm (c) 24.05 mm  
(b) 24.11 mm (d) 24.24 mm
26. The least count of an external micrometer (range 0—25 mm) having 50 divisions on circular scale and pitch 0.5 mm is:  
(a) 0.01 mm (c) 0.05 mm  
(b) 0.02 mm (d) 0.001 mm
27. Dial gauge used in Metrology Laboratories is:  
(a) a direct measuring instrument  
(b) a comparing instrument  
(c) both a direct and an indirect measuring instrument  
(d) same as a Micrometer and a Vernier Calliper
28. The minimum reading on a commonly used dial gauge is  
(a) 0.025 mm (c) 0.01 mm  
(b) 0.001 mm (d) 0.05 mm
29. While using a dial gauge for checking the run-out on a shaft, the dial gauge should be:  
(a) held in the hand  
(b) fixed on a stand so that the dial gauge plunger is resting on the job  
(c) fixed on a stand and the plunger is slightly loaded on the job, and the needle reading zero on the dial  
(d) fitted securely to any fixed part and plunger slightly preloaded and dial reading zero

- 30.** Sine bar can be used for measuring taper:
- (a) with the help of height gauge
  - (b) with the help of V-calliper
  - (c) with the help of bevel protractor
  - (d) without any accessory
- 31.** The thread micrometer measures:
- (a) the major diameter of the thread
  - (b) the minor diameter of the thread
  - (c) the effective diameter of the thread
  - (d) the root diameter of the thread
- 32.** In the case of Vernier Callipers which one of the following statements is True?
- (a) the Vernier has 10 equal divisions with a total length equal to 10 divisions on the main scale
  - (b) the Vernier has 9 equal divisions with a total length equal to 10 divisions on the main scale
  - (c) the Vernier has 10 equal divisions with a total length equal to 9 divisions on the main scale
  - (d) there is no relationship between the divisions on the two scales
- 33.** Which one of the following Instruments is suitable for measuring the diameter of a steel wire?
- (a) Vernier Gauge
  - (b) Vernier Callipers
  - (c) Micrometer Gauge
  - (d) Meter rule
- 34.** The overall magnification of a microscope that has an objective magnification of 30 X and an eyepiece magnification of 10 X is:
- (a) 3 X
  - (b) 30 X
  - (c) 300 X
  - (d) 3000 X

- 35.** Good quality scales for use in fitting shop measurements are usually made of:
- (a) Low Carbon Steel
  - (b) Plastic sheets
  - (c) Good quality Aluminium
  - (d) Stainless steel
  - (e) Wood
- 36.** Vernier calliper is commonly used in a:
- (a) smithy shop for measurement of finished jobs
  - (b) foundry shop for measurement of dimensions of mould cavity
  - (c) machine shop for measurement of finished metallic jobs
  - (d) welding shop for marking and measuring dimensions on a sheet metal
- 37.** Vernier callipers are made from:
- (a) mild steel
  - (b) stainless steel
  - (c) CI
  - (d) Cast steel
- 38.** Vernier callipers are used for:
- (a) measuring angles
  - (b) taking linear measurements
  - (c) checking surface finish
  - (d) checking surface irregularities
- 39.** Height gauges are used for measuring:
- (a) Depth and height
  - (b) External taper
  - (c) Internal taper
  - (d) Surface finish
- 40.** Height gauges and depth gauges are based on the principle of:
- (a) micrometer
  - (b) vernier calliper
  - (c) nut and bolt
  - (d) sliding friction
  - (e) Bevel protractor

41. For taking measurements of the height of a job with the help of an height gauge the following item is normally required in addition to the height gauge and the job:
- (a) V-block
  - (b) Angle plate
  - (c) Surface plate
  - (d) Sine bar
42. Micrometers are manufactured from:
- (a) mild steel
  - (b) stainless steel
  - (c) CI
  - (d) cast steel
43. Micrometers are used for
- (a) checking angles
  - (b) taking linear measurements
  - (c) checking surface finish
  - (d) marking jobs on a surface plate
44. Circular scale of the micrometer is marked on the part known as the:
- (a) shaft
  - (b) barrel
  - (c) ratchet
  - (d) thimble
  - (e) spindle
45. In an accurate micrometer a part called ..... is attached to the thimble so that the measuring pressure during clamping of different jobs is kept constant.
- (a) locknut
  - (b) magnifying glass
  - (c) spindle
  - (d) spanner
  - (e) ratchet
46. Millimeter scale in a micrometer is marked on the part called:
- (a) barrel
  - (b) thimble
  - (c) spindle
  - (d) anvil

47. Combination set is basically a:
- (a) Precision measuring instrument
  - (b) Marking device
  - (c) Checking and marking device
  - (d) Vernier Bevel Protractor
48. The center head in a combination set is used for:
- (a) locating the center of a bar stock
  - (b) measuring the diameter of a bar stock
  - (c) measuring the center-to-center distance in bar stocks
  - (d) measuring the angles
49. While using a combination set, the squareness of the given job is checked by the:
- (a) center head
  - (b) graduated protractor
  - (c) square head
  - (d) scale
50. The least count of a Vernier Protractor having 12 divisions on Vernier scale and matching with  $23^\circ$  on the main scale is: (1 main scale division corresponds to  $2^\circ$ )
- (a) 5 minutes
  - (b) 10 minutes
  - (c) 12 minutes
  - (d) 5 degrees
51. The joining of two slip gauges for building up a size combination is called:
- (a) fixing
  - (b) assembling
  - (c) wringing
  - (d) pasting
52. The taper of internal dovetail can be measured with the help of:
- (a) sinebar
  - (b) combination set
  - (c) balls of standard dimensions and slip gauges
  - (d) vernier callipers

- 53.** External taper can be accurately measured with the help of:
- (a) sine bar and slip gauges
  - (b) vernier calliper
  - (c) micrometer
  - (d) combination set
- 54.** A sine bar is specified by:
- (a) its total length
  - (b) the center distance between the two rollers of the sine bar
  - (c) the minimum angle that can be measured
  - (d) the maximum angle that can be measured
  - (e) the accuracy with which the angular measurements can be made
- 55.** Gear tooth calliper is used to find the chordal thickness of gear tooth of:
- (a) spur gears
  - (b) helical gears
  - (c) worm gears
  - (d) bevel gears
- 56.** For correct and precise measurements of thread characteristics we use:
- (a) screw pitch gauge
  - (b) micrometer with accessories
  - (c) tool room microscope
  - (d) thread gauge
- 57.** Dial gauge measures:
- (a) circular dimensions as needle rotates on the dial
  - (b) linear dimensions as contact pointer moves up and down
  - (c) angular divisions
  - (d) surface roughness of finished jobs
- 58.** Which part of the combination set can be used to lay out the centerlines on the end of a round bar stock?
- (a) The center head
  - (b) The square head
  - (c) The Bevel Protractor
  - (d) The bubble



- 59.** In Metrology Laboratory, the joining of two slip gauges for purposes of precision measurement is known as:
- (a) assembly
  - (b) welding
  - (c) adhesion
  - (d) wringing
  - (e) slipping
- 60.** In manufacturing industries, Plug Gauges are used to:
- (a) measure the diameter of the workpieces
  - (b) measure the diameter of the holes in the workpieces
  - (c) check the diameter of the holes in the workpieces
  - (d) check the length of the holes in the workpieces
- 61.** In production shops, snap gauges are used to:
- (a) check the length of the workpieces
  - (b) check the diameter of the workpieces
  - (c) check the diameter of the holes in the workpieces
  - (d) measure the diameter of the holes in the workpieces
- 62.** In Limits, Fits, and Tolerances, the term “allowance” is usually referred to as:
- (a) Minimum clearance between shaft and hole
  - (b) Maximum clearance between shaft and hole
  - (c) Tolerance of hole or shaft
  - (d) Difference between maximum size and minimum size of the hole
  - (e) Difference between maximum size and minimum size of the shaft
- 63.** In the case of a clearance fit between a shaft and a hole, the *minimum clearance* is obtained when:
- (a) the shaft is of minimum diameter and the hole is of maximum diameter
  - (b) the shaft is of maximum diameter and the hole is of minimum diameter
  - (c) both the shaft and hole are of minimum diameter
  - (d) both the shaft and hole are of maximum diameter

- 64.** The condition of the assembly between a shaft and a hole is such that there is always a clearance fit. The *maximum clearance* between shaft and hole is obtained when:
- (a) both the shaft and hole are of minimum diameter
  - (b) both the shaft and hole are of maximum diameter
  - (c) the shaft is of minimum diameter and the hole is of maximum diameter
  - (d) the shaft is of maximum diameter and the hole is of minimum diameter
- 65.** The distance between the corresponding points of any two adjacent screw threads is known as:
- (a) pitch of the screw thread
  - (b) accuracy of the screw thread
  - (c) start of the screw thread
  - (d) diameter of the screw thread at the pitch line.

## 25. Key

- |         |         |         |         |
|---------|---------|---------|---------|
| 1. (c)  | 18. (c) | 35. (d) | 52. (c) |
| 2. (d)  | 19. (a) | 36. (c) | 53. (a) |
| 3. (c)  | 20. (d) | 37. (b) | 54. (b) |
| 4. (b)  | 21. (a) | 38. (b) | 55. (a) |
| 5. (d)  | 22. (e) | 39. (a) | 56. (c) |
| 6. (b)  | 23. (d) | 40. (b) | 57. (b) |
| 7. (d)  | 24. (c) | 41. (c) | 58. (a) |
| 8. (d)  | 25. (c) | 42. (b) | 59. (d) |
| 9. (c)  | 26. (a) | 43. (b) | 60. (c) |
| 10. (c) | 27. (c) | 44. (d) | 61. (b) |
| 11. (d) | 28. (c) | 45. (e) | 62. (a) |
| 12. (b) | 29. (d) | 46. (a) | 63. (b) |
| 13. (c) | 30. (a) | 47. (c) | 64. (c) |
| 14. (d) | 31. (c) | 48. (a) | 65. (a) |
| 15. (a) | 32. (c) | 49. (c) |         |
| 16. (c) | 33. (c) | 50. (a) |         |
| 17. (d) | 34. (c) | 51. (c) |         |

## *THERMAL ENGINEERING*

*Choose the correct alternative:*

1. Orsat apparatus is used in:
  - (a) measuring turbulent flow in pipes
  - (b) the determination of flue gas composition
  - (c) determining the working stresses in a beam
  - (d) vibrating the membranes
  - (e) solving differential equations
2. A device that is sensitive to the degree of moisture in the air is:
  - (a) An aquastat
  - (b) a theostat
  - (c) A damperstat
  - (d) An hygrostat
  - (e) A thermostat
3. A bi-metallic element is made up by riveting a brass and iron strip together. When subjected to high temperature, the element will:
  - (a) vibrate
  - (b) bend
  - (c) remain the same length
  - (d) shorten
4. A device that is used to convert mechanical energy into electrical energy is usually called a:
  - (a) battery
  - (b) generator
  - (c) motor
  - (d) transformer

5. Sheet metal ducts in a building would most likely to carry:
- (a) electric cables
  - (b) water
  - (c) steam
  - (d) air
6. The engines of bulldozers are mostly:
- (a) steam engines
  - (b) petrol engines
  - (c) diesel engines
  - (d) kerosene engines
7. Wind velocity is usually measured by a (an):
- (a) Altimeter
  - (b) Tachometer
  - (c) Psychrometer
  - (d) Anemometer
8. A device used for the automatic regulation of temperature by means of a relay that utilizes the contraction and expansion of the metals due to temperature variation is called a:
- (a) hydrostat
  - (b) thermostat
  - (c) retort
  - (d) solenoid
9. The Stefan-Boltzmann law states that  $Q = \sigma eAT^4$  CHU/hr.
- (a)  $Q$  is the net rate of heat transfer from a black body
  - (b)  $Q$  is the net rate of heat transfer for any body
  - (c)  $Q$  represents the total radiant energy absorbed by a black body
  - (d)  $Q$  will change with the rate of energy which the black body receives from the surroundings
  - (e)  $Q$  is the total radiated energy of a black body regardless of the rate of energy being received from the surroundings at the same time
10. An increase in evaporation is most likely to take place when air:
- (a) is stagnant
  - (b) becomes warmer
  - (c) becomes cooler
  - (d) is saturated
  - (e) is expanding
11. The convective heat transfer coefficient is analogous to:
- (a) the viscosity of a fluid
  - (b) the heat capacity of a fluid

- (c) the skin friction coefficient of a fluid
  - (d) the coefficient of mechanical friction
  - (e) none of the above
- 12.** The ratio of  $C_p/C_v$  for air and most common gases below 500 °C is closest to:
- (a) 0.79
  - (b) 1.04
  - (c) 1.00
  - (d) 1.70
  - (e) 1.40
- 13.** The value of the ratio of the specific heat at a constant volume to the specific heat at a constant pressure:
- (a) is a function only of the molecular density of the gas
  - (b) varies as the square of the Mach Number
  - (c) must always be greater than unity
  - (d) cannot be greater than unity
  - (e) varies inversely as the specific volume
- 14.** A hot body will radiate heat most rapidly if its surface is:
- (a) Rough and white
  - (b) White and polished
  - (c) Grey
  - (d) Black and rough
  - (e) Black and polished
- 15.** The specific heat of an actual gas  $C_v$  is most nearly equal to the specific heat of an ideal gas when:
- (a) the pressure is zero
  - (b) the temperature is zero
  - (c) the pressure is infinite
  - (d) the specific volume is zero
  - (e) the specific volume is infinite
- 16.** The most efficient thermodynamic cycle is which of the following?
- (a) Carnot
  - (b) Stirling
  - (c) Diesel
  - (d) Otto
  - (e) Two-cycle

17. Which statement concerning the specific heats of a gas is false?
- (a)  $C_p$  is greater than  $C_v$  for any gas.
  - (b)  $C_p/C_v$  is about 1.4 for air
  - (c)  $C_p/C_v$  is used in the theory of sound
  - (d) Hydrogen has small values of  $C_p$  and  $C_v$
  - (e) The expression  $2/C_p - C_v$  gives a good approximation to the molecular wt. of a gas.
18. According to the Stefan-Boltzmann equation, the ratio of heat radiated from a body at 100°C to that radiated from a body at 10°C is:
- (a)  $(100/10)^4$
  - (b)  $(373/283)^3$
  - (c)  $(373/273)^3$
  - (d)  $(100/10)^3$
  - (e)  $(373/283)^3$
19. The quality of steam at any point under the dome of a Mollier diagram:
- (a) is greater than 100% because the steam is superheated
  - (b) is negative
  - (c) is zero since the steam is superheated
  - (d) is between 0 and 100%
  - (e) is less than 50%
20. Which of the following statements concerning a mixture of gases is (are) true?
- (I) The total pressure equals the sum of the partial pressures of the components.
  - (II) The partial pressure of any component is the pressure that the gas would exert, if it alone were to occupy the entire volume
  - (III) At pressures of a few atmospheres or less, gas mixtures may be regarded as ideal gases:
- (a) all are true
  - (b) only I is true
  - (c) only I and III are true
  - (d) only II is true
  - (e) only I and II are true

21. Brick and glass have coefficients of thermal conductivity 0.0015 and 0.0025 Cal/cm<sup>3</sup> -sec-°C. cm respectively. The ratio of heat lost through 10 square meters of 3 mm thick glass to that lost through an equal area of 20 cm thick brick is:
- (a) 1: 40 (d) 1: 110  
(b) 40: 1 (e) 3: 200  
(c) 110: 1
22. If a plate of Nickel 0.2 cm thick has a 40° difference in temperature between its faces and transmits 600 kilo Calories/hr. through an area of 5 cm<sup>2</sup>, the thermal conductivity of Nickel in Cal/cm<sup>3</sup> - sec °C. cm is most nearly:
- (a) 0.16 (c) 1.30 (e) 0.13  
(b) 1.67 (d) 0.14
23. Which one of the following terms is true in respect of the term “Convection”?
- (a) It is highest for dull black and rough bodies  
(b) It applies to the transfer of heat through solids  
(c) It is important in the transfer of heat between solids and fluids  
(d) It is lowest for shiny surfaces  
(e) None of these
24. In calculating the heat transfer through insulated circular pipes where the outside diameter is more than about twice the inside diameter, the area A to be used is:
- (a)  $\sqrt{A_{OD} \times A_{ID}}$  (d)  $(3A_{OD} + A_{ID}) / 2$   
(b)  $(A_{OD} - A_{ID}) / 2.3 \text{ Log}_{10} \frac{A_{OD}}{A_{ID}}$  (e) None of these  
(c)  $(A_{OD} + A_{ID}) / 2$
25. The gravimetric analysis of a flue gas gave the following data:

<i>Gas</i>	<i>%by weight</i>	<i>Specific heat</i>
W	15	0.30
X	60	0.25
Y	10	0.20
Z	15	0.15

The overall specific heat of the flue gas is:

- (a) 0.225 (c) 0.228 (e) 0.248  
(b) 0.238 (d) 0.215

26. According to the equation  $C + H_2O \rightarrow CO + H_2$ , how many kg. of CO are produced per kg of coke containing 90% Carbon?

- (a) 2.10 kg (c) 4.20 kg (e) 4.66 kg  
(b) 2.33 kg (d) 4.50 kg

27. In the expression  $P_1 V_1^k = P_2 V_2^k$  for an isentropic expansion,  $K$  is:

- (a)  $(C_p - C_v) / C_p$  (d)  $C_p / C_v$   
(b)  $(C_v - C_p) / C_v$  (e)  $1 - C_p / C_v$   
(c)  $C_v - C_p$

28. The Carnot cycle consists of:

- (a) two isothermals, one isentropic, and one isobaric  
(b) two isothermals, one isentropic, and one polytropic  
(c) two isothermals, two polytropics  
(d) one isothermal, one isobaric, and two isentropics  
(e) none of these

29. In the expression for heat flow  $Q = \frac{I}{R}$ ,  $R =$

- (a)  $\frac{L}{K}$  (c)  $\frac{K}{LA}$  (e)  $\frac{I}{KLA}$   
(b)  $\frac{L}{KA}$  (d)  $KLA$

30. The statement "Equal volumes of different gases at the same temperature contain the same number of molecules" is:

- (a) Le Chatelier's Principle (c) Dulong and Petit's Law  
(b) Avogadro's Law (d) Archimede's Principle

31. The Mollier diagram is a plot of:

- (a)  $T$  and  $S$  (c)  $P$  and  $V$  (e)  $H$  and  $S$   
(b)  $T$  and  $H$  (d)  $T$  and  $P$



where  $T$  is the temperature  
 $S$  is the Entropy  
 $H$  is the total Heat or enthalpy  
 $P$  is the pressure  
 and,  $V$  is the volume

- 32.** When a solid changes directly to the gaseous form without ever being a liquid, the process is called:
- (a) Sublimation
  - (b) Freezing
  - (c) Condensation
  - (d) Crystallization
  - (e) Evaporation
- 33.** Which of the following is an energy unit?
- (a) Newton
  - (b) Centigrade-Heat-Unit (C.H.U.)
  - (c) Watt
  - (d) kg-m.
  - (e) Horse Power
- 34.** A substance that absorbs moisture from the air is said to be:
- (a) Autogenous
  - (b) hygroscopic
  - (c) Effervescent
  - (d) saprophytic
- 35.** With increase in temperature, the viscosity of the lubricating oil:
- (a) decreases
  - (b) increases
  - (c) do not change
  - (d) becomes zero
- 36.** The flash point of a liquid fuel is defined as that temperature at which:
- (a) sufficient vapor is produced to form an ignitable mixture with air
  - (b) the liquid will be spontaneously flammable
  - (c) the vapor will be spontaneously flammable
  - (d) the liquid will be spontaneously flammable in the presence of Oxygen

- 37.** Carnot cycle consists of two isothermal processes and:
- (a) one constant volume and one constant pressure process
  - (b) one adiabatic process and one isobaric process
  - (c) two constant volume processes
  - (d) two constant pressure processes
  - (e) two adiabatic processes
- 38.** The most efficient thermodynamic cycle operating between two fixed Temperatures is:
- (a) Rankine cycle
  - (c) Dual cycle
  - (e) Carnot cycle
  - (b) Otto cycle
  - (d) Diesel cycle
- 39.** No engine can be more efficient than the engine working on:
- (a) Diesel cycle
  - (c) Carnot cycle
  - (e) Joule cycle
  - (b) Dual cycle
  - (d) Otto cycle
- 40.** In thermodynamics, Carnot cycle is also called as:
- (a) Constant pressure cycle
  - (b) Constant volume cycle
  - (c) Constant temperature cycle
  - (d) Constant heat cycle
- 41.** Otto cycle used in petrol engines is also known as
- (a) Constant pressure cycle
  - (c) Dual cycle
  - (b) Constant volume cycle
  - (d) Diesel cycle
- 42.** The air standard efficiency of an I.C. Engine working on the Otto cycle is a function of:
- (a) Clearance volume only
  - (b) Volume of cylinder only
  - (c) Ratio of volume of cylinder to the clearance volume (*viz.* Compression ratio)
  - (d) the quality of fuel used in the engine

43. Otto cycle consists of:
- (a) Two isothermal processes, and two adiabatic processes
  - (b) Two constant volume processes, and two adiabatic processes
  - (c) Two constant volume processes, and two constant pressure processes
  - (d) Two constant pressure processes, and two adiabatic processes
  - (e) One isothermal process, one adiabatic process, one constant volume process, and one constant pressure process
44. The constant volume cycle is used in:
- (a) Refrigerators
  - (c) Diesel Engines
  - (b) Steam Engines
  - (d) Petrol Engines
45. In an Otto cycle engine the working medium *viz.* the air is compressed or expanded adiabatically according to the law:
- (a)  $pv$  is a constant
  - (b)  $pv^{0.4}$  is a constant
  - (c)  $pv^{1.4}$  is a constant
  - (d)  $pv^{2.0}$  is a constant
  - (e)  $p/v$  is a constant where  $p$  is pressure and  $v$  is volume of the working medium.
46. In Otto cycle, both heat addition and heat rejection occur at:
- (a) constant pressure
  - (c) constant temperature
  - (b) constant volume
  - (d) constant entropy
47. Which *one* of the following statements is true in respect of an ideal Diesel cycle?
- (a) Heat is added to the working medium at constant volume
  - (b) Heat is added to the working medium at constant pressure
  - (c) Heat is rejected from the working medium at constant pressure
  - (d) Both heat addition and heat rejection occur at constant volume
  - (e) Both heat addition and heat rejection occur at constant pressure

**48.** In an I.C. engine operating on an ideal Diesel cycle:

- (a) Both heat addition and heat rejection occur at constant pressure
- (b) Both heat addition and heat rejection occur at constant volume
- (c) Heat is added to the working medium at constant volume
- (d) Heat is rejected from the working medium at constant volume
- (e) Heat is rejected from the working medium at constant pressure

**49.** In Diesel cycle, the compression and expansion of the working medium is according to the Law:

- (a)  $p v$  is a constant
- (b)  $p/v$  is a constant
- (c)  $v/p$  is a constant
- (d)  $p v^{cp/cv}$  is a constant
- (e)  $p$  is constant.

where  $p$  is pressure,  $v$  is the volume and  $C_p$  is the specific heat of the working medium at constant pressure and  $C_v$  is the specific heat of the working medium at constant volume.

**50.** In Diesel cycle, during heat supply:

- (a) Pressure remains constant
- (b) Volume remains constant
- (c) Both pressure and volume remain constant
- (d) Temperature remains constant

**51.** In Diesel cycle, when heat is rejected from the working medium:

- (a) Temperature remains constant
- (b) Pressure remains constant
- (c) Volume remains constant
- (d) Both pressure and volume remain constant

**52.** In Diesel cycle:

- (a) Compression ratio and expansion ratio are the same
- (b) Compression ratio is less than the expansion ratio
- (c) Compression ratio is greater than the expansion ratio
- (d) Compression ratio + Expansion ratio = 1

- 53.** In Diesel engines, injection of fuel continues till:
- (a) the spark plug gives out a spark
  - (b) the compression is complete
  - (c) the clearance volume is filled with the fuel oil
  - (d) the cut off point is reached
- 54.** The thermodynamic cycle in which heat is supplied partly under constant pressure and partly under constant volume is known as:
- (a) Carnot cycle
  - (b) Diesel cycle
  - (c) Dual cycle
  - (d) Otto cycle
  - (e) Rankine cycle
- 55.** The principle of Joules cycle is applied in:
- (a) Petrol Engines
  - (b) Diesel Engines
  - (c) Refrigerators
  - (d) Gas turbines
  - (e) Compressors
- 56.** Joule cycle consists of:
- (a) two isobaric processes and two isothermal processes
  - (b) two isothermal processes and two adiabatic processes
  - (c) two constant pressure processes and two constant volume processes
  - (d) two adiabatic processes and two isobaric processes
  - (e) four isothermal processes

**26. Key**

- |         |         |         |         |
|---------|---------|---------|---------|
| 1. (b)  | 15. (a) | 29. (b) | 43. (b) |
| 2. (d)  | 16. (a) | 30. (b) | 44. (d) |
| 3. (b)  | 17. (d) | 31. (e) | 45. (c) |
| 4. (b)  | 18. (b) | 32. (a) | 46. (b) |
| 5. (d)  | 19. (d) | 33. (b) | 47. (b) |
| 6. (c)  | 20. (a) | 34. (b) | 48. (d) |
| 7. (d)  | 21. (c) | 35. (a) | 49. (d) |
| 8. (b)  | 22. (a) | 36. (a) | 50. (a) |
| 9. (e)  | 23. (c) | 37. (e) | 51. (c) |
| 10. (b) | 24. (b) | 38. (e) | 52. (c) |
| 11. (c) | 25. (b) | 39. (c) | 53. (d) |
| 12. (e) | 26. (a) | 40. (d) | 54. (c) |
| 13. (d) | 27. (d) | 41. (b) | 55. (d) |
| 14. (d) | 28. (e) | 42. (c) | 56. (d) |

## REFRIGERATION AND AIR-CONDITIONING

*Choose the correct alternative:*

1. A sling psychrometer is used to measure:  
(a) volume (c) pressure  
(b) humidity (d) gas velocity.
2. The type of control valve in a refrigerant circuit which may be connected to the circuit discharge line, evaporator, condenser, and suction line is:  
(a) a pilot-operated expansion valve  
(b) an externally equalized expansion valve  
(c) a reverse cycle refrigerant valve  
(d) a hot gas refrigerant by-pass valve
3. Refrigerant enters the condenser of a mechanical refrigeration system as a  
(a) low pressure gas  
(b) high pressure gas  
(c) low pressure liquid  
(d) high pressure liquid
4. During its passage through a simple direct expansion refrigeration system, the refrigerant used changes its state:  
(a) once (c) three times  
(b) twice (d) four times

5. When foodstuffs are kept in a refrigerator, it is essential that:
  - (a) the coldest foods are placed at the top of the cabinet
  - (b) the coldest foods are placed at the bottom of the cabinet
  - (c) space is left for air to circulate around the packages
  - (d) space is left for packages to expand and contract
6. One of the main advantages of a serviceable hermetically-sealed type compressor over an open type is that:
  - (a) no shaft seal is required
  - (b) cylinder lubrication is easier
  - (c) any refrigerant can be used
  - (d) mechanical efficiency is greater
7. A capillary tube is often used to control refrigerant flow and expansion in a domestic refrigerator system instead of an expansion valve because it is:
  - (a) simple and economical to manufacture
  - (b) less likely to become blocked
  - (c) able to control the flow more accurately
  - (d) easier to replace in the system
8. Which is the most efficient of the following insulating materials?
  - (a) Corkboard
  - (b) Glass fiber sheet
  - (c) Mineral fiber sheet
  - (d) Foamed urethane sheet
9. In the construction of drinking water coolers, the water chilling circuit is normally:
  - (a) of the tube-in-tube type
  - (b) made with the refrigerant coiled wound outside a water tank
  - (c) made with the refrigerant coiled wound outside a water storage tank
  - (d) of the shell-and-tube type
10. Hot-wall condensers, with the condensing tubing attached to the inside surface of the cabinet's outer shell, are most often used in:
  - (a) domestic refrigerators
  - (b) food freezers



- (c) drinking water coolers
  - (d) domestic dehumidifiers
- 11.** When moisture is present in a refrigerant, it can lead to the formation of:
- (a) hydrochloric acid
  - (b) hydrogen
  - (c) peroxide
  - (d) carbon dioxide
- 12.** Many bubbles in the liquid line sight glass are a sign that the system is:
- (a) properly charged
  - (b) contaminated with air
  - (c) overcharged
  - (d) undercharged
- 13.** The first action to be taken when a domestic air-conditioner has a large amount of its refrigerant charge is to:
- (a) recharge the system
  - (b) test for presence of moisture in the system
  - (c) test for presence of acids in the system
  - (d) find and repair any leaks
- 14.** When installing a compressor type domestic refrigerator, it should be levelled carefully in order to:
- (a) avoid spillage of the condensate
  - (b) maintain the correct oil levels
  - (c) reduce vibrations when switched on
  - (d) ensure correct flow of the refrigerant
- 15.** A refrigeration system is leak tested, and pressure tested over a period of one full day as a final precaution, and it is found to be entirely free of leaks. If the gauge is operating properly, the gauge pressure will vary if:
- (a) the system contains moisture
  - (b) the refrigerant charge is increased
  - (c) there are marked changes in the surrounding temperatures
  - (d) the pressure gauge valve is closed

16. The relief valve is a better safety device than the fusible plug because:
  - (a) its action can be seen by a plant operator
  - (b) it can be set to work at a lower pressure
  - (c) it can be set to work at a higher pressure
  - (d) if it operates, only part of the refrigerant charge is lost
17. A dual purpose gauge may show refrigerant pressure on one scale and on the other scale:
  - (a) refrigerant temperature
  - (b) latent heat
  - (c) sensible heat
  - (d) ambient temperature
18. The boiling point of a refrigerant can be varied by altering the:
  - (a) superheat setting of the expansion valve
  - (b) pressure within the refrigeration system
  - (c) setting of the thermostat in the system
  - (d) moisture content of the refrigerant
19. Refrigerant leaves the condenser of a mechanical refrigeration system as a
  - (a) low pressure liquid
  - (b) high pressure liquid
  - (c) low pressure gas
  - (d) high pressure gas
20. A sling psychrometer is used to read:
  - (a) dry bulb temperature
  - (b) wet bulb temperature
  - (c) wet and dry bulb temperatures
  - (d) dew point temperature
21. A heat exchanger may be installed in a system between the:
  - (a) hot gas and the suction lines
  - (b) hot gas and the liquid lines
  - (c) suction and the liquid lines
  - (d) suction and the discharge lines

22. The purpose of fitting a fan to a finned coil evaporator is to:
- (a) increase the refrigerating capacity
  - (b) prolong the life of the refrigerant
  - (c) ease the load on the compressor on starting
  - (d) increase the frequency of the refrigerator cycle
23. Finned evaporators are used in air-conditioning applications to:
- (a) equalize air flow over the cooling coil surface
  - (b) prevent moisture carry-over
  - (c) extend the effective area of the cooling surface
  - (d) increase the dehumidifying capacity
24. When empty cartons are stacked against the static type condenser at the back of the cabinet of a domestic refrigerator:
- (a) the evaporator will become frosted too heavily
  - (b) the unit will cut out on the thermostat
  - (c) the condensing efficiency will fall and compressor will feel hot
  - (d) the unit will defrost and refreeze
25. Two identical condenser coils, with the same internal and external temperatures are placed, one in still air and the other in the tank of water. The maximum refrigeration capacities are:
- (a) greater for the coil in the air
  - (b) both the same
  - (c) greater for the coil in water
  - (d) dependent on the refrigerant used
26. In a domestic, compressor-operated refrigerator the correct operation of the capillary tube depends upon:
- (a) its internal dimensions
  - (b) the atmospheric pressure
  - (c) the refrigerant temperature
  - (d) the Relative Humidity (RH)

27. The type of installation in which an automatic expansion valve is most suitable for use is a:
  - (a) small high-temperature cold room
  - (b) domestic refrigerator
  - (c) large air-conditioning installation
  - (d) two temperature cabinet with two evaporators
28. The liquid line of refrigeration system may be insulated, to minimize:
  - (a) condensation
  - (b) heat loss
  - (c) heat gain
  - (d) heat transfer
29. After a hermetic compressor has burned out, and been replaced, it is good practice to include in the system a large drier/strainer in the:
  - (a) liquid line
  - (b) suction line
  - (c) hot gas line
  - (d) discharge line
30. If a refrigerant drier has been opened and recharged with silica gel, it should then be:
  - (a) dehydrated and sealed
  - (b) re-installed immediately
  - (c) sealed and kept in stock for three months
  - (d) re-used on high temperature circuits only
31. The effect of using refrigerant-22 in a system is that the compressor lubricating oil charges is circulated:
  - (a) in the compressor sump only
  - (b) throughout the system at all times
  - (c) around the low temperature system only
  - (d) around the high temperature only

- 32.** With a leak-free system, insulation of the suction line is carried out to:
- (a) prevent condensation
  - (b) exclude heat from outside
  - (c) separate adjacent suction and liquid line
  - (d) avoid heat losses to surrounding air
- 33.** When installing a domestic refrigerator, levels should be checked carefully to avoid:
- (a) noise from unlubricated moving parts
  - (b) noise resulting from vibrations
  - (c) noise resulting from pipe touching the cabinet
  - (d) liquid refrigerant draining into the compressor
- 34.** A plate type evaporator is often used in a:
- (a) domestic air-conditioner
  - (c) domestic dehumidifier
  - (b) drinking water cooler
  - (d) two-compartment refrigerator
- 35.** The butter compartment of a domestic refrigerator is normally located:
- (a) at the top of the cabinet
  - (c) at a central height
  - (b) at the bottom of the cabinet
  - (d) at the rear side or the door
- 36.** The purpose of flushing out a refrigerant system with inert gas, after replacing a burnt out sealed unit motor, is to:
- (a) dehydrate the system
  - (b) move the carbonized oil
  - (c) pressure test the system
  - (d) drive out air from the system
- 37.** When installing any new electrical plant it is necessary to check that:
- (a) concrete foundations are available
  - (b) provision is made for extension
  - (c) overhead cranes are available
  - (d) mains voltage and frequency are correct

- 38.** The normal operation of the electric circuit of a refrigerator is best tested by:
- (a) a clip-on Ammeter
  - (b) an Ohm meter
  - (c) a bulb type tester
  - (d) a Voltmeter
- 39.** When switched on, a domestic refrigerator compressor does not start. The first point which should be checked is that the:
- (a) compressor motor is not burned out
  - (b) thermostat is not jammed in the open position
  - (c) compressor safety device is not opened by the overload
  - (d) power is available at the power point
- 40.** If a motor starting winding has burned out, the first action is to:
- (a) replace the defective winding
  - (b) see if both the windings of the motor have been burnt out
  - (c) check whether motor turns freely off load
  - (d) isolate completely from the mains
- 41.** After replacing a blown mains fuse for a domestic air conditioner, and before running the unit continuously it is essential first to:
- (a) switch off and then restart the unit
  - (b) check that the unit is free from noise
  - (c) check the air filter for cleanliness
  - (d) check the value of the current drawn from the mains while the equipment is running
- 42.** Once connected to the mains and switched on, a domestic air conditioner can be best tested for its correct performance by the use of:
- (a) a Voltmeter
  - (b) an hermetic unit analyser
  - (c) a clip-on Ammeter
  - (d) an ordinary Ammeter

- 43.** An electric motor driving a centrifugal air fan is found to be running hot. The most likely cause is:
- (a) slack driving belts
  - (b) fan starting load is too heavy
  - (c) heavy deposits of dust or/and oil
  - (d) bent fan blades
- 44.** A domestic air conditioner may suffer from low voltage, even though the correct supply voltage is present at the power point, if:
- (a) the power cable has over-sized conductors
  - (b) the power cable has undersized conductors
- 45.** A capacitor start electric motor is better suited for refrigerant compressor use than a shaded pole motor of the same H.P. because:
- (a) it is able to withstand voltage fluctuations better
  - (b) it can start against a heavier load
  - (c) it does not run so hot
- 46.** An hermetically-sealed compressor does not start when switched on and its motor does not hum. This could be due to:
- (a) faulty starting capacitor
  - (b) open-circuit motor windings
  - (c) low supply voltage
  - (d) a seized up compressor
- 47.** The number of electrical connections on the capacitor block for use with a capacitor start and run electric motor is:
- (a) 2
  - (b) 3
  - (c) 4
  - (d) 5
- 48.** The most probable cause of failure of a motor safety device on the hermetically sealed compressor in a domestic air conditioner is:
- (a) excessive current due to low mains voltage
  - (b) too high a refrigeration duty at evaporator
  - (c) suction line pressure too low

- 49.** The contacts of a current-operated relay on a single phase capacitor-start compressor motor got stuck in the closed position. As a result the compressor
- (a) will not start
  - (b) will start and run in reverse
  - (c) overload cut-out will operate
  - (d) motor winding will burn out
- 50.** When making a 90° bend with 12 mm outside diameter soft copper tubing, it is advisable to use a bending spring and a pipe bender to:
- (a) avoid flattening of the tubing
  - (b) save effort:
  - (c) ensure a constant radius
  - (d) avoid hardening of the tubing
- 51.** When working with large diameter pipe work, flanged fittings are more often used than welded joints, because:
- (a) good welding or brazing needs constant practice
  - (b) flanged fittings are less likely to leak
  - (c) flanged fittings are very cheap
  - (d) control valves and fittings with flanged joints are more easily removed and replaced
- 52.** Which of the following actions is the most important before any heat is applied when welding or brazing refrigerant lines to replace fittings?
- (a) clean the tubing
  - (b) remove any insulation
  - (c) pump out all refrigerant
  - (d) put on welding mask



**27. Key**

<b>1.</b> (b)	<b>14.</b> (c)	<b>27.</b> (b)	<b>40.</b> (b)
<b>2.</b> (a)	<b>15.</b> (c)	<b>28.</b> (c)	<b>41.</b> (d)
<b>3.</b> (a)	<b>16.</b> (b)	<b>29.</b> (b)	<b>42.</b> (c)
<b>4.</b> (b)	<b>17.</b> (a)	<b>30.</b> (a)	<b>43.</b> (a)
<b>5.</b> (a)	<b>18.</b> (b)	<b>31.</b> (b)	<b>44.</b> (b)
<b>6.</b> (a)	<b>19.</b> (a)	<b>32.</b> (a)	<b>45.</b> (b)
<b>7.</b> (a)	<b>20.</b> (c)	<b>33.</b> (b)	<b>46.</b> (b)
<b>8.</b> (d)	<b>21.</b> (b)	<b>34.</b> (d)	<b>47.</b> (b)
<b>9.</b> (c)	<b>22.</b> (a)	<b>35.</b> (d)	<b>48.</b> (a)
<b>10.</b> (b)	<b>23.</b> (c)	<b>36.</b> (d)	<b>49.</b> (c)
<b>11.</b> (d)	<b>24.</b> (c)	<b>37.</b> (d)	<b>50.</b> (a)
<b>12.</b> (b)	<b>25.</b> (c)	<b>38.</b> (a)	<b>51.</b> (d)
<b>13.</b> (d)	<b>26.</b> (a)	<b>39.</b> (d)	<b>52.</b> (d)



## *AUTOMOBILE ENGINES*

*Choose the correct alternative:*

1. Petrol used in automobile engines is mainly composed of Carbon and .....
  - (a) Nitrogen
  - (b) Oxygen
  - (c) Hydrogen
  - (d) Air
  - (e) Water molecules
2. Spark ignition engines operate on .....
  - (a) Auto cycle
  - (b) Otto cycle
  - (c) Diesel cycle
  - (d) Carnot cycle
  - (e) Rankine cycle
3. Compression ignition engines operate on .....
  - (a) Rankine cycle
  - (b) Carnot cycle
  - (c) Auto cycle
  - (d) Otto cycle
  - (e) Diesel cycle
4. What is the device which supplies correct mixture of air and petrol to an I.C. engine?
  - (a) Mechanical fuel pump
  - (b) Injector

- (c) Carburettor
  - (d) Electrical fuel pump
  - (e) Fuel injection pump
5. The air-fuel ratio in a spark ignition engine varies from .....
- (a) 1: 1 to 4: 1
  - (b) 4: 1 to 8: 1
  - (c) 10: 1 to 16: 1
  - (d) 20: 1 to 50: 1
  - (e) 20: 1 to 120: 1
6. The air-fuel ratio in a compression ignition engine varies from:
- (a) 1: 1 to 10: 1
  - (b) 10: 1 to 20: 1
  - (c) 20: 1 to 60: 1
  - (d) 20: 1 to 120 : 1
  - (e) 20: 1 to 200: 1
7. The maximum pressure of air fuel mixture at the end of compression in petrol engines varies from:
- (a) 6—10 kg/cm<sup>2</sup>
  - (b) 10—30 kg/cm<sup>2</sup>
  - (c) 30—100 kg/cm<sup>2</sup>
  - (d) 100—1000 kg/cm<sup>2</sup>
8. The maximum pressure of air at the end of compression in diesel engines is about:
- (a) 10 kg/cm<sup>2</sup>
  - (b) 30 kg/cm<sup>2</sup>
  - (c) 100 kg/cm<sup>2</sup>
  - (d) 300 kg/cm<sup>2</sup>
  - (e) 1000 kg/cm<sup>2</sup>
9. For an ordinary petrol engine used in cars, the compression ratio is:
- (a) 1: 1
  - (b) 7: 1
  - (c) 16: 1
  - (d) 160: 1
  - (e) 1: 7
10. The compression ratio generally used in diesel engines is:
- (a) 7: 1
  - (b) 16: 1
  - (c) 1: 7
  - (d) 1: 16
  - (e) 15: 1

11. With increase in compression ratio, thermal efficiency:
  - (a) decreases
  - (b) increases
  - (c) becomes zero
  - (d) do not vary at all
  
12. Injection of fuel in diesel engines is done at a pressure of about:
  - (a)  $10 \text{ kg/cm}^2$ — $20 \text{ kg/cm}^2$
  - (b)  $50 \text{ kg/cm}^2$ — $80 \text{ kg/cm}^2$
  - (c)  $100 \text{ kg/cm}^2$ — $120 \text{ kg/cm}^2$
  - (d)  $150$  — $200 \text{ kg/cm}^2$
  - (e)  $1000 \text{ kg/cm}^2$ — $2000 \text{ kg/cm}^2$
  
13. .... is added as fuel additive for reducing the knocking tendency in petrol.
  - (a) Metal activator
  - (b) Phosphorus compound
  - (c) Antioxidant inhibitor
  - (d) Tetra-ethyl lead
  - (e) Amino acid
  
14. The ability of petrol to resist detonation during combustion is given by:
  - (a) Cetane number
  - (b) Tripane number
  - (c) Octane number
  - (d) Iso-octane number
  - (e) Performance number
  
15. In the case of a four cylinder in-line engine, for the best engine performance the firing order is:
  - (a) 1 2 3 4
  - (b) 1 3 4 2
  - (c) 1 3 2 4
  - (d) 1 4 2 3
  - (e) 1 4 3 2
  
16. The best firing order for a six cylinder in-line engine is:
  - (a) 1 2 3 4 5 6
  - (b) 2 3 4 5 6 1
  - (c) 1 4 2 6 3 5
  - (d) 1 5 3 2 4 6
  - (e) 1 4 2 6 5 3

17. In multi-cylinder engines a particular sequence in the firing order is necessary:
- (a) to give good distribution of fuel to all the cylinders
  - (b) to give better balance of the engine
  - (c) to provide the best engine performance
  - (d) to operate the ignition system smoothly
18. As the number of cylinders in multi-cylinder engines increases the power-to-weight ratio:
- (a) remains the same
  - (b) decreases
  - (c) increases
  - (d) becomes zero
19. To connect piston to the connecting rod the ..... are used:
- (a) rod caps
  - (b) cap bolts
  - (c) small end bearings
  - (d) big end bearings
  - (e) gudgeon pins
20. For each crankshaft revolution, the cam shaft revolves:
- (a) one-half turn
  - (b) one turn
  - (c) two turns
  - (d) four turns
  - (e) as many turns as the number of valves in the engine
21. The ratio between the speed of the camshaft and the speed of the crankshaft is:
- (a) 1: 1
  - (b) 1: 2
  - (c) 1: 4
  - (d) 1: 12
  - (e) 1: 14
22. Fuel injection pumps in compression ignition engines are driven with the help of:
- (a) crankshaft
  - (b) fanbelt
  - (c) flywheel
  - (d) cam shaft
  - (e) propeller shaft

- 23.** The clearance between the valve and tappet of an I.C. Engine is measured by using .....
- (a) snap gauge
  - (b) slip gauge
  - (c) feeler gauge
  - (d) internal micrometer
  - (e) vernier scale
- 24.** Vibration damper:
- (a) reduces the speed of the flywheel
  - (b) drives the pulley
  - (c) controls the torsional vibrations
  - (d) dampens the engine speed
  - (e) increases the engine vibrations
- 25.** Engine decoking refers to the operation of:
- (a) applying carbon coating on valve ports
  - (b) adding fuel additives to ensure complete combustion of hydrocarbons
  - (c) preventing the formation of carbon deposits
  - (d) removing carbon deposits
  - (e) increasing the compression ratio in the engine
- 26.** A sooty deposit on the insulator around the center electrode in a spark plug means that the:
- (a) spark plug is running too cold
  - (b) spark plug is running too hot
  - (c) air-fuel mixture is lean
  - (d) air-fuel mixture is rich
  - (e) sealing gaskets in the spark plug are worn out
- 27.** Engine misfiring is likely to result from:
- (a) spark plug gap too narrow
  - (b) spark plug gap too wide
  - (c) incorrect mixture
  - (d) vapor lock in fuel line
  - (e) clogged exhaust

- 28.** Thick smoke emitted by an engine is a sign of:
- (a) burning of lubricating oil in the combustion chamber
  - (b) defective brake system
  - (c) very lean mixture of air and petrol
  - (d) very rich mixture of air and petrol
- 29.** Tuning up of an engine usually means:
- (a) checking the ignition timing for obtaining maximum performance
  - (b) checking the carburettor for maximum engine performance
  - (c) replacing the defective valves and defective piston rings
  - (d) checking the spark plugs and replacing them if necessary
  - (e) checking and adjusting all the different components of an engine for maximum performance
- 30.** The most frequent cause for engine overheating is:
- (a) slipping of fan belt
  - (b) defective fuel pump
  - (c) weak battery
  - (d) use of improper exhaust pipe
- 31.** The device located in the exhaust system to reduce the exhaust noise is called the:
- (a) exhaust valve
  - (b) exhaust pipe
  - (c) tail pipe
  - (d) muffler
- 32.** The Brake Horse Power (BHP) of an engine is given by the expression:
- (a)  $2\pi NT$
  - (b)  $2\pi NT/450$
  - (c)  $2\pi NT/1000$
  - (d)  $2\pi NT/4500$
  - (e)  $2\pi NT/33000$
- where N is the R.P.M. of crankshaft and T is the torque in kg.m.



**33.** Indicated Horse Power (IHP) for a single cylinder engine is given by the expression:

- (a)  $\frac{PLAN}{1000}$  (c)  $\frac{PLAN}{9000}$   
 (b)  $\frac{PLAN}{4500}$  (d)  $\frac{PLAN}{2}$

where P is the indicated mean effective pressure ( $\text{kg}/\text{cm}^2$ )

L is the length of the stroke (m)

A is the area of cross section of cylinder ( $\text{cm}^2$ )

N is the number of working strokes/min T is the torque (kg. m)

**34.** The Morse test on a multi-cylinder auto-engine gave the following results:

BHP with all cylinders working = 32

BHP with first cylinder cut out = 22

BHP with second cylinder cut out = 22

BHP with third cylinder cut out = 23

BHP with fourth cylinder cut out = 23

IHP of the engine is .....

- (a) 6 (c) 38 (e) 90  
 (b) 32 (d) 58

**35.** In four stroke engines used in automobiles, there is one working stroke for ..... of the engine flywheel.

- (a) each revolution  
 (b) every two revolutions  
 (c) every four revolutions  
 (d) every six revolutions.

**36.** Area enclosed by the indicator diagram used in I.C. engine testing represents:

- (a) the work done by the engine  
 (b) the heat absorbed by the engine  
 (c) the heat rejected by the engine  
 (d) the thermodynamic efficiency of the engine  
 (e) the volume of the engine cylinder

**28. Key**

- |        |         |         |         |
|--------|---------|---------|---------|
| 1. (c) | 10. (b) | 19. (e) | 28. (d) |
| 2. (b) | 11. (b) | 20. (a) | 29. (e) |
| 3. (e) | 12. (d) | 21. (b) | 30. (b) |
| 4. (c) | 13. (d) | 22. (d) | 31. (d) |
| 5. (c) | 14. (c) | 23. (c) | 32. (d) |
| 6. (d) | 15. (b) | 24. (c) | 33. (b) |
| 7. (a) | 16. (c) | 25. (d) | 34. (c) |
| 8. (b) | 17. (c) | 26. (a) | 35. (b) |
| 9. (b) | 18. (c) | 27. (b) | 36. (a) |

## *AUTOMOBILE ELECTRICAL EQUIPMENT*

*Choose the correct alternative:*

1. The density of Sulphuric Acid ( $H_2SO_4$ ) in a fully charged lead acid automobile battery is:
  - (a) 0.125 gms/m<sup>3</sup>
  - (b) 1.000 gms/cm<sup>3</sup>
  - (c) 1.250 gms/cm<sup>3</sup>
  - (d) 12.50 gms/cm<sup>3</sup>
  - (e) same as that of the water added in topping-up operation
  
2. A 12 Volt auto-battery of internal resistance 2.50 Ohms supplies power to a parallel connected bank of twenty 250 Ohms lamps. The voltage across any lamp is:
  - (a) 12/20
  - (b) 11
  - (c) 10
  - (d) 9
  - (e) 8
  
3. Capacitors used in automobile electrical system provide a means of:
  - (a) storing electrical charge
  - (b) increasing the resistance of circuit
  - (c) providing a power supply
  - (d) decreasing the resistance of a circuit

4. In the case of new spark plugs, the gap is usually
- (a) 0.01 mm                      (c) 0.10 mm                      (e) 1.00 mm  
(b) 0.06 mm                      (d) 0.60 mm
5. When a spark is produced at the spark plug, the voltage across the gap is approximately ..... Volts.
- (a) 6 — 8                              (d) 12,000 — 16,000  
(b) 12 — 16                              (e) 20,000 — 30,000  
(c) 1200 — 1600
6. With continuous usage of the spark plug, the spark plug gap size:
- (a) decreases                              (c) remains the same  
(b) increases                              (d) becomes zero
7. Magneto in an automobile electrical system is basically a:
- (a) transformer                              (d) a.c. generator  
(b) condenser                              (e) magnetic circuit  
(c) d.c. generator
8. A series wound D.C. motor would be most extensively used for a:
- (a) Drilling machine  
(b) Milling machine  
(c) Starter for an automobile  
(d) Planer  
(e) Lathe
9. The speed of an I.C. Engine is measured with the help of an instrument called:
- (a) Pyrometer  
(b) Speedometer  
(c) Viscometer  
(d) Dynamometer  
(e) Tachometer

- 10.** A cold plug has got a:
- (a) medium duty cycle
  - (b) shorter heat path
  - (c) longer heat path
  - (d) shorter insulator length
  - (e) longer insulator length
- 11.** A hot plug is generally used for:
- (a) Heavy duty engines
  - (b) Hot operating conditions
  - (c) Low speed engines
  - (d) Medium speed engines
  - (e) High speed engines
- 12.** A hot plug has got a:
- (a) longer heat path
  - (b) shorter heat path
  - (c) longer insulator nose
  - (d) shorter insulator nose
  - (e) heavy duty cycle
- 13.** In automobile electrical system, which one of the following electrical devices stores electricity?
- (a) Transformer
  - (b) Solenoid
  - (c) Relay
  - (d) Condenser
  - (e) Spark plug

## 29. Key

- |               |                |                |
|---------------|----------------|----------------|
| <b>1.</b> (c) | <b>6.</b> (b)  | <b>11.</b> (c) |
| <b>2.</b> (c) | <b>7.</b> (c)  | <b>12.</b> (a) |
| <b>3.</b> (a) | <b>8.</b> (c)  | <b>13.</b> (d) |
| <b>4.</b> (d) | <b>9.</b> (e)  |                |
| <b>5.</b> (e) | <b>10.</b> (b) |                |



## *AUTOMOTIVE CHASSIS*

*Choose the correct alternative:*

1. It is preferable to mount the engine on the frame at
  - (a) one or two points
  - (b) three points
  - (c) four points
  - (d) six points
  - (e) as many points as possible
2. Clutch slip at the mating surfaces is mainly due to:
  - (a) New linings
  - (b) Dry friction surfaces
  - (c) Improper pedal adjustment
  - (d) Tight pressure springs
3. Tractive effort in a passenger car is maximum in:
  - (a) First gear
  - (b) Second gear
  - (c) Third gear
  - (d) Top gear
4. In jeeps ..... is generally provided
  - (a) two wheel drive
  - (b) four wheel drive
  - (c) six wheel drive
  - (d) front-engine-rear wheel drive
  - (e) rear engine-rear wheel drive

5. Under normal circumstances which car is capable of ascending the steeper grade?
- (a) Car with the front-wheel drive
  - (b) Car with the rear-wheel drive
  - (c) It is difficult to tell
6. The passenger car steering gears are usually made.....
- (a) reversible
  - (b) non-reversible
  - (c) semi-reversible
  - (d) irreversible
7. The steering ratio in the case of modern automobiles varies between:
- (a) 1: 1 and 4: 1
  - (b) 4: 1 and 2: 1
  - (c) 12: 1 and 24: 1
  - (d) 24: 1 and 48 : 1
8. The maximum possible rotation of the steering knuckle is up to ..... from straight ahead position.
- (a) 5°
  - (b) 15°
  - (c) 25°
  - (d) 35°
  - (e) 45°
9. When the rear slip angle is greater than the front slip angle, the quality of the steering is known as:
- (a) over steering
  - (b) under steering
  - (c) normal steering
  - (d) neutral steering
  - (e) zero steering
10. The angle between the vertical line and the center line of the king pin is known as:
- (a) toe angle
  - (b) king pin angle
  - (c) caster angle
  - (d) camber angle
  - (e) pressure angle
11. Tilting of the front wheels away from the vertical is called:
- (a) caster
  - (b) camber
  - (c) toe-in
  - (d) toe-out
  - (e) king-pin inclination



- 12.** The inward tilt of the king-pin is called:
- (a) caster angle
  - (b) camber angle
  - (c) king pin angle
  - (d) toe-in angle
  - (e) toe-out angle
- 13.** Positive Caster on cars will cause the car to:
- (a) Roll-in on turns
  - (b) Roll-out on turns
  - (c) Lean-in on turns
  - (d) Bank-in on turns
- 14.** Positive caster tends to make the front wheels:
- (a) to skid
  - (b) to roll out
  - (c) to slide
  - (d) to toe-in
  - (e) to toe-out
- 15.** If the front wheels have negative caster, the car would tend to:
- (a) Lean-in on turns
  - (b) Bank out on turns
  - (c) Roll-in on turns
  - (d) Roll-out on turns
- 16.** The differential gear ensures, that the final output torque is ..... between the two wheels without any consideration of their relative speeds.
- (a) equally distributed
  - (b) unequally distributed
  - (c) randomly distributed
- 17.** The pressure of air inside the pneumatic tires in modern automobiles varies up to:
- (a) 10 atmosphere
  - (b) 20 atmospheres
  - (c) 40 atmospheres
  - (d) 1000 atmospheres
- 18.** The most usual cause of excessive tire wear is:
- (a) less air pressure inside the tire
  - (b) excessive air pressure inside the tire
  - (c) excessive speed of vehicle
  - (d) improper braking system used

- 19.** Girling brake system is basically:
- (a) a mechanical type of brake
  - (b) an electrical type of brake
  - (c) an electro-mechanical type of brake
  - (d) a vacuum type of brake
  - (e) an air brake
- 20.** The brake efficiency is 100 percent when:
- (a) all the brakes are in excellent condition
  - (b) the driver brings the vehicle to a dead stop in 1 second
  - (c) the stopping distance is 10 meters at a speed of 10 km/hr.
  - (d) the rate of deceleration is  $1\text{m/sec}^2$
  - (e) the rate of deceleration is  $10\text{ m/sec}^2$
- 21.** Automobile propeller shafts are provided with ..... to take care of the difference in the driving angle as rear axle moves up and down due to irregularities in the road surface.
- (a) Pin and cotter joints
  - (b) Butt joints
  - (c) Pivot joints
  - (d) Universal joints
  - (e) Clutch joints
- 22.** The primary purpose of the clutch in automobiles is to:
- (a) act like a brake in case of emergency
  - (b) give high speed to the road wheel
  - (c) take up the drive smoothly
  - (d) decelerate the engine

**30. Key**

- |        |         |         |         |
|--------|---------|---------|---------|
| 1. (b) | 7. (c)  | 13. (b) | 19. (a) |
| 2. (c) | 8. (d)  | 14. (d) | 20. (e) |
| 3. (a) | 9. (a)  | 15. (a) | 21. (d) |
| 4. (b) | 10. (c) | 16. (a) | 22. (c) |
| 5. (b) | 11. (b) | 17. (a) |         |
| 6. (c) | 12. (c) | 18. (a) |         |



## *SUPERVISORY DEVELOPMENT*

*Choose the correct alternative:*

1. Of the following behavior characteristics of a supervisor, the one that is most likely to lower the morale of the men he supervises is:  

(a) enthusiasm	(c) punctuality
(b) favouritism	(d) thoroughness
2. The ability of an employee to take the first step and follow through on a job is known as:  

(a) manners	(c) initiative
(b) laziness	(d) individuality
3. The best method of getting an employee who is not working up to his capacity to produce more work is to:  

(a) have another employee criticize his production
(b) privately criticize his production but encourage him to produce more
(c) criticize his production before his associates
(d) criticize his production and threaten to dismiss him
4. The best thing for a supervisor to do when a subordinate has done a very good job is to:  

(a) tell him to take it easy
(b) praise his work

- (c) reduce his work load
  - (d) say nothing because he may feel proud
5. If a design staff cannot possibly complete a drawing on time, then the best action for him to take is:
- (a) work during lunch time
  - (b) work overtime
  - (c) ask an employee to assist him
  - (d) notify the supervisor
6. The best way to correct a mistake made by your subordinate is to:
- (a) correct the mistake yourself and privately explain the correction to subordinate
  - (b) correct the mistake yourself and say nothing to subordinate
  - (c) give it to another subordinate to correct
  - (d) insult him and then have him correct the mistake
7. The best method of allocating the job to the technicians would be to allocate them according to the technician's:
- (a) seniority
  - (b) desire to do the work
  - (c) ability to do the work
  - (d) attitude towards other employees
8. The most important factor that an individual must fulfill in order to ensure his own safety in a plant or on a construction job is to:
- (a) work slowly
  - (b) be familiar with the specifications
  - (c) wear clothing to suit climatic conditions
  - (d) be alert
9. Two subordinates under your supervision dislike each other to the extent that production is cut down. Your best action as a supervisor is to:
- (a) ignore the matter and hope for the best
  - (b) transfer the more aggressive man
  - (c) cut down on the work-load
  - (d) talk to them together about the matter

- 10.** A design staff doing drawing work complains that the lighting at his desk is poor. Of the following, the best action to take is to:
- (a) exchange seats with another staff
  - (b) tell him to have his eyes checked
  - (c) do nothing about it
  - (d) check the light intensity with a meter, and improve the lighting, if necessary
- 11.** A subordinate who continuously by-passes his immediate supervisor for technical information should be:
- (a) reprimanded by his immediate supervisor
  - (b) ignored by his immediate supervisor
  - (c) given more difficult work to do
  - (d) given less difficult work to do
- 12.** Of the following, the best way to handle an over talkative subordinate is to:
- (a) have your superior talk to him about it
  - (b) have a subordinate talk to him about it
  - (c) talk to him about it in a group conference
  - (d) talk to him about it in private
- 13.** A supervisor from another shop asks you to assist him on a job which would require a full day of your time. Of the following, the best immediate action for you to take is to:
- (a) refuse to assist him
  - (b) ask for compensation before doing it
  - (c) assist him promptly
  - (d) notify his Department head.
- 14.** Of the following, the best way to develop a subordinate's potential is to:
- (a) give him a fair chance to learn by doing
  - (b) give him more than his share of work
  - (c) criticize only his work
  - (d) urge him to do his work rapidly

15. For best execution of work, the work should be assigned according to a person's:
- (a) attitude towards the work      (c) salary
  - (b) ability to do the work      (d) seniority
16. One of the following characteristics which a supervisor should *not* display while explaining a job to a subordinate is:
- (a) enthusiasm      (c) self-pity
  - (b) confidence      (d) determination
17. When a worker feels he has been unfairly treated, or handicapped or is dissatisfied with general working conditions, he is likely to submit a:
- (a) suggestion      (c) complaint
  - (b) argument      (d) grievance
18. Complicated instructions should *not* be written:
- (a) accurately      (c) factually
  - (b) clearly      (d) verbosely
19. The purpose of “earthing” in electrical devices and equipment is:
- (a) to eliminate interference from adjacent electrical equipment
  - (b) to complete the necessary electrical circuit
  - (c) to secure the mains cable to the chassis (metal framework) of the apparatus or equipment
  - (d) to provide a means of making the apparatus or equipment safe in case a fault occurs
20. The following component (s) is/are required to initiate and to sustain a fire:
- (a) a source of heat
  - (b) a source of any combustible material
  - (c) a supply of Oxygen or air
  - (d) all the above components



21. Which of the following can minimize the occurrence of accidents in factories?
- (a) Proper and thorough training schemes
  - (b) A proper attitude towards Safety, Health, and Welfare
  - (c) A strict adherence to Safety rules and procedures
  - (d) Wearing of the appropriate safety clothing
  - (e) All the above factors
22. .... is your mental, emotional, physical, and behavioral response to anxiety-producing events or situations.
- (a) Technology
  - (b) Stress
  - (c) Environment
  - (d) Information
  - (e) Sensitivity
23. .... is the science addressing the compatibility of people and machines.
- (a) Ergonomics
  - (b) CNC programming
  - (c) HRD (Human Resource Development)
  - (d) Robotics
24. .... views motivation as dependent on the strength of an individual's desire for a set of goals and the likelihood that a specific type of behavior will lead to the achievement of the individual's goals.
- (a) Differentiation model of motivation
  - (b) Needs model of motivation
  - (c) Expectancy model of motivation
  - (d) All the above
25. The theory of .... explains the forces and behavior that occur within a group.
- (a) Information systems
  - (b) Barriers
  - (c) Change
  - (d) Group dynamics

26. Two facets in any process of change are:
- (a) Technological and social
  - (b) Behavioral and psychological
  - (c) Familiar and unfamiliar
  - (d) Good and bad
  - (e) All the above
27. The term used to justify automated systems for professional or management staff is:
- (a) Fail safe
  - (b) Soft Skills
  - (c) Value added
  - (d) All the above
28. Machine-paced work does *not* cause stress among the workers.
- (a) True
  - (b) False
29. Behavior differences between individuals are produced by physical differences, mental capabilities, life experiences, culture, and perception of a situation.
- (a) True
  - (b) False
30. According to the needs model of motivation, money remains important only to the extent that it contributes to the fulfillment of social or ego needs.
- (a) True
  - (b) False
31. If half the potential of human resources could be used, the productivity increase would exceed that possible from technology.
- (a) True
  - (b) False

- 32.** The highest need in the needs hierarchy is the need for self-fulfillment.
- (a) True
  - (b) False
- 33.** The feasibility study implies the practicability of a proposed project and involves an analysis of the total requirements for a ..... evaluation of a proposed solution.
- (a) Operator
  - (b) Economic
  - (c) Technical
  - (d) Environment
  - (e) All the above
- 34.** A feasibility study can result in:
- (a) A recommendation to do the system analysis
  - (b) Management asking for additional information
  - (c) The project's being dropped or shelved
  - (d) All the above

### 31. Key

- |               |                |                |                |
|---------------|----------------|----------------|----------------|
| <b>1.</b> (b) | <b>10.</b> (d) | <b>19.</b> (d) | <b>28.</b> (b) |
| <b>2.</b> (c) | <b>11.</b> (a) | <b>20.</b> (d) | <b>29.</b> (a) |
| <b>3.</b> (b) | <b>12.</b> (d) | <b>21.</b> (e) | <b>30.</b> (a) |
| <b>4.</b> (b) | <b>13.</b> (c) | <b>22.</b> (b) | <b>31.</b> (a) |
| <b>5.</b> (d) | <b>14.</b> (a) | <b>23.</b> (a) | <b>32.</b> (a) |
| <b>6.</b> (a) | <b>15.</b> (b) | <b>24.</b> (c) | <b>33.</b> (e) |
| <b>7.</b> (c) | <b>16.</b> (c) | <b>25.</b> (d) | <b>34.</b> (d) |
| <b>8.</b> (d) | <b>17.</b> (d) | <b>26.</b> (a) |                |
| <b>9.</b> (d) | <b>18.</b> (d) | <b>27.</b> (c) |                |



## *WORK STUDY AND INDUSTRIAL ENGINEERING*

*Choose the correct alternative:*

1. It is generally recognized that the “Father of Scientific Management” is:
  - (a) Frank Gilbreth
  - (b) Lilian Gilbreth
  - (c) F.W. Taylor (Frederick Winslow Taylor)
  - (d) Peter F. Drucker
2. The Scientific study of the relationship between man and his working environment is known as:
  - (a) Industrial Psychology
  - (b) Ergonomics
  - (c) Industrial Engineering
  - (d) Work study
  - (e) Industrial Management
3. By which *one* of the following methods, productivity of an enterprise can be increased?
  - (a) by buying additional equipment
  - (b) by working for an additional shift
  - (c) by better utilization of existing plant and equipment
  - (d) by increasing the sales price of the products

4. In Outline Process Chart, the following symbols are used:
- (a) O, [ ], and  $\rightarrow$
  - (b) O, [ ]
  - (c) [ ],  $\nabla$ , and  $\rightarrow$
  - (d) O,  $\rightarrow$  and  $\nabla$
  - (e) D, O, [ ], and  $\nabla$
5. In the construction of a flow process chart the following symbols are used:
- (a) O, [ ], and  $\rightarrow$
  - (b)  $\rightarrow$ , D, and [ ]
  - (c)  $\rightarrow$ , D and O
  - (d)  $\rightarrow$ , D, O,  $\nabla$  and [ ]
  - (e) X, D, O,  $\rightarrow$ , and [ ]
6. In the construction of two handed process chart, the following symbols are used:
- (a) O,  $\rightarrow$ , D, and [ ]
  - (b)  $\rightarrow$ , [ ], and  $\nabla$
  - (c) O, [ ], and  $\rightarrow$
  - (d) O,  $\rightarrow$ , D, and  $\nabla$
- (O stands for Operation,  $\rightarrow$  stands for Transport, D stands for Delay, [ ] stands for Inspection, and  $\nabla$  stands for Storage)
7. In Time and Motion study, the fundamental motions of human body are called:
- (a) Therbligs
  - (b) M.T.M. units
  - (c) Sequence of steps
  - (d) Sequence of operations
  - (e) "B" units
8. The "THERBLIGS" have been first introduced by:
- (a) Frank Gilbreth
  - (b) F.W.Taylor
  - (c) SIMO
  - (d) L.H.C. Tippet
  - (e) L.H. Gantt
9. "Therbligs" are extensively used in the construction of:
- (a) Two handed process chart
  - (b) Outline Process chart
  - (c) Fiow Process chart
  - (d) SIMO chart

- 10.** The concept of “Rating” was first introduced by:
- (a) F.W. Taylor
  - (b) F.B. Gilbreth and L.M. Gilbreth
  - (c) Charles E. Bedaux
  - (d) L.H. Gantt
- 11.** Methods Time Measurement (M.T.M.) was first developed by:
- (a) L.H. Gantt
  - (b) H.B. Maynard
  - (c) L.H.C. Tippet
  - (d) Gilbreth
- 12.** Work Sampling (or Activity Sampling) as a technique of work measurement was first introduced by:
- (a) Gilbreth
  - (b) L.H. Gantt
  - (c) L.H.C. Tippet
  - (d) Anne G. Shaw
  - (e) H.B. Maynard
- 13.** Which one of the following is *not* an Incentive Scheme?
- (a) Monthly Salary
  - (b) Halsey 50—50 Plan
  - (c) 100% Bonus Plan
  - (d) Straight Piece-Work with Guaranteed Minimum Base
  - (e) Rowan Premium Plan
- 14.** Greater flexibility in plant layout is achieved in the case of
- (a) Layout by fixed position
  - (b) Process Layout
  - (c) Product Layout
  - (d) Group Layout
- 15.** The important objective of using materials handling equipment in manufacturing concerns is:
- (a) to increase the cost of the product
  - (b) to improve the operators’ safety
  - (c) to improve the cleanliness of the workplace
  - (d) to improve the overall productivity of the concern

- 16.** Conveyors as materials handling equipment are extensively used in the case of:
- (a) Process Layout
  - (b) Product Layout
  - (c) Layout by fixed position
  - (d) Group Layout
- 17.** The concept of “ABC” analysis is applied mostly in:
- (a) Plant Layout and Materials Handling
  - (b) Ergonomics
  - (c) Methods Time Measurement
  - (d) Inventory Control
  - (e) Process Planning
- 18.** A batch of 500 components is produced on a capstan lathe. The piece work rate/piece is 20 Paise, and the direct material cost/piece is 40 Paise. Over-heads are 500% of direct labor cost. What is the total cost of the entire batch of the components?
- (a) Rs. 100/-
  - (b) Rs. 200/-
  - (c) Rs. 500/-
  - (d) Rs. 800/-
  - (e) Rs. 1600/-
- 19.** The method often used to keep a record of the progress of a Project is a
- (a) Bar Chart
  - (b) P-chart
  - (c) PERT chart
  - (d) Mollier Chart
  - (e) Polar chart
- 20.** The most important aspect in a good engineering report is:
- (a) its shortness
  - (b) its promptness
  - (c) its accuracy
  - (d) its good grammar
- 21.** Which *one* of the following indicates an increase in productivity?
- (a) increased output as a result of waste reduction
  - (b) increased output as a result of working for an additional shift
  - (c) increased production owing to addition of machines and equipment



- 22.** In a decimal minute stop watch the minimum reading is:
- (a) 1.0 minute
  - (b) 0.1 minute
  - (c) 0.01 minute
  - (d) 0.001 minute
  - (e) 0.0001 minute
- 23.** Job evaluation is:
- (a) Same as Merit Rating
  - (b) Evaluating the worth of the person who is holding the job.
  - (c) A system for determining the worth, in monetary terms, of jobs within an organization.
- 24.** Determining and comparing the content of particular jobs without regard to the individuals performing the jobs is the function of:
- (a) Job evaluation
  - (b) Merit Rating
  - (c) Incentive schemes
  - (d) Method study
- 25.** Work measurement is determining:
- (a) the basis for introducing wage incentive plan
  - (b) the employee performance standards
  - (c) the costs
  - (d) the production schedules and standards
  - (e) all the above
- 26.** The most traditional and most often used work measurement technique is:
- (a) the work sampling technique
  - (b) the stop-watch time study
  - (c) the Predetermined Motion Time System (PMTS)
  - (d) the Method-Time Measurement (MTM)
- 27.** The work of a lathe machine operator producing a large number of components/day can be timed accurately by using:
- (a) the work sampling method
  - (b) the stop-watch time study method

- (c) the P.M.T. system
  - (d) the analytical estimating method
- 28.** Work Sampling Technique is based on the application of statistical sampling principles to work Measurement. This technique:
- (a) Utilizes observations made at regular intervals of time
  - (b) Utilizes observations made at random intervals of time
  - (c) Utilizes observations made at equal intervals of time
- 29.** Work sampling technique (one of the work measurement techniques) can be used most effectively:
- (a) for measuring long cycle operations
  - (b) for measuring short-cycle operations
  - (c) for situations involving a series of short, complex operations
- 30.** Which *one* of the following techniques is most suitable when standards are needed by an office manager who does not have the time to measure each individual's work?
- (a) Work sampling
  - (b) Time study using a stop watch
  - (c) Analytical estimating
  - (d) Methods-Time Measurement (MTM)
- 31.** Under the ..... technique, tables of standard unit times for various body motions are used to arrive at the time standards for a given operation.
- (a) Analytical Estimating
  - (b) PMT (Pre-determined Motion Times)
  - (c) Work sampling
  - (d) stop watch time study
- 32.** The most scientific of all the work measurement techniques is:
- (a) the stop-watch Time Study
  - (b) the Work-Sampling technique

- (c) the PMT (Predetermined Motion Times) technique
  - (d) the Analytical Estimating
- 33.** Which *one* of the following work measurement techniques is most suitable when a new assembly process is being introduced:
- (a) Analytical Estimation
  - (b) PMT system
  - (c) Time study using a stopwatch
  - (d) Activity sampling
  - (e) Work sampling
- 34.** ..... is perhaps the only way to set time standards in advance in new work situations not tried before.
- (a) The PMT method
  - (b) The Stopwatch study
  - (c) The work sampling technique
  - (d) Analytical estimation
- 35.** The basic objective of introducing wage incentive systems and wage incentive plans is:
- (a) to reduce the employee's actual earnings
  - (b) to increase the unit cost of the item produced
  - (c) to increase the worker effectiveness and to reduce the unit labour cost
- 36.** In "Taylor Differential Piece Rate System":
- (a) one piece rate is established for each job
  - (b) two different piece rates are established for each job
  - (c) three different piece rates are established for each job
  - (d) No piece rates are established for the jobs
- 37.** The Merrick Multiple wage plan is a wage incentive system very similar to the Taylor Differential Piece Rate incentive system. In Merrick Multiple wage plan:
- (a) no piece rates are established for the jobs
  - (b) three different piece rates are established for each job
  - (c) two different piece rates are established for each job
  - (d) only one fixed piece rate is established for a job

- 38.** The time required to complete a task is established and a bonus is paid to the worker for every hour he saves from the established time required. This type of incentive plan is known as:
- (a) Rowan Plan
  - (b) Bedaux Plan
  - (c) Taylor Differential Piece rate system
  - (d) Halsey Premium plan
  - (e) Day work plan
- 39.** The time required to complete a job is established and a bonus is paid to the worker based on the exact % of time saved. This type of incentive plan is known as:
- (a) Day work plan
  - (b) Halsey Premium Plan
  - (c) Taylor plan
  - (d) Bedaux Plan
  - (e) Rowan Plan
- 40.** Which *one* of the following represents a group incentive plan?
- (a) Scanlon Plan
  - (b) Rowan Plan
  - (c) Bedaux Plan
  - (d) Taylor Differential Piece Rate system
  - (e) Halsey Premium Plan
- 41.** Which *one* of the following represents a group incentive plan?
- (a) Halsey Premium Plan
  - (b) Bedaux plan
  - (c) Lincoln Plan
  - (d) Rowan Plan
  - (e) Taylor Plan
- 42.** In Lincoln plan (one type of group incentive plan), the amount of the profit which an employee receives, in addition to the guaranteed basic pay/wages, is based on:
- (a) a Standard rating system
  - (b) a Merit rating system
  - (c) a job evaluation system
  - (d) his individual performance

### 32. Key

- |         |         |         |         |
|---------|---------|---------|---------|
| 1. (c)  | 12. (c) | 23. (c) | 34. (a) |
| 2. (b)  | 13. (a) | 24. (a) | 35. (c) |
| 3. (c)  | 14. (b) | 25. (e) | 36. (b) |
| 4. (b)  | 15. (d) | 26. (b) | 37. (b) |
| 5. (d)  | 16. (b) | 27. (b) | 38. (d) |
| 6. (d)  | 17. (d) | 28. (b) | 39. (e) |
| 7. (a)  | 18. (d) | 29. (a) | 40. (a) |
| 8. (a)  | 19. (a) | 30. (a) | 41. (c) |
| 9. (d)  | 20. (c) | 31. (b) | 42. (b) |
| 10. (c) | 21. (a) | 32. (c) |         |
| 11. (b) | 22. (c) | 33. (b) |         |



## *CAD/CAM/CIM (COMPUTER AIDED DESIGN, COMPUTER AIDED MANUFACTURING, AND COMPUTER INTEGRATED MANUFACTURING)*

1. The function(s) of CAD is (are):
  - (a) geometric modeling
  - (b) drafting
  - (c) documentation
  - (d) all of the above
2. The function(s) of CAM is (are):
  - (a) numerical control
  - (b) robotics use and their programming
  - (c) process planning
  - (d) all of the above
3. Robot is basically a(n):
  - (a) machining device
  - (b) inspection device
  - (c) material handling device
  - (d) machine tool
4. Group technology brings together and organizes:
  - (a) common parts, problems, and tasks
  - (b) automation and tool production
  - (c) parts and simulation analysis

5. Flexible manufacturing allows for:
  - (a) quick and inexpensive product changes
  - (b) tool design and tool production
  - (c) automated design
6. The benefit(s) of CAD is(are):
  - (a) Shorter lead time
  - (b) Minimum transcription error
  - (c) Improved design accuracy
  - (d) All the above
7. Group Technology (GT) involves the grouping of parts, machines or processes by a certain criteria to increase the overall productivity of the manufacturing system.
  - (a) True
  - (b) False
8. \_\_\_\_\_ may be defined as the effective use of computer technology in the operations, control, and management of the manufacturing facility through either direct or indirect interface with the physical and human resources of the company.
  - (a) CAD
  - (b) CAM
  - (c) CAI
  - (d) CAPP
9. \_\_\_\_\_ is concerned with the activities that are involved in the preparation and generation of route sheets. (Route sheets list the sequence of operations and machines required to produce a part or a component.)
  - (a) CAD
  - (b) CAM
  - (c) CAI
  - (d) CAPP
  - (e) CAD/CAM
10. \_\_\_\_\_ can be described as an activity that uses computers to assist in the creation, development, modification, analysis, validation, or optimization of a design.
  - (a) CAD
  - (b) CAPP
  - (c) CAM
  - (d) CAD/CAM
  - (e) CIM



- 11.** Cutting speeds and feed rates are selected on the basis of the:
- (a) Type of machining operation
  - (b) Machine tool and cutting tool used
  - (c) Work material and operating parameters
  - (d) All the above
- 12.** CIM (Computer Integrated Manufacturing) involves:
- (a) All the engineering functions of CAD/CAM
  - (b) All the business functions such as marketing and customer support
  - (c) Design, manufacturing planning, and manufacturing
  - (d) All the above
- 13.** \_\_\_\_\_ refers to production management techniques for collecting data from factory operations and using the data to help in monitoring and control of production and inventory in the factory.
- (a) Process control
  - (b) Shop floor control
  - (c) Manufacturing control
  - (d) Items (b) and (c) above
- 14.** \_\_\_\_\_ effectively uses the computer technology in the planning, management and control of the manufacturing function in a factory.
- (a) CAE
  - (b) CAD
  - (c) CAM
  - (d) CAPP
- 15.** CAD/CAM involves the use of digital computers to accomplish certain functions in:
- (a) Product Design
  - (b) Process Planning
  - (c) Production/Manufacturing
  - (d) All the above
- 16.** \_\_\_\_\_ involves interrelated operations, beginning with product creation and ending with product despatching.
- (a) Manufacturing engineering
  - (b) Production planning
  - (c) CAD/CAM
  - (d) CIM

17. \_\_\_\_\_ will provide the technological base for the computer-integrated factory of the future.
- (a) CAD (c) CAPP  
(b) CAM (d) CAD/CAM
18. \_\_\_\_\_ prepares a listing of the operation sequence required to process a particular product or component.
- (a) CAD (c) CAD/CAM  
(b) CAPP (d) CIM
19. \_\_\_\_\_ provide(s) computer assistance to all functions in the production cycle.
- (a) CAD (c) CIM  
(b) CAM (d) All the above
20. \_\_\_\_\_ involves the use of computer systems to plan, manage and control the operations of a manufacturing/production plant through either direct or indirect computer interface with the plant's resources.
- (a) CAD (c) CAPP  
(b) CAM (d) CAI
21. Computer process control involves:
- (a) Direct computer interface with the manufacturing process  
(b) Monitoring the capabilities of the manufacturing process  
(c) Controlling of the manufacturing process  
(d) All the above
22. The actual conversion of raw materials and shapes into end products of proper size, configuration, and performance specifications is accomplished by \_\_\_\_\_ technology.
- (a) Computer  
(b) Engineering  
(c) Industrial  
(d) Production

- 23.** Raw factory data is converted into real value for management after they have been:
- (a) Examined
  - (b) Analyzed
  - (c) Compared
  - (d) Classified
  - (e) All the above
- 24.** Product designs are documented and preserved by means of:
- (a) Component drawings
  - (b) Specifications
  - (c) Bill of materials
  - (d) All the above
- 25.** A major factor in the use of micro-computers in control systems is the need for communication among the various parts of the system.
- (a) True
  - (b) False
- 26.** A Flexible Manufacturing System (FMS) consists of a group of processing work stations (usually CNC machines) connected by automated part handling systems.
- (a) True
  - (b) False
- 27.** Engineering department is the principal user of CAD, whereas the factory floor/shop floor is the principal user of CAM.
- (a) True
  - (b) False
- 28.** In CNC Machine, the computer serves as the control mechanism and manages the various processing operations.
- (a) True
  - (b) False
- 29.** The translation phase of product manufacturing is the responsibility of the manufacturing engineering department.
- (a) True
  - (b) False

30. Successful implementation of the FOF (Factories Of the Future) concept will be better achieved by top-down design of an hierarchical control architecture.
- (a) True
  - (b) False
31. The sequence of events that take place from the beginning until the time the product is dispatched is often referred to as \_\_\_\_\_:
- (a) A production cycle
  - (b) A production planning and control cycle
  - (c) Flow cycle
  - (d) Product cycle
32. \_\_\_\_\_ is a system in which the computer develops process plans for a part that are based on information stored in a data base.
- (a) CAPP
  - (b) FMS
  - (c) MIS
  - (d) FMC
33. An automated flow line consists of several \_\_\_\_\_ linked together by work-handling devices that transfer parts between different work centers.
- (a) CNC Machines
  - (b) Work stations
  - (c) Robots
  - (d) All the above
34. The objective(s) of using the flow line automation is(are)
- (a) Reduce labor cost, integration of operations, and increase production rates
  - (b) Minimize distance moved between operations, integration of operations, and reduce work in progress
  - (c) Specialization of operations, integration of operations, and minimize distances moved between operations
  - (d) Reduce labour cost, minimize distances moved between operations, and increase production rates
  - (e) all the above

- 35.** The primary technique to create interest in CIM (Computer Integrated Manufacturing) amongst all the staff in the company is to get \_\_\_\_\_ involved.
- (a) CEO (Chief Executive Officer) of the Company.
  - (b) Management Teams
  - (c) Employees
  - (d) All of the above
- 36.** CIM implementation team leader should have the following quality/qualities:
- (a) Hard working, respected by all team members, knows everything about CIM, and good decision maker
  - (b) Good leadership skills, respected by all team members, good at generating ideas, and ability to communicate well
  - (c) Highly placed in the organization, good leadership skills, good understanding of systems, and procedures and respected by all team members
  - (d) All the above
- 37.** Area (s) of concern in the implementation of CIM at the enterprise level is (are):
- (a) Motivation of the employees
  - (b) Know-how skills
  - (c) Necessary tools and good organization structure
  - (d) All the above
- 38.** An important “early” strategy in the CIM solutions process is the establishment of an organization structure that reflects the three levels of management (i.e. top, middle, and lower levels)
- (a) True
  - (b) False
- 39.** The justification of CIM projects is always a major stumbling block in implementing an effective CIM strategic plan.
- (a) True
  - (b) False

- 40.** Common justification factors in implementing a CIM strategy are:
- (a) Improved system throughput, advancement of technology, and improved productivity
  - (b) A reduction in the manufacturing cycle, reduced overhead expenses, and improved product quality
  - (c) Competitively priced products and improved product quality
  - (d) All the above
- 41.** The framework for a CIM proposal and the elements of the proposal will vary from enterprise to enterprise.
- (a) True
  - (b) False
- 42.** Poor prior planning for CIM is one of the major factors for unsuccessful implementation of the system in the firm.
- (a) True
  - (b) False
- 43.** The management team is a decision-making team with representation from each of the involved departments that are most likely to be affected by the implementation of a CIM strategy.
- (a) True
  - (b) False
- 44.** Constraint(s) that may limit the scope of a CIM development project may be:
- (a) Financial
  - (b) Legal
  - (c) Human resources
  - (d) Economic
  - (e) All the above

**33. Key**

- |         |         |         |         |
|---------|---------|---------|---------|
| 1. (d)  | 12. (d) | 23. (e) | 34. (e) |
| 2. (d)  | 13. (d) | 24. (d) | 35. (d) |
| 3. (c)  | 14. (c) | 25. (a) | 36. (d) |
| 4. (a)  | 15. (d) | 26. (a) | 37. (d) |
| 5. (a)  | 16. (d) | 27. (a) | 38. (a) |
| 6. (d)  | 17. (d) | 28. (a) | 39. (a) |
| 7. (a)  | 18. (b) | 29. (a) | 40. (d) |
| 8. (b)  | 19. (d) | 30. (a) | 41. (a) |
| 9. (d)  | 20. (b) | 31. (a) | 42. (a) |
| 10. (a) | 21. (d) | 32. (a) | 43. (a) |
| 11. (d) | 22. (d) | 33. (d) | 44. (e) |





## *MANUFACTURING SYSTEMS*

1. A Manufacturing System may be viewed as a “production system” wherein a set of “input” parameters are transformed into some desirable “output” parameters.  
(a) True (b) False
2. The most important concepts of a manufacturing system is the relationship of the individual parts to the whole system.  
(a) True (b) False
3. Manufacturing is a transformation process in which raw materials are converted into components/products that have value in the marketplace.  
(a) True (b) False
4. Factory management may be defined as a closed-loop communications network involving scheduling of “J” no. of jobs across “M” no. of machines.  
(a) True (b) False
5. A manufacturing cycle may be defined as system involving activities and operations from product design to delivery and product service.  
(a) True (b) False
6. It is highly desirable that the manufacturing engineering department provides advice to the product design department on the producibility or manufacturability of the product.  
(a) True (b) False

7. An integrated CAD/CAM database system is known as the manufacturing database.
- (a) True (b) False
8. CAD/CAM is a closed loop system reflecting all activities in the production/manufacturing cycle.
- (a) True (b) False
9. Important CAM applications are:
- (a) Computer-aided line balancing, process control, cost estimating, CAPP, and process monitoring
- (b) Computerized machinability data systems, computer-assisted NC part programming, development of work standards, and production and inventory planning
- (c) Shop floor control, process control, production and inventory planning, and cost estimating
- (d) All the above
10. Group Technology (GT) is a manufacturing philosophy in which:
- (a) Similar parts are identified and grouped together to take advantage of their similarities in design and production
- (b) Product design features and manufacturing aspects are considered together
- (c) Similar parts are arranged into families of parts
- (d) All the above
11. A list of the sequence of moves between operations or work centers is called a:
- (a) Route sheet
- (b) Production schedule
- (c) Work-in-process sheet
- (d) Capacity requirements planning
12. The system development cycle begins with the concept of meeting the needs of the organization.
- (a) True (b) False

13. System implementation should enable the seamless integration of products, services, and sub-systems.  
(a) True (b) False
14. Involvement of top management is *not* a pre-requisite for the successful implementation of a system.  
(a) True (b) False
15. Contract negotiation is the final phase of the procurement from the CIM system developer.  
(a) True (b) False
16. Common methods of procuring computer hardware systems are by purchasing, leasing, or renting them.  
(a) True (b) False
17. The staff involved in a CIM system must be trained on their role in using the system and how the system will help them.  
(a) True (b) False
18. The type of training method used is determined by the kind of training or learning experiences you would like to have.  
(a) True (b) False
19. When the new component replaces the old component or the new system replaces the old system, this is considered as the maintenance.  
(a) True (b) False
20. The more sophisticated or more innovative the system becomes, the higher the probability of failure.  
(a) True (b) False
21. The general practice is to make the system 100% secure and fool-proof.  
(a) True (b) False

22. \_\_\_\_\_ are a major source of data collection.
- (a) Interviews
  - (b) Observations
  - (c) Inspection of documents and records
  - (d) Questionnaires
23. Observations are generally made to determine
- (a) Work flow
  - (b) Physical location of work stations
  - (c) Who does what task
  - (d) How each task is performed
  - (e) All the above
24. In the \_\_\_\_\_ phase the following steps are taken; review of the objectives: develop a model, evaluate constraints, develop alternative models, conduct feasibility study, conduct cost/benefit analysis, and prepare recommendations report.
- (a) Need analysis
  - (b) Design
  - (c) Evaluation
  - (d) Implementation
  - (e) Review
25. In addressing the human side of using computer systems, \_\_\_\_\_ should be considered.
- (a) Providing for employees' well-being
  - (b) Providing a safe and healthy work environment
  - (c) Providing a comfortable work environment
  - (d) All the above
26. Changes take place in organizations just for the sake of change.
- (a) True
  - (b) False
27. The feasibility study is designed to determine if a problem exists and to ascertain its nature and scope if it exists.
- (a) True
  - (b) False

- 28.** Another term for “feasibility study” is “preliminary investigation.”  
(a) True (b) False
- 29.** Management officials, users, and analysts should not be directly involved in determining the objectives for the need for CIM.  
(a) True (b) False
- 30.** The primary purpose of studying the present system is to survey the current system and its operation in order to understand what the system does and what it should do.  
(a) True (b) False
- 31.** By studying books, periodicals, and brochures, insight can be gained regarding trends, alternatives, and product specifications.  
(a) True (b) False
- 32.** The results of the systems analysis are not presented to management in a written or oral presentation.  
(a) True (b) False
- 33.** In the system design phase, the focus is on studying the current system.  
(a) True (b) False
- 34.** The purpose of the system implementation phase is to achieve a fully documented operational system.  
(a) True (b) False
- 35.** Success or failure of a system is dependent on the people who will actually use it.  
(a) True (b) False
- 36.** The internal and external environment affects the maintenance procedures and systems followed in a company.  
(a) True (b) False

37. The methods generally used to assess vendor claims for their products, components and services are:
- (a) Performance during trial periods
  - (b) Testing against industry benchmark
  - (c) Vendor rating
  - (d) All the above
38. To share maximum information with a large number of individuals, the \_\_\_\_\_ training method is used.
- (a) Simulation
  - (c) Lecture
  - (e) On-the-job
  - (b) Video
  - (d) Hands-on
39. There should be 100% security against data transfer, data modification, and data removal.
- (a) True
  - (b) False
40. Information systems should have:
- (a) Proper planning and integrity
  - (b) Proper maintenance procedures, documentation, and cost control
  - (c) Proper planning and testing
  - (d) Integrity and controllability
  - (e) All the above
41. \_\_\_\_\_ is the ability to continue performance even if one or more components fail:
- (a) Integrity
  - (c) Controllability
  - (b) Fail-safe
  - (d) Security
42. \_\_\_\_\_ is an ongoing activity to keep the system at its highest level of efficiency and effectiveness within the constraints of the organization.
- (a) Documentation
  - (c) Security
  - (b) Testing
  - (d) Maintenance

43. External environmental factor(s) that can affect the need for maintenance are:
- (a) Government regulations and introduction of new technology
  - (b) Economic conditions and competitive market
  - (c) Qualified maintenance personnel are not available
  - (d) All the above
44. \_\_\_\_\_ is an integral part of the system since it provides transparency and understanding of the system.
- (a) Planning
  - (b) Documentation
  - (c) Testing
  - (d) Maintenance
  - (e) Training
45. Two basic models used in database management are \_\_\_\_\_ and \_\_\_\_\_.
- (a) Synthetic, analytical
  - (b) Relational, hierarchical
  - (c) Vertical structure, horizontal structure
  - (d) Network, nodes
46. The term “Protocol” refers to a set of established rules and procedures that allows smooth and orderly transfer of information.
- (a) True
  - (b) False
47. \_\_\_\_\_ planning involves forecasting the demand for the firm’s products and services and translating this forecast into its equivalent demand for various factors of production.
- (a) Product
  - (b) Process
  - (c) Production
  - (d) Works
48. A CIM system must be carefully planned in advance by a multi-functional team approach.
- (a) True
  - (b) False

- 49.** The correct sequence of the three basic operations of an information system are:
- (a) Processing, input, output
  - (b) Input, processing, output
  - (c) Output, processing, input
  - (d) Input, output, processing
- 50.** Which is the best example of a real-time processing?
- (a) Printing of payroll cheques
  - (b) Summarizing daily transactions
  - (c) Calculating weekly inventory lends
  - (d) Requesting an airline reservation
- 51.** The “paperless factory” is often cited as the ultimate goal in the world of manufacturing.
- (a) True
  - (b) False
- 52.** In a real CIM system, some parts required on an urgent basis can be manufactured and dispatched on the same day and order is received.
- (a) True
  - (b) False
- 53.** A CIM system usually requires an organizational approach to manufacturing in order to:
- (a) Bring the different automated work centers together through a common data-link system
  - (b) Provide a frame work for design and implementing CIM
  - (c) Share data between different automated work centers
  - (d) All these
- 54.** Measures of CIM performance include factors such as
- (a) Development lead time for new products
  - (b) Manufacturing lead time
  - (c) Inventory level maintained
  - (d) Quality levels maintained
  - (e) All the above



55. MRP-II stands for:
- (a) Materials Requirements Planning
  - (b) Materials Resource Planning
  - (c) Manufacturing Resource Planning
  - (d) Manufacturing Requirements Planning
56. A Manufacturing Information System (MIS):
- (a) Consists primarily of technology and equipment
  - (b) Consists of persons, rules and procedures, data, hardware, and software
  - (c) Is a tool for taking correct decisions
  - (d) A tool for processing of information
57. \_\_\_\_\_ and \_\_\_\_\_ form the hub of a typical CIM system.
- (a) Computers, machines
  - (b) Procedures, computers
  - (c) Communication, database
  - (d) All the above
58. \_\_\_\_\_ should be actively involved in all CIM development processes.
- (a) Management
  - (b) Production Staff
  - (c) Design Engineers
  - (d) Customers
  - (e) All the above
59. The application of Computer-aided production and control systems enables us to:
- (a) Increase Productivity
  - (b) Reduce Waste
  - (c) Produce complex parts
  - (d) All the above
60. Integrated engineering and production systems are required to take products from concept stage to manufacturing lines.
- (a) True
  - (b) False

- 61.** Computer-controlled systems operate over the entire manufacturing cycle involving:
- (a) Data communication
  - (b) Data base management
  - (c) Running production lines
  - (d) All the above
- 62.** A physical path of a LAN consists of:
- (a) Coaxial communication cables
  - (b) Optical fibers
  - (c) Microwaves
  - (d) All the above
- 63.** Distributed computer control implies decentralization of computer functions.
- (a) False
  - (b) True
- 64.** Automation is the key to:
- (a) A shorter work week
  - (b) Safer working conditions for the worker
  - (c) Lower prices and better product
  - (d) Means of increasing the standard of living of our people
  - (e) All the above
- 65.** Flexible inspection system involves the use of Coordinate Measuring Machines (CMM).
- (a) True
  - (b) False
- 66.** The purpose of automated materials handling equipment/systems in a factory is to move raw materials, work in process, finished parts, tools, and supplies from one location to another to facilitate the overall manufacturing operation.
- (a) True
  - (b) False

- 67.** An AGV (Automated Guided Vehicle) is a materials handling system that is moved along defined pathways in the shop floor between different work stations.
- (a) True (b) False
- 68.** Materials Requirements Planning (known as MRPI) system starts with the company's business plan.
- (a) True (b) False
- 69.** Flexible Manufacturing Systems (FMS) incorporate automation concepts such as:
- (a) CNC machines, group technology, and automatic material handling between machines
- (b) Computer control over the materials handling systems, Direct numerical machine tools, group technology; and CNC machines
- (c) Equipment maintenance and repair; tool changing and tool setting
- (d) Items (a) and (b) above
- 70.** Manufacturing Resource Planning (known as MRP-II) is a method of top-down scheduling of all the manufacturing resources required in the production of a product.
- (a) True (b) False
- 71.** Adaptive Control (AC) has attributes (i.e. features) of both feedback systems and optimal control systems.
- (a) True (b) False
- 72.** Shop Floor Control (SFC) is concerned with the release of the production orders the factory, controlling the processing of the orders through the various working centers, and acquiring current information on the status of the orders.
- (a) True (b) False
- 73.** Off-line inspection is achieved by performing the inspection procedure during the production operation.
- (a) True (b) False

- 74.** CIM follows the path of defining the system, funding, managing and coordinating all the improvement projects in the company.  
(a) True (b) False
- 75.** The financial function of an organization is mainly concerned with the money or cash flow.  
(a) True (b) False
- 76.** The marketing function of an organization determines what products and services should flow from the firm to the customers.  
(a) True (b) False
- 77.** Demand-based marketing policy establishes a price compatible with the value that the customer/buyer places on the product or service.  
(a) True (b) False
- 78.** Pricing models should consider both internal and external influences.  
(a) True (b) False
- 79.** Computer-Integrated Production Management Systems (CIPMS) have traditionally been called production planning and control (PPC) in industrial engineering.  
(a) True (b) False
- 80.** MRP (Materials Requirements Planning) interacts with two subsystems-viz. production scheduling and capacity requirements planning.  
(a) True (b) False
- 81.** MRP and MRP-II are one and the same concept.  
(a) True (b) False
- 82.** The orientation of the company's objectives to satisfy the needs and wants of customers for a profit or service is considered as the \_\_\_\_\_.  
(a) Planning concept (c) Manufacturing concept  
(b) Marketing concept (d) Control concept

- 83.** Strategies that enable the resources to be used judiciously in marketing the company's products and service are called the:
- (a) Marketing mix
  - (b) Production mix
  - (c) Financial mix
  - (d) All the above
- 84.** The marketing mix includes:
- (a) Product
  - (b) Sales Promotion Strategy
  - (c) Place
  - (d) Price
  - (e) All the above.
- 85.** Major subsystems of CIPMS (Computer-Integrated Production Management System) include:
- (a) Production and inventory management
  - (b) Plant shop scheduling
  - (c) Shop monitoring and control
  - (d) Plant maintenance
  - (e) All the above
- 86.** \_\_\_\_\_ is a system of monitoring the status of production activities in the plant and reporting the same to management so that effective controls are established.
- (a) Shop floor control
  - (b) Production control
  - (c) Scheduling control
  - (d) Financial control
- 87.** \_\_\_\_\_ is a technique of managing production inventories that takes into consideration the specific timing of material requirements.
- (a) CIPMS
  - (b) CAM
  - (c) CAD
  - (d) MRP
- 88.** \_\_\_\_\_ is the effective use of manpower, company's materials, bought out components and in-house production processes in the manufacturing industry.
- (a) Production control
  - (b) Forecasting
  - (c) Operations management
  - (d) All the above

89. \_\_\_\_\_ minimizes the inventory cost by ordering and manufacturing smaller quantities.

- (a) JIT
- (b) Push system
- (c) Mass production
- (d) Flexible Manufacturing System,(FMS)

### 34. Key

- |         |         |         |         |
|---------|---------|---------|---------|
| 1. (a)  | 24. (b) | 47. (a) | 70. (a) |
| 2. (a)  | 25. (d) | 48. (a) | 71. (a) |
| 3. (a)  | 26. (b) | 49. (b) | 72. (a) |
| 4. (a)  | 27. (a) | 50. (d) | 73. (b) |
| 5. (a)  | 28. (a) | 51. (a) | 74. (b) |
| 6. (a)  | 29. (b) | 52. (a) | 75. (a) |
| 7. (a)  | 30. (a) | 53. (d) | 76. (a) |
| 8. (a)  | 31. (a) | 54. (e) | 77. (a) |
| 9. (d)  | 32. (b) | 55. (c) | 78. (a) |
| 10. (d) | 33. (b) | 56. (b) | 79. (a) |
| 11. (a) | 34. (a) | 57. (c) | 80. (a) |
| 12. (a) | 35. (a) | 58. (e) | 81. (b) |
| 13. (a) | 36. (a) | 59. (d) | 82. (b) |
| 14. (b) | 37. (d) | 60. (a) | 83. (a) |
| 15. (a) | 38. (c) | 61. (d) | 84. (e) |
| 16. (a) | 39. (a) | 62. (d) | 85. (e) |
| 17. (a) | 40. (e) | 63. (b) | 86. (a) |
| 18. (a) | 41. (b) | 64. (e) | 87. (d) |
| 19. (b) | 42. (d) | 65. (a) | 88. (c) |
| 20. (a) | 43. (d) | 66. (a) | 89. (a) |
| 21. (a) | 44. (b) | 67. (a) |         |
| 22. (a) | 45. (b) | 68. (a) |         |
| 23. (e) | 46. (a) | 69. (d) |         |