

SECTION 1 - SECTION 1

Question No.1

A metric thread of pitch 2 mm and thread angle 60° is inspected for its pitch diameter using 3-wire method. The diameter of the best size wire (in mm) is

- 2.000
- 1.000
- 1.154
- 0.866

Question No.2

The Jominy End Quench Test is used to find

- Young's modulus
- Yield strength
- Thermal conductivity
- Hardenability

Question No.3

A centrifugal pump has a discharge rate of 2000 lpm of water against a total head of 200 m. If the pump efficiency is 75%, the input power to the pump in kW is

- 13.33
- 49.05
- 87.20
- 7.50

Question No.4

A fixed gear having 100 teeth meshes with another gear having 25 teeth, the centre lines of both the gears being joined by an arm so as to form an epicyclic gear train. The number of rotations made by the smaller gear for one rotation of the arm is

- 5
- 6
- 4
- 3

Question No.5

The stream function = $x^3 - y^3$ is observed for a two dimensional flow field. What is the magnitude of the velocity at point (1, -1)?

- 0
- 2.83
- 2.83
- 4.24

Question No.6

_____ is an inversion of Double slider crank chain

- Coupling rod of a locomotive
- Scotch yoke mechanism
- Reciprocating engine
- Hand pump

Question No.7

Which of the following is not a path function?

- Thermal conductivity
- Heat
- Work
- Kinetic energy

Question No.8

If ω/ω_n is very high for a body vibrating under steady state vibrations, the phase angle for all values of damping factors, will tend to approach

- 90°
- 180°
- 360°
- 0°

Question No.9

The crystal structure of aluminium is

- Face centered cubic
- Body centered cubic
- Close packed hexagonal
- Body centered tetragonal

Question No.10

An automotive engine having a mass of 135 kg is supported on four springs with linear characteristics. Each of the two front springs has a stiffness of 3 MN/m while the stiffness of each of 2 rear springs is 4.5 MN/m. The engine speed (rpm) at which resonance is likely to occur is

- $10^3/6\pi$
- $10^4/\pi$
- $10^3(6\pi)$
- $1/6\pi$

Question No.11

For the standard transportation linear programme with m sources and n destinations and total supply equaling total demand, an optimal solution (lowest cost) with the smallest number of non-zero x_{ij} values (amounts from source i to destination j) is desired. The best upper bound for this number is

- mn
- $m + n$
- $m+n-1$
- $2(m + n)$

Question No.12

In a multiple-disc clutch, the axial intensity of pressure is not to exceed 0.2 MPa. The inner radius of the disc is 100 mm and is half of the outer radius. The axial force per pair of contact surface in N is

- 3000π
- 2000π
- 4000π
- 6000π

Question No.13

A car moving with uniform acceleration covers 450 m in a 5 second interval and covers 700 m in the next 5 second interval. The acceleration of the car is

- 50 m/s^2
- 10 m/s^2
- 25 m/s^2
- 7 m/s^2

Question No.14



- 0.125
- 0.785
- 0.062
- 0.250

Question No.15



The time variation of the position of a particle in a rectilinear motion is given by $x=2t^3+t^2+2t$. If 'V' is the velocity and 'a' is the acceleration of the particle in consistent units, the motion started with

- V = 2, a = 2
- V = 2, a = 0
- V = 0, a = 2
- V = 0, a = 0

Question No.16



A heat engine receives heat at the rate of 2500 kJ/min and gives an output of 12.4 kW. Its thermal efficiency is, nearly:

- 26%
- 23%
- 18%
- 30%

Question No.17



Heat and work are

- point functions
- path functions
- extensive properties
- intensive properties

Question No.18



A sine bar has a length of 400 mm. Each roller has a diameter of 30 mm. During taper angle measurement of a component, the height from the surface plate to the center of a roller is 120 mm. The calculated taper angle (in degrees) is

- 17.8
- 74.8
- 15.2
- 16.6

Question No.19

Which one of the following is an Open Pair?

- Cam and follower
- Lead screw and nut
- Ball and socket joint
- Journal bearing

Question No.20

A column has a rectangular cross-section of 10×20 mm and a length of 1 m. The slenderness ratio of the column is approximately equal close to

- 477
- 1000
- 200
- 346

Question No.21



- 0
- 140 ccw
- 140 cw
- 70 cw

Question No.22

A cantilever beam of length L is subjected to a moment M at the free end. The moment of inertia of the beam cross section about the neutral axis is I and the young's modulus is E , the magnitude of the maximum deflection is

-
-
-
-

Question No.23

Which of the following statement is correct during adiabatic charging of an ideal gas into an empty cylinder from a supply main?

- The specific internal energy of the gas in the supply main is equal to the specific enthalpy of the gas in the cylinder
- The specific enthalpy of the gas in the supply main is equal to the

specific enthalpy of the gas in the cylinder

- The specific enthalpy of the gas in the supply main is equal to the specific internal energy of the gas in the cylinder
- The specific internal energy of the gas in the supply main is equal to the specific internal energy of the gas in the cylinder

Question No.24



Consider the following statements:

- i. For a radial-translating roller follower, parabolic motion of the follower is very suitable for high speed cams.
- ii. Pitch point on pitch circle of a cam corresponds to the point of maximum pressure angle.

Which of the statements given above is/are correct?

- ii only
- Both i and ii
- Neither i nor ii
- i only

Question No.25



For high speed engines, the cam follower should move with

- Cycloidal motion
- Uniform acceleration and retardation
- Uniform velocity
- Simple harmonic motion

Question No.26



When 3-2-1 principle is used to support and locate a three-dimensional work-piece during machining, the number of degrees of freedom that are restricted is

- 7
- 10
- 9
- 8

Question No.27



A plane wall is 25 cm thick with an area of 1 m^2 , and has a thermal conductivity of 0.5 W/mK . If a temperature difference of 60°C is imposed across it, what is the heat flow?

- 140W
- 120W
- 180W

160W

Question No.28



A ring gauge is used to measure

- Outside diameter but not roundness
- Both outside diameter and roundness
- Roundness but not outside diameter
- Only external threads

Question No.29



Dew point temperature is the temperature at which condensation begins when the air is cooled at constant

- Pressure
- Entropy
- Enthalpy
- Volume

Question No.30



A band brake having band-width of 80 mm, drum diameter of 250 mm, coefficient of friction of 0.25 and angle of wrap of 270 degrees is required to exert a friction torque of 1000N-m The maximum tension (in kN) developed in the band is

- 11.56
- 6.12
- 5.92
- 2.78

Question No.31



Friction at the tool-chip interface can be reduced by

- Decreasing the rake angle
- Increasing the cutting speed
- Decreasing the cutting speed
- Increasing the depth of cut

Question No.32





None of these

Question No.33



A steel bar 300 mm in diameter is turned at a feed of 0.2 mm/rev with a depth of cut of 3 mm. The rotational speed of the workpiece is 200 rpm. The material removal rate (in mm^3/s) is

- 880
- 942
- 1884
- 1800

Question No.34



When supported on three points, out of the 12 degrees of freedom the number of degrees of freedom arrested in a body is

- 4
- 6
- 3
- 5

Question No.35



During steady flow compression process of a gas with mass flow rate of 2 kg/s, increases in specific enthalpy is 15 kJ/kg and decrease in kinetic energy is 2 kJ/kg. The rate of heat rejection to the environment is 3 kW. The power needed to drive the compressor is c

- 37 kW
- 23 kW
- 26 kW
- 29 kW

Question No.36



Measurement of temperature is based on which law of thermodynamics?

- First law of thermodynamics
- Second law of thermodynamics
- Zeroth law of thermodynamics
- Third law of thermodynamics

Question No.37

A key connecting a flange coupling to a shaft is likely to fail in

- Tension
- Bending
- Torsion
- Shear

Question No.38

A stone of mass m at the end of a string of length l is whirled in a vertical circle at a constant speed. The tension in the string will be maximum when the stone is

- quarter way down from the top
- half way down from the top
- at the top of the circle
- at the bottom of the circle

Question No.39

Instantaneous centre of a body rolling with sliding on a stationary curved surface lies

- on the common tangent at the point of contact
- at the point of contact
- on the common normal at the point of contact
- at the centre of curvature of the stationary surface

Question No.40

The bolts in a rigid flanged coupling connecting two shafts transmitting power are subjected to

- Transfers force and bending moment
- Axial force and bending moment
- Shear force and bending moment
- Torsion and bending moment

Question No.41




In order to increase the sensitivity of U-tube manometer 1 leg is inclined at an angle β . Ratio of sensitivity of inclined tube to the sensitivity of U-tube is: -

- $\sin \beta$
- $\cos \beta$
- $1/\sin \beta$

- $1/\cos \beta$

Question No.42

Pressure drop for a laminar flow of a liquid in a smooth pipe at normal temperature and pressure conditions is:-

- 
- 
- 
- None of these

Question No.43

In order to measure the flow, with a venturimeter, it is installed in

- Any direction and in any location
- Horizontal line
- Inclined line with flow downwards
- Inclined line with flow upwards

Question No.44

A project consists of three parallel paths with durations and variances of (10,4), (12,4) and (12, 9), respectively. According to the standard PERT assumptions, the distribution of the project duration is

- Beta with mean 10 and standard deviation 2
- Beta with mean 12 and standard deviation 2
- Beta with mean 12 and standard deviation 3
- Beta with mean 10 and standard deviation 3

Question No.45

A gas expands in a frictionless piston-cylinder arrangement. The expansion process is very slow, and is resisted by an ambient pressure of 100 kPa. During the expansion process, the pressure of the system (gas) remains constant at 300 kPa. The change in volume of the gas is 0.01 m^3 . The maximum amount of work that could be utilized from the above process is

- 0 kJ
- 3 kJ
- 2 kJ
- 1kJ

Question No.46

For the same maximum pressure and heat input, the most efficient cycle is:

- Brayton cycle
- Dual combustion cycle
- Otto cycle
- Diesel cycle

Question No.47

A helical coil spring with wire diameter 'd' and coil diameter 'D' is subjected to external load. A constant ratio of d and D has to be maintained, such that the extension of spring is independent of d and D. What is the ratio?

- D^3/d^4
- $D^{4/3}/d^3$
- $D^{3/4}/D^3$
- d^3/D^4

Question No.48

The value of elasticity increases, when temperature

- Increases
- Decreases
- Remains constant
- None of the These

Question No.49

A rotating shaft carrying a unidirectional transverse load is subjected to

- Constant bending stress
- Variable bending stress
- Variable shear stress
- Constant shear stress

Question No.50

In a single spindle automatic lathe two tools are mounted on the turret, one form tool on the front slide and the other, a parting tool on the rear slide. The parting tool operation is much longer than form tool operation and they operate simultaneously (overlap). The number of cams required for this job is

- One
- Four
- Three
- Two

Question No.51

- 0.835
- 1
- 0.223
- 0.625

Question No.52

In a structural member under fatigue loading, the minimum and maximum stresses developed at the critical point are 50 MPa and 150 MPa, respectively. The endurance, yield, and the ultimate strengths of the material are 200 MPa, 300 MPa and 400 MPa, respectively. The factor of safety using modified Goodman criterion is

- 12/7
- 2
- 8/5
- 3/2

Question No.53

A band brake having band width of 80 mm, drum diameter of 250 mm, coefficient of friction 0.25 and angle of wrap of 270 degrees is required to exert a friction torque of 1000 N-m. The maximum tension (in kN) developed in the band is

- 1.88
- 6.12
- 3.56
- 11.56

Question No.54

When the relation between the controlling force ' F_c ' and radius of rotation ' r ' for a spring controlled governor is $F_c = ar + b$, then the governor will be

- Stable
- Unstable
- Isochronous
- None of these

Question No.55

For a given heat flow and for the same thickness, the temperature drop across the material will be maximum for

- Glass-wool
- Refractory brick
- Copper
- Steel

Question No.56

In a fluid machinery, the relationship between saturation temperature and pressure decides the process of

- Turbulent mixing
- Flow separation
- Water hammer
- Cavitation

Question No.57

The percentage of carbon in gray cast iron is in the range of

- 2.5 to 4 %
- 1.25 to 1.75 %
- 0.25 to 0.75 %
- 8 to 10 %

Question No.58



- 25
- 0
- 50
- 20

Question No.59

Hardness of steel greatly improves with

- Normalizing
- Annealing
- Cyaniding
- Tempering

Question No.60

The efficiency and work ratio of a simple gas turbine cycle are

- High
- Very high
- Very low
- Low

Question No.61

A two dimensional fluid element rotates like a rigid body. At a point within the element, the pressure is 1 unit. Radius of the Mohr's circle, characterizing the state of stress at that point, is:

- 0 unit
- 1 unit
- 0.5 unit
- 2 unit

Question No.62

The geometrically similar pumps are running at 100 rpm speed (both). If one pump has impeller diameter of 0.3 m and discharge of 20 lps against 20 m head, and the other pump gives half of this discharge rate, calculate head and diameter of second pump

- 10.5 m and 0.12 m
- 10.5 m and 0.23 m
- 12.5 m and 0.23 m
- 12.5 m and 0.12 m

Question No.63

During normalizing process of steel, the specimen is heated

- Between the upper and lower critical temperature and cooled in furnace
- Above the upper critical temperature and cooled in furnace
- Between the upper and lower critical temperature and cooled in still air
- Above the upper critical temperature and cooled in still air

Question No.64

For reversible adiabatic process, change in entropy is

- Maximum
- Zero
- Negative
- Minimum

Question No.65

In a point to point control NC m/c, the slides are positioned by an integrally stepper motor drive. If the specification of the motor is 1deg/pulse, and the pitch of the lead screw is 3.6 mm, what is the expected positioning accuracy?

- 10 micron
- 1 micron
- 50 micron
- 100 micron

Question No.66

Determine the ratio of the buckling strength of a solid steel column to that of a hollow column of the same material having the same area of cross section. The internal diameter of the hollow column is half of the external diameter Both columns are of identical length and are pinned or hinged at the ends

- $P_s/P_h = 2/5$
- $P_s/P_h = 1$
- $P_s/P_h = 4/5$
- $P_s/P_h = 3/5$

Question No.67

A 4-cylinder 4-stroke CI Engine has a bore and stroke of 80 mm and 80 mm respectively. The compression ratio is 8. The clearance volume and cubic capacity of the engine are:-

- 45 cc and 1200 cc
- 45 cc and 1608.5 cc
- 65 cc and 1200 cc
- 57.4 cc and 1608.5 cc

Question No.68

The ratio of yield stress obtained from torsion test to yield stress obtained from tensile test, according to maximum distortion energy theory is

- 0.62
- 0.5
- 0.77
- 0.577

Question No.69

A vertical wall is subjected to a pressure due to one kind of liquid, on one of its

sides. The total pressure on the wall per unit length is (where w = Specific weight of liquid, and H = Height of liquid)

- $wH^2/3$
- $wH^2/2$
- wH
- $wH/2$

Question No.70

In a vehicle, differential mechanism is used for

- Decrease torque
- Take reverse
- Increase torque
- Take turn

Question No.71

The centre to centre distance between two consecutive rivets in a row, is called

- Diagonal pitch
- Pitch
- Back pitch
- Margin

Question No.72

Two particles with masses in the ratio 1:4 are moving with equal kinetic energies. The magnitude of their linear momentums will conform to the ratio of

- 8:1
- 1:8
- 2:1
- 1:2

Question No.73

In a plate cam mechanism with reciprocating roller follower, the follower has a constant acceleration in the case of

- simple harmonic motion
- 3-4-5 polynomial motion
- parabolic motion
- cycloidal motion

Question No.74

In a spring mass system, the mass is 'm' and the spring constant is 'k'. The critical damping coefficient of the system is 0.1kg/s. In another spring mass system, the mass is 2 m and the spring constant is 8 k. The critical damping coefficient in kg/s of the system is

- 0.3kg/s
- 0.5kg/s
- 0.4kg/s
- 0.2 kg/s

Question No.75



-
-
-
-

Question No.76

An item can be purchased for Rs. 100. The ordering cost is Rs. 200 and the inventory carrying cost is 10% of the item cost per annum. If the annual demand is 4000 units, the economic order quantity (in units) is

- 50
- 400
- 200
- 100

Question No.77

Guest's theory is used for

- Ductile materials
- Brittle materials
- Plastic materials
- Elastic materials

Question No.78

Twenty-degree full depth involute profiled 19-tooth pinion and 37-tooth gear are in mesh. If the module is 5 mm, the center distance between the gear pair will be

- 280mm
- 300mm

- 150mm
- 140mm

Question No.79



In order to test the efficiency of reducer gear train 1 kW input was given at the input end at a speed of 1440 rpm and at the output end the measured torque was 56.36 N.m. If the ratio of speed reduction in this unit is 10:1, the efficiency is about

- 63%
- 85%
- 78%
- 96%

Question No.80



In case of free vibration with viscous damping, the damping force is proportional to

- The velocity
- The acceleration
- The displacement
- The natural frequency

Question No.81



A CNC vertical milling machine has to cut a straight slot of 10 mm width and 2 mm depth by a cutter of 10 mm diameter between points (0, 0) and (100, 100) on the XY plane (dimensions in mm). The feed rate used for milling is 50 mm/min. Milling time for the slot (in seconds) is

- 180
- 240
- 120
- 170

Question No.82



A circular solid disc of uniform thickness of 20 mm, radius of 200 mm and mass of 20 kg, is used as a flywheel. If it rotates at 600 rpm, the kinetic energy of the flywheel, in Joules is

- 3160
- 395
- 1580
- 790

Question No.83

In Oxyacetylene gas welding, temperature at the inner cone of the flame is around

- 3200°C
- 3500°C
- 2200°C
- 2550°C

Question No.84

The permissible stress in the fillet weld is 100 N/mm². The fillet weld has equal leg lengths of 15 mm each. The allowable shearing load on the weldment per cm length of the weld is

- 7.5 kN
- 15 kN
- 10.6 kN
- 22.5 kN

Question No.85

The constant volume cycle is also called

- Diesel cycle
- Stirling cycle
- Carnot cycle
- Otto cycle

Question No.86

The discharge over a right angled notch is (where H = Height of liquid above the apex of notch)

- $(8/15) \cdot C_d \cdot 2g \cdot H^{3/2}$
- $(8/15) C_d \cdot 2g \cdot H^{5/2}$
- $(8/15) \cdot C_d \cdot 2g \cdot H^2$
- $(8/15) \cdot C_d \cdot 2g \cdot H$

Question No.87

A steel ball of mass 1kg and specific heat 0.4 kJ/kg is at a temperature of 60°C. It is dropped into 1kg of water at 20°C. The final steady state temperature of water is:

- 23.5°C

- 35°C
- 30°C
- 40°C

Question No.88

Replacing a water-cooled condenser with an air-cooled one in a vapour compression refrigeration system with constant evaporator pressure results in:

- Increase in condensation pressure
- Decrease in pressure ratio
- Increase in pressure ratio
- Increase in condensation temperature

Question No.89

The static deflection of a shaft under a flywheel is 4 mm. Take $g = 10 \text{ m/s}^2$. What is the critical speed in rad/s?

- 50
- 20
- 5
- 10

Question No.90

An external gear with 60 teeth meshes with a pinion of 20 teeth, module being 6 mm. What is the centre distance in mm?

- 240
- 120
- 180
- 300

Question No.91

A square key of side $d/4$ is to be fitted on a shaft of diameter d and in the hub of a pulley. If the material of the key and shaft is same and the two are to be equally strong in shear, what is the length of the key?

- $3\pi d/4$
- $\pi d/2$
- $2\pi d/3$
- $4\pi d/5$

Question No.92

Modulus of resilience is the ratio of

- Resilience and unit area
- Proof resilience and unit volume
- Maximum stress energy and unit volume
- Minimum strain energy and unit volume

Question No.93

A compression spring is made of music wire of 2 mm diameter having a shear strength and shear modulus of 800 MPa and 80 GPa respectively. The mean coil diameter is 20 mm, free length is 40 mm and the number of active coils is 10. If the mean coil diameter is reduced to 10 mm, the stiffness of the spring is approximately

- increased by 8 times
- decreased by 2 times
- increased by 2 times
- decreased by 8 times

Question No.94

The clearance in toothed gear is kept as

- 1.50 module
- 1.60 module
- 1.67 module
- 1.57 module

Question No.95

A heat engine using water from a lake at 12°C as source and the surrounding atmosphere at 2°C as sink executes 1080 cycles per min. If amount of heat supplied per cycle is 57 J, what is the output of the engine?

- 56 W
- 36 W
- 66 W
- 46 W

Question No.96

A man is drawing water from a well with the help of a bucket which leaks uniformly. The bucket weighs 200 N when full while 100 N of water leaks out by the time it arrives at the top. Water is available in the well at a depth of 10 m. The work done by the man in drawing the water is

- 1000 J

- 3000 J
- 1500 J
- 2000 J

Question No.97



- 375 kN/m
- 200 kN/m
- 125 kN/m
- 500 kN/m

Question No.98



The maximum thickness of boundary layer in a pipe of radius 'R' is

- R
- 0.5R
- 0.22R
- 0.1R

Question No.99



In order to have an interference fit, it is essential that the lower limit of the shaft should be

- Lesser than the upper limit of the hole
- Greater than the lower limit of the hole
- Lesser than the lower limit of the hole
- Greater than the upper limit of the hole

Question No.100



For a given cutting tool, reducing the cutting speed by half improves the tool life by 8 times. Taylor's tool life index (n) for this tool-workpiece combination is

- 0.5
- 0.33
- 0.1
- 0.25