ISRO IPRC TA 2022

Q1. A bicycle is pedaled with a constant torque of 100 N-m with the wheel revolving at 20 RPM. What is the power developed?
(a) 210 W
(b) 0.2 HP
(c) 2 KW
(d) 2 HP

Q2. The sensitivity of reading of manometer can be increased by
(a) Using high specific gravity liquid
(b) Inclining the manometer tube
(c) Use of vacuum
(d) All of the above

Q3. A fluid whose viscosity changes with the rate of deformation or shear strain is
(a) Newtonian fluid
(b) Non- Newtonian fluid
(c) Ideal Fluid
(d) Bernoulli Fluid

Q4. The elements in ascending order from lowest density via
1. Water, 2. Mercury, 3. Iron, 4. Kerosene
(a) 1, 3, 4, 2
(b) 4, 1, 3, 2
(c) 1, 4, 2, 3
(d) 3, 2, 1, 4

Q5. If speed of centrifugal pump Increases, its NPSH requirement
(a) Decreases
(b) Increases
(c) Remains constant
(d) Is independent of speed

Q6. Amount of energy required to raise the temperature of a substance of 1 kg mass by 1°C is called
(a) Specific entropy
(b) Specific heat capacity
(c) Sensible heat
(d) Latent heat

Q7. Number of working strokes per minute for a four stroke cycle engine is_____ the speed of the engine in RPM
(a) Equal to
(b) One half of
(c) Four times
(d) Twice

Q8. In an evaporator, heat rejection is carried out at constant
(a) Temperature
(b) Pressure
(c) Temperature and pressure
(d) Volume

Q9. Standard atmospheric pressure at sea level is
(a) 1.013 bar
(b) 1013 mm of Hg
(c) 1.013E5 MPa
(d) All of the above

Q10. The included angle of cross section of a V-belt is usually
(a) 55° to 60°
(b) 45° to 60°
(c) 30° to 40°
(d) 20° to 30°

Q11. Power transmitting shafts are designed on the basis of
(a) Strength
(b) Stiffness
(c) a and b
(d) None of the above

Q12. Mohr's circle is often used to calculate
(a) Principle Strain

(b) Principle stress
(c) Modulus of rigidity
(d) Beam stiffness

Q13. Hot working of metals is carried out
(a) At the re-crystallization temperature
(b) Below the re-crystallization temperature
(c) Above the re-crystallization temperature
(d) Just above the melting temperature

Q14. Ability of the machine component to resist fatigue is measured by
(a) Bend test
(b) Impact test
(c) Elastic limit
(d) Endurance limit

Q15. The alloy used for making electrical resistance and heating element is
(a) Tungsten
(b) German silver
(c) Nichrome
(d) Invar

Q16. In an interchangeable assembly, shaft of size $50^{+0.04}_{-0.01}$ Mates with hole of size $50^{+0.03}_{-0.02}$Mm. The maximum interference in the assembly is
(a) 60µm
(b) 10µm
(c) 20µm
(d) 70µm

Q17. A solid cylinder of 20 mm diameter and 100mm height is reduced to 50 mm height by forging between two flat dies. The change in diameter is
(a) 2.07%
(b) 41.4%
(c) 20.7%
(d) 50%

Q18. Additive manufacturing is also called
(a) Non-traditional manufacturing
(b) 3-D printing
(c) Laser welding technique
(d) Plasma addition manufacturing

Q19. Inertia of rectangular section having b = width and d = depth about x-axis is given by
(a) Ix = $\frac{b^2d^2}{6}$
(b) Ix = $\frac{db^3}{12}$
(c) Ix = $\frac{bd^3}{12}$
(d) Ix = $\frac{BD^3-bd^3}{12}$

Q20. The young's modulus of a material is 125 GPa and Poisson's ratio is 0.25. The modulus of rigidity of the material is
(a) 30 GPa
(b) 50 GPa
(c) 80 GPa
(d) 100 GPa

Q21. If a body is moving with a uniform acceleration (a), then final velocity (V) of the body after time (t) is equal to where, u = Initial velocity, S = Distance travelled in 't' seconds
(a) $ut + 1/2(at^2)$
(b) $u + at$
(c) $u^2 + 2as$
(d) None of the above

Q22. One Kilo Pascal is equivalent to
(a) 1000 N/mm^2
(b) 1000 N/cm
(c) 1000 N $/cm^2$
(d) 1000 N/m^2

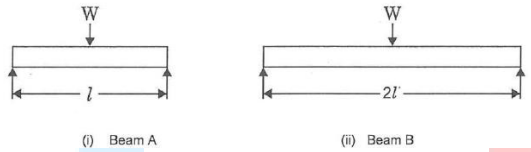
Q23. A metal pipe of 1 m diameter contains a fluid having a pressure of 1 N/mm^2. If the permissible tensile stress in the metal is 20 N/mm^2, then the thickness of the metal required for making the pipe will be
(a) 5 mm

(b) 10mm
(c) 15mm
(d) 25mm

Q24. The law pv^n =C. If the value of n = 1, the process is known as
(a) Adiabatic
(b) Isothermal
(c) Isentropic
(d) Polytropic

Q25. Standard color coding of Oxygen gas cylinders
(a) Grey
(b) Maroon
(c) Black
(d) Red

Q26. Two simply supported beams 'A' and 'B' of same breadth and depth carries a central load W as shown in figure. The deflection of beam 'B' will be as that of beam 'A'.



(i) Beam A (ii) Beam B

(a) one half
(b) double
(c) four times
(d) eight times

Q27. Breakeven point is the point where
(a) Fixed and variable cost lines intersect
(b) Fixed and total cost lines intersect
(c) Variable and total cost lines intersect
(d) Sales revenue and total cost lines intersect

Q28. To increase the corrosion resistance of steel
(a) Vanadium is added as an alloying element
(b) Chromium is added as alloying element
(c) Nickel is added as an alloying element
(d) Copper is added as an alloying element

Q29. Gaseous nitrogen is stored in a vessel of volume $3m^3$ at 6 bar (a) pressure and temperature of 27°C. Find the mass of the nitrogen gas stored in the vessel. Assume gas constant, R = 300 J/kgK.
(a) 10 kg
(b) 20 kg
(c) 30 kg
(d) 15 kg

Q30. The most popular and standard type for all purpose tool steels is 18: 4: 1 High Speed Steel (H.S.S), which contains
(a) 18% chromium, 4% tungsten and 1% vanadium
(b) 18% tungsten, 4% vanadium and 1% chromium
(c) 18% tungsten, 4% chromium and 1% vanadium
(d) 18% vanadium, 4% chromium and 1% tungsten

Q31. Gauge pressure at a point is equal to
(a) Absolute pressure + atmospheric pressure
(b) Absolute pressure - atmospheric pressure
(c) Vacuum pressure + absolute pressure
(d) Absolute pressure - vacuum pressure

Q32. A cycle consisting of two constant pressure and two isentropic processes is known as
(a) Carnot cycle
(b) Stirling cycle
(c) Otto cycle
(d) Brayton cycle

Q33. Which of the following welding process uses non-consumable electrodes?
(a) TIG welding
(b) MIG welding

(c) Manual arc welding
(d) Submerged arc welding

Q34. In order to grind soft material
(a) Fine grained grinding wheel is used
(b) Coarse grained grinding wheel is used
(c) Medium grained grinding wheel is used
(d) All the above

Q35. The ability of material to absorb energy within elastic region is called
(a) Ductility
(b) Resilience
(c) Toughness
(d) Hardness

Q36. The CG of a plane lamina will not be at its geometrical center in the case of
(a) Right angled triangle
(b) Equilateral triangle
(c) Rectangle
(d) Circle

Q37. Shear Force at a point in a beam, where maximum bending moment occurs is
(a) Maximum
(b) Half the maximum
(c) Zero
(d) None of the above

Q38. Thermit Welding is a form of
(a) Fusion welding
(b) Gas welding
(c) Arc welding
(d) Resistance welding

Q39. The degree of closeness of the measured value of a certain quantity with its true value is known as
(a) Accuracy
(b) Precision
(c) Sensitivity
(d) Standard

Q40. The least count of analog vernier caliper is
(a) 0.1mm
(b) 0.01mm
(c) 0.001mm
(d) 0.02mm

Q41. Injection molding is the ideal method for processing
(a) Plastics
(b) Thermo plastics
(c) Thermo setting plastics
(d) Nonferrous materials

Q42. The cutting tool in a milling machine is mounted on
(a) Spindle
(b) Column
(c) Knee
(d) Arbour

Q43. In the CNC machine tool, the part program entered into the computer memory
(a) Can be used again bit if it has to be modified every time
(b) Can be used only once
(c) Can be used again and again
(d) None of the above

Q44. An ideal fluid is
(a) Frictionless and incompressible
(b) One which obeys Newton's law of viscosity
(c) Frictionless and compressible
(d) Very viscous

Q45. Braking jet in an impulse turbine is used
(a) To break the jet of water
(b) To bring the runner to rest in a short time
(c) To change the direction of runner
(d) None of the above

Q46. In a double acting compressor, the air is compressed
(a) In one cylinder
(b) In two cylinders
(c) In a single cylinder on both side of piston
(d) In two cylinders on both side of the piston

Q47. In a transformer electric power is transferred from primary winding to secondary winding
(a) Through air
(b) By magnetic flux
(c) Through insulation medium
(d) None of the above

Q48. A solid circular steel shaft of diameter 2 cm is subjected to a permissible shear stress of 10 kN/cm2, then the value of twisting moment will be
(a) 5π kN-Cm
(b) 10л KN-Cm
(c) 15πkN-Cm
(d) 20π KN-Cm

Q49. The life of a ball bearing at a load of 10 kN is 8000 hrs. Its life in hours, if the load is increased to 20 kN, keeping all other conditions the same, is
(a) 4000
(b) 2000
(c) 1000
(d) 500

Q50. A spur gear has the following specifications:
No. Of teeth = 22
Pitch circle diameter = 14mm
Find out the value of circular pitch
(a) 16mm
(b) 8mm
(c) 4mm
(d) 2mm

Q51. A bottle opener belongs to which class of the
(a) Effort in the middle
(b) Fulcrum in the middle
(c) Resistance in the middle
(d) None of the above

Q52. Engine pistons are usually made of aluminum alloy because it
(a) Is lighter
(b) Offers less wear
(c) Absorbs shock
(d) Is stronger

Q53. Most 4 cylinder automobile engines have a firing order of
(a) 1-3-2-4
(b) 1-4-3-2
(c) 1-2-3-4
(d) 1-3-4-2

Q54. The lubricating oil is circulated in an IC engine by
(a) Centrifugal pump
(b) Positive displacement pump
(c) Roots blower
(d) Natural circulation thermo siphon

Q55. In blanking operation the clearance provided is
(a) 50% on punch and 50% on die
(b) On die
(c) On Punch
(d) On die or punch depends upon designer's choice

Q56. Loading in production planning may be defined as
(a) Assign the work to the facilities
(b) Sending the raw materials to the store
(c) Sending the finished material to the store
(d) Uploading software in machine control pane

Q57. Point to point systems CNC are used for
(a) Facing
(b) Parting
(c) Reaming
(d) Grooving

Q58. The basic geometric building blocks provided in a CAD/CAM package are
(a) Points
(b) Lines
(c) Circles
(d) All the above

Q59. What is the full form of SLS?
(a) Selective Laser Simulator
(b) Selective Laser Sintering
(c) Sintering Laser Simulator
(d) Stereo lithography Laser Sintering

Q60. The function of interpolator in a CNC machine controller is to
(a) Control spindle speed
(b) Control tool rapid approach speed
(c) Coordinate feed rates of axes
(d) Perform miscellaneous (M) functions (tool change, coolant control etc.)

IPRC TA 2022 SOLUTION

Ans1. a
Solution:
T = 100 N-m
N = 20 rpm
P = $\frac{2\pi nt}{60} = \frac{2\pi \times 100}{3}$ = 210W

Ans2. b
Solution:

Ans3. b
Solution:

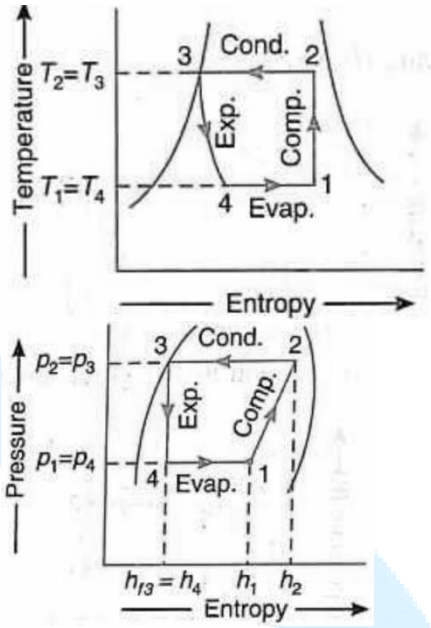
Ans4. b
Solution:

Ans5. b
Solution: If speed of centrifugal pump increases, chances of drop in pressure of fluids may increase which may lead to cavitation hence NPSH requirement increases.

Ans6. b
Solution:

Ans7. b
Solution: Number of working strokes per min. For a four stroke cycle engine are one half the speed of the engine in r.p.m. While number of working strokes per min. For a two stroke cycle engine are equal to the speed of the engine in r.p.m.

Ans8. c
Solution: Evaporation may occur at atmospheric pressure and room temp.



Ans9. a
Solution:

Ans10. c
Solution:
The included angle of the V-belt lies in the range of 30° - 40°, The nominal included angle of the V-belt shall be 40°

Ans11. c
Solution:

Ans12. b
Solution:

Ans13. c
Solution:

Ans14. d
Solution:

Ans15. c
Solution:

Ans16. a
Solution:
Maximum interference = the maximum limit for shaft - The minimum limit for the hole

= (50+ 0.04) - (50 - 0.02) = 0.06mm = 60microns

Ans17. b
Solution:
$\frac{\pi}{4}{d_1}^2 \times 100 = \frac{\pi}{4}{d_2}^2 \times 50$
$d_2 = 100\sqrt{2} = 141.4$
Therefore change in diameter = 141.4 - 100 = 41.4

Ans18. b
Solution:

Ans19. c
Solution:

Ans20. b
Solution: Applying E = 2C (1+ μ)
C = $\frac{E}{2(1+\mu)} = \frac{125 \times 10^9}{2(1+0.25)}$ = 0.5 × 1011 = 50GPa

Ans21. b
Solution:

Ans22. d
Solution: 1 kPa = 1013.25 N/m2

Ans23. d
Solution: Applying $\sigma = \frac{Pd}{2t}$
T = $\frac{1000}{40}$ = 25mm

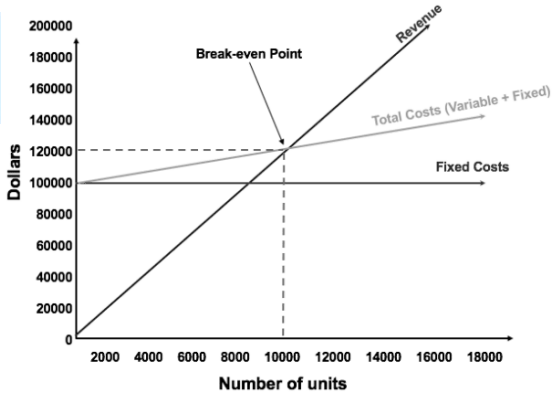
Ans24. b
Solution:

Ans25. c
Solution:

Ans26. d
Solution:
Concentrated load P at the centre:
$\delta = \frac{PL^3}{48EI}$

$L_B = 2L_A$
$\frac{\delta_B}{\delta_A} = \frac{(L_B)^3}{(L_A)^3} = (2)^3 = 8$
$\delta_B = 8\delta_A$
∴ the deflection of beam B is 8 times as coMPared to beam A.

Ans27. d
Solution:



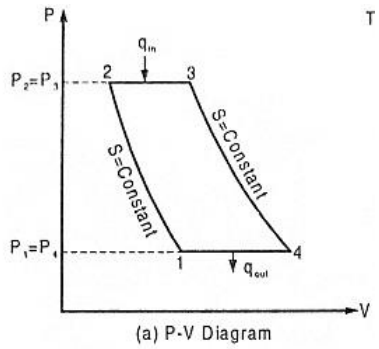
Ans28. b
Solution:

Ans29. b
Solution:
PV = mRT
6 × 105 × 3 = m × 300 × 300
M = 180/9 = 20 kg

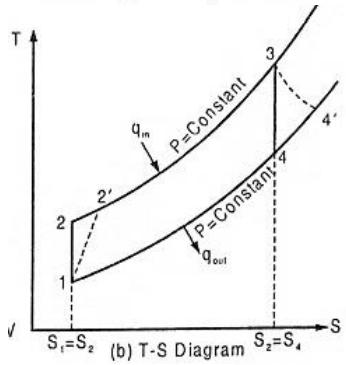
Ans30. c
Solution:

Ans31. b
Solution:

Ans32. d
Solution:



(a) P-V Diagram



(b) T-S Diagram

Ans33. a
Solution:

Ans34. b
Solution:
Note: ~ grinding of hard materials requires fine grit size and soft grades
~ Grinding of soft materials requires coarse grit size and hard grades.

Ans35. b
Solution:

Ans36. a
Solution:

Ans37. c
Solution:

Ans38. a
Solution:

Ans39. a
Solution:

Accuracy is the degree of closeness between a measurement and its true value. Precision is the degree to which repeated measurements under the same conditions show the same results.

Ans40. d
Solution:

Ans41. c
Solution:

Ans42. d
Solution:

Ans43. c
Solution:

Ans44. a
Solution:

Ans45. b
Solution:

Ans46. c
Solution:

Ans47. b
Solution:

Ans48. a
Solution:
T = $\frac{\pi d^3 \tau_{max}}{16}$ = $\frac{8\pi \times 10}{16}$ = 5π kN-cm

Ans49. c
Solution:
The approximate rating of the service life of a ball or roller bearing is based on the given fundamental equation.
$L = \left(\frac{C}{P}\right)^k \times 10^6 \text{revolution}$
Where L is rating life, C is a basic dynamic load, P is an equivalent dynamic load
k = 3 for ball bearing

k = 10/3 for roller bearing

$$L = \left(\frac{C}{P}\right)^3 \Rightarrow L \ \alpha \ \frac{1}{P^3} \Rightarrow \frac{L_1}{L_2} =$$

$$\Rightarrow \frac{L_1}{L_2} = \left(\frac{P_2}{P_1}\right)^3 = 2^3 \Rightarrow L_2 = \frac{L_1}{8} = \frac{8000}{8}$$

= 1000

Ans50. d
Solution:
Circular pitch = $\frac{\pi D}{T}$ = $\frac{22 \times 14}{7 \times 22}$ = 2mm

Ans51. c
Solution:

Ans52. a
Solution:

Ans53. d
Solution:

Ans54. b
Solution:

Ans55. c
Solution:

Ans56. a
Solution: A load means the quantity of work, and allocating the quantity of work to the processes necessary to manufacture each item is called loading.

Ans57. c
Solution:

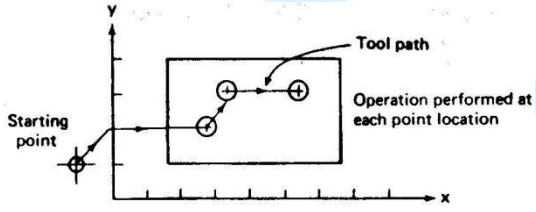


FIGURE 8.5 Point-to-point (positioning) control in NC.

The point-to-point (PTP) control system is many times referred to as the positioning system. The primary function of the PTP control system is to move a tool from one point location to another specified point, generally to do hole operations such as drilling, boring, reaming, tapping, and punching.

Ans58. d
Solution: packages typically provides basic geometric building blocks, including points, lines, and circles.

Ans59. b
Solution:

Ans60. c
Solution: