

Andhra Pradesh State Council of Higher Education

Notations :

- 1.Options shown in green color and with ✓ icon are correct.
- 2.Options shown in red color and with ✗ icon are incorrect.

Question Paper Name :	Nano Technology 31st May 2024 Shift 2
Duration :	120
Total Marks :	120
Display Marks:	No
Share Answer Key With Delivery Engine :	Yes
Calculator :	None
Magnifying Glass Required? :	No
Ruler Required? :	No
Eraser Required? :	No
Scratch Pad Required? :	No
Rough Sketch/Notepad Required? :	No
Protractor Required? :	No
Show Watermark on Console? :	Yes
Highlighter :	No
Auto Save on Console?	Yes
Change Font Color :	No
Change Background Color :	No
Change Theme :	No
Help Button :	No
Show Reports :	No

Show Progress Bar :	No
Is this Group for Examiner? :	No
Examiner permission :	Cant View
Show Progress Bar? :	No

Nano Technology

Section Id :	33300856
Section Number :	1
Mandatory or Optional :	Mandatory
Number of Questions :	120
Section Marks :	120
Enable Mark as Answered Mark for Review and Clear Response :	Yes
Maximum Instruction Time :	0
Is Section Default? :	null

Question Number : 1 Question Id : 3330086601 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

When several forces act at a point and their vector sum is zero, the forces are said to be

Options :

1. ✓ **Balanced**

2. ✗ **Unbalanced**

3. ✗

Non-concurrent

4. ✘ Concurrent

Question Number : 2 Question Id : 3330086602 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The centroid of a composite plane figure is found by

Options :

1. ✘ Dividing the sum of the areas by the sum of their centroids

2. ✔ Dividing the sum of the moments of the areas about an axis by the total area

3. ✘ Adding the centroids of individual figures

4. ✘ Multiplying the total area by the sum of centroids

Question Number : 3 Question Id : 3330086603 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The theorem relates the moment of inertia about any axis to the moment of inertia about a parallel axis through the centroid?

Options :

1. ✘ Perpendicular axis theorem
2. ✔ Parallel axis theorem
3. ✘ Axis of symmetry theorem
4. ✘ Centroidal axis theorem

Question Number : 4 Question Id : 3330086604 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Polar moment of inertia is used primarily for calculating the stresses in

Options :

1. ✘ Bending
2. ✔ Torsion
3. ✘ Shear

4. ✘ Compression

Question Number : 5 Question Id : 3330086605 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The equation $F=kx$ describes a force that is

Options :

1. ✘ Inversely proportional to displacement
2. ✔ Directly proportional to displacement
3. ✘ Independent of displacement
4. ✘ Equal to displacement

Question Number : 6 Question Id : 3330086606 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

D'Alembert's Principle is used to

Options :

1. ✔ Convert dynamic problems into static problems
2. ✘

Solve fluid dynamics problems

3. ✘ Analyze chemical reaction dynamics
4. ✘ Study heat transfer

Question Number : 7 Question Id : 3330086607 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Impulse can be defined as

Options :

1. ✔ The change in momentum
2. ✘ The rate of change of momentum
3. ✘ A constant force applied over a distance
4. ✘ Energy transferred over time

Question Number : 8 Question Id : 3330086608 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which type of motion does a rigid body undergo about a fixed axis?

Options :

1. ✘ Translational
2. ✔ Rotational
3. ✘ Elliptical
4. ✘ Random

Question Number : 9 Question Id : 3330086609 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Mohr's Circle is used to

Options :

1. ✔ Determine principal stresses and strains
2. ✘ Calculate bending moments
3. ✘ Analyze fluid flow
4. ✘ Measure thermal expansion

Question Number : 10 Question Id : 3330086610 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The bending moment diagram represents

Options :

1. ✓ The cumulative effect of external loads as a function of position along the element
2. ✘ The direct measure of material strength
3. ✘ The displacement of a beam under load
4. ✘ The shear force distribution along the beam

Question Number : 11 Question Id : 3330086611 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following is not a type of support in structural analysis?

Options :

1. ✘ Fixed support
2. ✘ Roller support

3. ✘ Pinned support

4. ✔ Elastic support

Question Number : 12 Question Id : 3330086612 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Shearing force in a beam tends to cause

Options :

1. ✘ Compression

2. ✘ Tension

3. ✘ Bending

4. ✔ Sliding

Question Number : 13 Question Id : 3330086613 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The concept of mass moment of inertia is significant in the analysis of

Options :

1. ✘

Fluid flow

2. ✘ Heat transfer

3. ✔ Rotational dynamics

4. ✘ Electrical circuits

Question Number : 14 Question Id : 3330086614 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Torsion in circular shafts is analyzed to determine

Options :

1. ✘ Bending moments

2. ✔ Shear stresses

3. ✘ Compressive stresses

4. ✘ Tensile stresses

Question Number : 15 Question Id : 3330086615 Display Question Number : Yes Is Question

Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Principal stresses occur where the shear stress is

Options :

1. ✘ Maximum
2. ✘ Minimum
3. ✔ Zero
4. ✘ Constant

Question Number : 16 Question Id : 3330086616 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

If three forces acting in equilibrium at a point are 3 N, 4 N, and 5 N, the angle between the 3 N and 4 N forces is closest to:

Options :

1. ✘ 36.87 degrees
2. ✘ 53.13 degrees
3. ✔ 90 degrees

4. ✘ 120 degrees

Question Number : 17 Question Id : 3330086617 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The centroid of a rectangle of height h and width w is located at

Options :

1. ✔ $(h/2, w/2)$

2. ✘ $(h/4, w/4)$

3. ✘ $(w/3, h/3)$

4. ✘ (w, h)

Question Number : 18 Question Id : 3330086618 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

For a thin plate shaped like a quarter circle, the polar moment of inertia at the center of the circle is given by

Options :

1. ✘ $\pi R^4/4$

2. ✔

$$\pi R^4/8$$

3. ✘ $\pi R^4/16$

4. ✘ $\pi R^4/2$

Question Number : 19 Question Id : 3330086619 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The moment of inertia of a rectangle with base b and height h about an axis through its centroid parallel to the base is

Options :

1. ✘ $bh^3/3$

2. ✔ $bh^3/12$

3. ✘ $bh^3/6$

4. ✘ $bh^3/9$

Question Number : 20 Question Id : 3330086620 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

A mass undergoes simple harmonic motion (SHM) with an amplitude of 10 cm. Its maximum acceleration is 5 m/s^2 . The angular frequency ω of the mass is

Options :

1. ✘ 5 rad/s
2. ✔ 7 rad/s
3. ✘ 10 rad/s
4. ✘ 22.5 rad/s

Question Number : 21 Question Id : 3330086621 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Why the inertia torque acts in the opposite direction to the accelerating couple?

Options :

1. ✔ Bring the body in equilibrium
2. ✘ To reduce the accelerating torque
3. ✘ Acts as a constraint torque
4. ✘ Increase the linear acceleration

Question Number : 22 Question Id : 3330086622 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

A beam is supported at two points with a uniform load across its length. The type of bending moment diagram this beam will have is

Options :

1. ✘ Linearly increasing
2. ✔ Parabolic
3. ✘ Constant
4. ✘ Hyperbolic

Question Number : 23 Question Id : 3330086623 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

A circular shaft subjected to torsion experiences a shear stress τ . If the radius of the shaft doubles, the shear stress will

Options :

1. ✔ Halve
2. ✘ Double

3. ✘ Quadruple

4. ✘ Remain the same

Question Number : 24 Question Id : 3330086624 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

A particle moves with constant acceleration of 2 m/s^2 starting from rest. Its velocity after 3 seconds is

Options :

1. ✘ 5 m/s

2. ✔ 6 m/s

3. ✘ 9 m/s

4. ✘ 12 m/s

Question Number : 25 Question Id : 3330086625 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

In a 2D stress system on an element, if the normal stresses on the x and y axes are σ_x and σ_y , and the shear stress is τ , the normal stress on a plane inclined at 45° to these axes is:

Options :

1. ✘ $(\sigma_x + \sigma_y)/2 - \tau$

2. ✔ $(\sigma_x + \sigma_y)/2$

3. ✘ $(\sigma_x + \sigma_y)/2 + \tau$

4. ✘ $\sigma_x + \sigma_y$

Question Number : 26 Question Id : 3330086626 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

What characterizes a turbulent flow compared to a laminar flow?

Options :

1. ✘ Lower Reynolds number

2. ✔ More chaotic energy distribution

3. ✘ More predictable velocity profiles

4. ✘ Lower viscosity

Question Number : 27 Question Id : 3330086627 Display Question Number : Yes

Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which type of flow has no rotation of fluid elements about their center of mass?

Options :

1. ✘ Rotational flow
2. ✔ Irrotational flow
3. ✘ Uniform flow
4. ✘ Non-uniform flow

Question Number : 28 Question Id : 3330086628 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

What does the conservation of mass principle state for a fluid in motion?

Options :

1. ✘ Mass is transferred from high to low pressure areas.
2. ✔ The mass of fluid leaving a system equals the mass entering.
3. ✘ Mass can be converted into energy.

4. ✘ Mass increases with velocity.

Question Number : 29 Question Id : 3330086629 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Euler's equation is used to describe the motion of fluids under the influence of what forces?

Options :

1. ✘ Pressure forces alone

2. ✘ Gravitational forces alone

3. ✘ Frictional forces alone

4. ✔ Pressure and gravitational forces

Question Number : 30 Question Id : 3330086630 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Bernoulli's equation is applicable under which of the following conditions?

Options :

1. ✘ Only for compressible flows

2. ✘ When thermal energy changes are significant

3. ✔ In inviscid, steady, and incompressible flows

4. ✘ Only in turbulent flows

Question Number : 31 Question Id : 3330086631 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

What is the primary feature of Couette flow?

Options :

1. ✘ Fluid motion driven solely by pressure gradient

2. ✔ Fluid between two surfaces moving relative to each other

3. ✘ Fluid in a circular pipe

4. ✘ Fluid flowing through an expanding channel

Question Number : 32 Question Id : 3330086632 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The Buckingham π theorem is used for which purpose in fluid mechanics?

Options :

1. ✘ Determining the velocity profile in turbulent flow
2. ✔ Formulating dimensionless groups from dimensional variables
3. ✘ Predicting the onset of turbulence
4. ✘ Calculating pressure losses in pipes

Question Number : 33 Question Id : 3330086633 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which type of heat transfer is primarily utilized in furnaces for metallurgical processes?

Options :

1. ✘ Conduction
2. ✘ Convection
3. ✔ Radiation
4. ✘ Advection

Question Number : 34 Question Id : 3330086634 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which equation would best describe the conservation of momentum for fluid flow in pipes?

Options :

1. ✘ Bernoulli's equation

2. ✔ Navier-Stokes equation

3. ✘ Continuity equation

4. ✘ Euler's equation

Question Number : 35 Question Id : 3330086635 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

In which scenario is Bernoulli's equation modified to include a term for head loss?

Options :

1. ✘ Inviscid, compressible flow

2. ✘ Incompressible, inviscid flow

3. ✓ Turbulent, viscous flow

4. ✘ Steady, uniform flow

Question Number : 36 Question Id : 3330086636 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The critical Reynolds number for the transition from laminar to turbulent flow in a pipe is approximately

Options :

1. ✘ 500

2. ✘ 2000

3. ✓ 2300

4. ✘ 4300

Question Number : 37 Question Id : 3330086637 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

A fluid flows through a pipe with a velocity that varies with time at a given point. What type of flow is this?

Options :

1. ✘ Steady flow
2. ✔ Unsteady flow
3. ✘ Uniform flow
4. ✘ Non-uniform flow

Question Number : 38 Question Id : 3330086638 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

If a fluid has a Reynolds number of 5000 in a pipe, The type of flow is

Options :

1. ✘ Laminar flow
2. ✘ Transitional flow
3. ✔ Turbulent flow
4. ✘ Irrotational flow

Question Number : 39 Question Id : 3330086639 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

A fluid traveling through a horizontal pipe with a decreasing cross-sectional area experiences what kind of pressure change, assuming inviscid flow?

Options :

1. ✘ Pressure increases
2. ✔ Pressure decreases
3. ✘ Pressure remains constant
4. ✘ Pressure becomes negative

Question Number : 40 Question Id : 3330086640 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

In plane Couette flow, what determines the shear stress between the plates?

Options :

1. ✘ The fluid's density
2. ✘ The distance between the plates
3. ✔ The velocity of the moving plate

4. ✘ The temperature of the fluid

Question Number : 41 Question Id : 3330086641 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

In a duct, if the flow enters at 1 kg/s and exits at 0.5 kg/s, what additional information is needed to use the continuity equation effectively?

Options :

1. ✘ The viscosity of the fluid

2. ✔ The density of the fluid

3. ✘ The temperature of the fluid

4. ✘ The velocity profile of the fluid

Question Number : 42 Question Id : 3330086642 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which method is used to improve the efficiency of heat transfer in regenerators?

Options :

1. ✘ Increasing the flow rate

2. ✘ Using high thermal conductivity materials
3. ✔ Maximizing the surface area
4. ✘ Minimizing the temperature difference

Question Number : 43 Question Id : 3330086643 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

For a fluid element in a steady, uniform flow, which of the following statements is true regarding the flow velocity at any point in the flow field?

Options :

1. ✘ It changes with time.
2. ✔ It is the same at every point.
3. ✘ It varies from point to point but is constant in time at each point.
4. ✘ It is zero.

Question Number : 44 Question Id : 3330086644 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction

Time : 0

In heat transfer, the Log Mean Temperature Difference (LMTD) is used in the design of

Options :

1. ✘ Boilers
2. ✔ Condensers
3. ✘ Regenerators
4. ✘ Radiators

Question Number : 45 Question Id : 3330086645 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

What parameter in boundary layer theory represents the thickness of the layer in which the velocity increases from zero at the surface to 99% of the free stream velocity?.

Options :

1. ✘ Displacement thickness
2. ✘ Momentum thickness
3. ✘ Energy thickness

4. ✓ Boundary layer thickness

Question Number : 46 Question Id : 3330086646 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The key factor in classifying furnaces used in metallurgical industries is

Options :

1. ✓ The type of fuel used
2. ✘ The materials being processed
3. ✘ The method of heat transfer
4. ✘ The maximum temperature achieved

Question Number : 47 Question Id : 3330086647 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

A cubic crystal has a unit cell edge length of 0.4 nm. What is the volume of the unit cell?

Options :

1. ✓ 0.064 nm³
2. ✘

0.016 nm³

3. ✘ 0.064 cm³

4. ✘ 0.004 nm³

Question Number : 48 Question Id : 3330086648 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

If a face-centered cubic (FCC) crystal has a lattice parameter of 0.5 nm, calculate the atomic radius.

Options :

1. ✔ 0.144 nm

2. ✘ 0.288 nm

3. ✘ 0.125 nm

4. ✘ 0.250 nm

Question Number : 49 Question Id : 3330086649 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Calculate the Burgers vector magnitude for a body-centered cubic (BCC) crystal with a lattice constant of 0.3 nm, assuming the dislocation is along the shortest lattice vector.

Options :

1. ✘ 0.3 nm
2. ✔ 0.212 nm
3. ✘ 0.15 nm
4. ✘ 0.106 nm

Question Number : 50 Question Id : 3330086650 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

A material is deformed by slip along a plane with a critical resolved shear stress (CRSS) of 150 MPa.

What is the applied stress needed if the orientation factor is 0.45?

Options :

1. ✘ 75 MPa
2. ✔ 333 MPa
3. ✘ 150 MPa
4. ✘ 675 MPa

Question Number : 51 Question Id : 3330086651 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

During cold working, a metal experiences a 10% reduction in cross-sectional area. If the original cross-sectional area was 1 cm^2 , what is the new cross-sectional area?

Options :

1. ✓ 0.90 cm^2
2. ✗ 0.95 cm^2
3. ✗ 0.10 cm^2
4. ✗ 1.10 cm^2

Question Number : 52 Question Id : 3330086652 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

A material undergoes recrystallization at 250°C . If the material is heated to 300°C , what process is most likely occurring?

Options :

1. ✗ Melting
2. ✓ Grain growth

3. ✘ Recovery

4. ✘ Further recrystallization

Question Number : 53 Question Id : 3330086653 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

An aluminum alloy sample has a yield stress of 250 MPa and a modulus of elasticity of 70 GPa. What is the strain at yield point?

Options :

1. ✔ 0.00357

2. ✘ 0.0357

3. ✘ 0.000357

4. ✘ 0.357

Question Number : 54 Question Id : 3330086654 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

In a tensile test, a ductile material exhibits necking after reaching its ultimate tensile strength. If the ultimate tensile strength is 500 MPa, what happens to the stress in the necked region?

Options :

1. ✘ It decreases.
2. ✘ It remains the same.
3. ✔ It increases.
4. ✘ It fluctuates.

Question Number : 55 Question Id : 3330086655 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

A steel bar exhibits a Hall-Petch relationship with a yield strength of 300 MPa when the average grain size is 10 micrometers. What trend in yield strength would you expect if the grain size is reduced to 5 micrometers?

Options :

1. ✘ Decrease
2. ✔ Increase
3. ✘ Stay the same
4. ✘ Initially increase, then decrease

Question Number : 56 Question Id : 3330086656 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

A cast iron beam shows a brittle fracture on the stress-strain diagram. What does this indicate about its elongation at break?

Options :

1. ✘ It is very high.
2. ✘ It is moderate.
3. ✔ It is very low.
4. ✘ It increases with temperature

Question Number : 57 Question Id : 3330086657 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The primary result of grain growth in a material is

Options :

1. ✘ Improved conductivity
2. ✘ Increased ductility

3. ✓ Decreased strength

4. ✗ Enhanced corrosion resistance

Question Number : 58 Question Id : 3330086658 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The typical characteristic of a stress-strain diagram for cast iron

Options :

1. ✗ High ductility and low yield strength

2. ✓ Low ductility and high brittleness

3. ✗ High toughness and elongation

4. ✗ Uniform strain hardening behavior

Question Number : 59 Question Id : 3330086659 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following is the effect of recrystallization on the properties of a material?

Options :

1. ✘ Increases hardness and brittleness
2. ✘ Reduces ductility and increases stiffness
3. ✔ Reduces strength and increases ductility

4. ✘ Increases electrical conductivity and reduces thermal conductivity

Question Number : 60 Question Id : 3330086660 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The primary mechanism for deformation by twinning is

Options :

1. ✔ Shear stress rearranges the crystal structure into mirror-image segments
2. ✘ Atoms jump from one lattice position to another
3. ✘ Dislocations move along slip planes
4. ✘ Grain boundaries move through the material

Question Number : 61 Question Id : 3330086661 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The effect of grain growth on the mechanical properties of a metal is

Options :

1. ✘ Increases hardness
2. ✘ Decreases electrical resistance
3. ✔ Reduces strength
4. ✘ Enhances corrosion resistance

Question Number : 62 Question Id : 3330086662 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Cold Working is primarily characterized by

Options :

1. ✘ Heating the material above its recrystallization temperature
2. ✔ Deforming the material at temperatures below its recrystallization temperature
3. ✘ Adding impurities to the material to strengthen it

4. ✘ Reducing the material's thickness through compression

Question Number : 63 Question Id : 3330086663 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The main mechanism of plastic deformation in metals is

Options :

Twinning

1. ✘

Slip

2. ✔

Elastic bending

3. ✘

Cracking

4. ✘

Question Number : 64 Question Id : 3330086664 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following crystal system has axes of equal length intersecting at 90-degree angles?

Options :

Orthorhombic

1. ✘

2. ✔

Cubic

3. ✘ Tetragonal

4. ✘ Hexagonal

Question Number : 65 Question Id : 3330086665 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The type of defect involves an atom from an impurity substituting for a lattice atom is

Options :

1. ✘ Interstitial defect

2. ✘ Vacancy defect

3. ✔ Substitutional defect

4. ✘ Frenkel defect

Question Number : 66 Question Id : 3330086666 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

How does dislocation movement by cross-slip differ from climb?

Options :

1. ✓ Cross-slip involves movement along a different slip plane, while climb involves vertical movement out of the slip plane.
2. ✗ Cross-slip requires higher temperatures than climb.
3. ✗ Climb is faster than cross-slip.
4. ✗ Climb involves multiple dislocations, cross-slip only one.

Question Number : 67 Question Id : 3330086667 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Consider a process where the entropy change of the system is negative. What can be inferred if the process is spontaneous?

Options :

1. ✗ The entropy of the surroundings must decrease.
2. ✓ The entropy of the surroundings must increase more than the decrease in the system.
3. ✗ The total energy of the system increases.
- 4.

✘ The system is in a closed cycle.

Question Number : 68 Question Id : 3330086668 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Identify the equation typically used to describe the efficiency of a cyclic process.

Options :

1. ✓ $\eta = 1 - \frac{Q_{out}}{Q_{in}}$

2. ✘ $PV = nRT$

3. ✘ $\Delta G = \Delta H - T\Delta S$

4. ✘ $F = ma$

Question Number : 69 Question Id : 3330086669 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

How does the Clausius-Clapeyron Equation help in meteorology?

Options :

1. ✘ It predicts weather patterns.

2. ✘ It explains changes in atmospheric pressure.
3. ✔ It calculates the rate of change of vapor pressure with temperature.
4. ✘ It determines the thermal conductivity of the atmosphere.

Question Number : 70 Question Id : 3330086670 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

A system undergoes isothermal reversible expansion. What is true about the work done by the system?

Options :

1. ✘ It is less than the heat absorbed.
2. ✔ It equals the heat absorbed.
3. ✘ It is more than the heat absorbed.
4. ✘ No work is done.

Question Number : 71 Question Id : 3330086671 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

What is the significance of the Gibbs-Helmholtz Equation in chemical thermodynamics?

Options :

1. ✘ It predicts the direction of chemical reactions.
2. ✔ It relates the Gibbs free energy change to temperature and enthalpy change.
3. ✘ It calculates the equilibrium constant at different pressures.
4. ✘ It determines the molecular weights of gases.

Question Number : 72 Question Id : 3330086672 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

If the enthalpy change for a process at constant pressure is negative, what type of process is it likely to be?

Options :

1. ✘ Endothermic
2. ✔ Exothermic
3. ✘ Isothermal

4. ✖ Adiabatic

Question Number : 73 Question Id : 3330086673 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

How can the concept of maximum work be used to determine the efficiency of a thermodynamic cycle?

Options :

1. ✖ By measuring the total heat input into the system.
2. ✔ By calculating the work output as a fraction of the heat absorbed.
3. ✖ By assessing the changes in volume at constant pressure.
4. ✖ By analyzing the molecular interactions during the cycle.

Question Number : 74 Question Id : 3330086674 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

A reaction's Gibbs free energy change (ΔG) is found to be positive at 298 K but becomes negative at 350 K. What does this imply about the reaction?

Options :

1. ✖ It is non-spontaneous at all temperatures.

2. ✘ It is spontaneous only above 350 K.
3. ✘ It is spontaneous only below 298 K.
4. ✔ It becomes spontaneous as temperature increases.

Question Number : 75 Question Id : 3330086675 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

A 10 kg block slides down a frictionless incline from a height of 5 meters. Assuming the gravitational constant $g=9.8 \text{ m/s}^2$, calculate the kinetic energy of the block at the bottom of the incline.

Options :

1. ✔ 490 J
2. ✘ 980 J
3. ✘ 4,900 J
4. ✘ 9,800 J

Question Number : 76 Question Id : 3330086676 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

One mole of an ideal gas expands isothermally and reversibly from 2 liters to 6 liters at a temperature of 300 K. Calculate the work done by the gas. ($R=8.314 \text{ J/K/mol}$)

Options :

1. ✘ 208.5 J

2. ✔ 416.7 J

3. ✘ 623.1 J

4. ✘ 831.4 J

Question Number : 77 Question Id : 3330086677 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

An ideal gas is compressed adiabatically, where its initial volume of 3 liters is reduced to 1 liter. If the initial pressure was 1 atm and $\gamma=5/3$, calculate the final pressure of the gas.

Options :

1. ✘ 1.2 atm

2. ✘ 3 atm

3. ✘ 4.5 atm

4. ✔

5 atm

Question Number : 78 Question Id : 3330086678 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Calculate the heat transferred when 50 g of water is heated from 20°C to 80°C. The specific heat capacity of water is $4.18 \text{ J}^\circ\text{C}^{-1}\text{g}^{-1}$

Options :

1. ✓ 12,540 J

2. ✗ 10,450 J

3. ✗ 8,360 J

4. ✗ 6,270 J

Question Number : 79 Question Id : 3330086679 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

A Carnot engine operates between a hot reservoir at 500 K and a cold reservoir at 300 K. Calculate the efficiency of the engine.

Options :

1. ✗ 20%

2. ✓ 40%

3. ✘ 60%

4. ✘ 80%

Question Number : 80 Question Id : 3330086680 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

A closed system undergoes a process resulting in a work output of 150 J while the heat removed from the system is 100 J. Calculate the change in internal energy of the system.

Options :

1. ✘ -50 J

2. ✓ 50 J

3. ✘ -250 J

4. ✘ 250 J

Question Number : 81 Question Id : 3330086681 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction

Time : 0

During an isothermal expansion, 2 moles of an ideal gas expand from 1 L to 3 L at a constant temperature of 300 K. Using $R=8.314 \text{ J/mol.k}$ calculate the work done by the gas.

Options :

1. ✘ 477.8 J
2. ✔ -477.8 J
3. ✘ 954.6 J
4. ✘ -954.6 J

Question Number : 82 Question Id : 3330086682 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction

Time : 0

Calculate the increase in entropy when two identical containers, each containing 2 moles of an ideal gas at 300 K and 1 atm, are allowed to mix freely.

Options :

1. ✔ 11.53 J/K
2. ✘ 5.76 J/K
3. ✘ 22.06 J/K

4. ✖ 34.10 J/K

Question Number : 83 Question Id : 3330086683 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

During an isothermal expansion of an ideal gas, how does the entropy of the system change?

Options :

1. ✖ The entropy decreases.
2. ✖ The entropy remains constant.
3. ✔ The entropy increases.
4. ✖ The entropy initially increases then decreases.

Question Number : 84 Question Id : 3330086684 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which process involves an increase in enthalpy due to the system absorbing heat from the surroundings?

Options :

1. ✖ Adiabatic expansion

2. ✘ Isothermal compression
3. ✔ Constant pressure heating
4. ✘ Adiabatic compression

Question Number : 85 Question Id : 3330086685 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

What does the Third Law of Thermodynamics state about the entropy of a perfect crystal at absolute zero temperature?

Options :

1. ✘ The entropy reaches its maximum value.
2. ✘ The entropy becomes indeterminate.
3. ✔ The entropy approaches zero.
4. ✘ The entropy is unaffected by temperature.

Question Number : 86 Question Id : 3330086686 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

How does doping affect the electrical properties of intrinsic semiconductors?

Options :

1. ✓ Increases conductivity by introducing impurities
2. ✗ Decreases conductivity by removing electrons
3. ✗ Increases transparency to visible light
4. ✗ Decreases mechanical strength

Question Number : 87 Question Id : 3330086687 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Consider the properties of ceramics. Which of the following is a reason for their brittleness?

Options :

1. ✗ High thermal expansion
2. ✗ High ionic bond strength
3. ✓ Covalent bonding networks
4. ✗ Presence of amorphous phases

Question Number : 88 Question Id : 3330086688 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Design a study to test the effectiveness of different nano-material coatings to improve the wear resistance of industrial cutting tools. What would be a key variable to control?

Options :

1. ✓ Coating thickness
2. ✗ Ambient temperature
3. ✗ Tool design
4. ✗ Cutting speed

Question Number : 89 Question Id : 3330086689 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which factor most significantly influences the optical properties of a material such as refractive index and absorption of light?

Options :

1. ✓ Chemical composition
2. ✗ Mechanical hardness

3. ✘ Electrical conductivity

4. ✘ Thermal conductivity

Question Number : 90 Question Id : 3330086690 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Evaluate the potential benefits and drawbacks of using ceramic matrix composites (CMCs) in aerospace engine components.

Options :

1. ✔ Benefits include lower weight and higher temperature tolerance; drawbacks include higher costs and complexity in manufacturing.

2. ✘ Benefits include higher electrical conductivity; drawbacks include lower thermal stability.

3. ✘ Benefits include easier processing; drawbacks include higher material costs only.

4. ✘ Benefits include increased thermal conductivity; drawbacks include reduced mechanical strength.

Question Number : 91 Question Id : 3330086691 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction

Time : 0

Analyze the implications of using a hard magnetic material in the stator of an electric motor instead of a soft magnetic material.

Options :

1. ✘ Increased energy efficiency due to better magnetic saturation.
2. ✘ Reduced electrical losses due to lower coercivity.
3. ✔ Increased energy losses due to higher coercivity.
4. ✘ Enhanced mechanical strength and durability of the motor.

Question Number : 92 Question Id : 3330086692 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction

Time : 0

Design an experiment to test the effectiveness of nanostructured coatings to improve the corrosion resistance of metals. What would be the primary performance metric to measure?

Options :

1. ✘ Coating hardness
2. ✔ Corrosion rate under controlled environmental conditions
3. ✘ Coating thickness uniformity

Electrical resistance of the coating

4. ✖

Question Number : 93 Question Id : 3330086693 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Considering the unique properties of nano materials, evaluate their use in targeted drug delivery systems.

Options :

1. ✔ Highly effective due to their small size and surface area, allowing for precise targeting.
2. ✖ Generally ineffective due to rapid clearance from the body.
3. ✖ Effective but often lead to high toxicity and side effects.
4. ✖ Ineffective due to instability in biological environments.

Question Number : 94 Question Id : 3330086694 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Identify a bottom-up approach in nanotechnology:

Options :

1. ✖ Carving out nanostructures from larger blocks of material.

2. ✓ Assembling structures atom by atom or molecule by molecule.
3. ✗ Using lasers to etch nanostructures.
4. ✗ Cutting materials into nanoscale pieces with a sharp blade.

Question Number : 95 Question Id : 3330086695 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Calculate the electrical conductivity of a copper wire if the number density of free electrons is 8.5×10^{28} electrons/m³ and the electron mobility is 0.0035 m²/Vs.

Options :

1. ✓ 4.76×10^7 S/m
2. ✗ 5.95×10^7 S/m
3. ✗ 6.80×10^7 S/m
4. ✗ 3.80×10^7 S/m

Question Number : 96 Question Id : 3330086696 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

A paramagnetic substance, in the form of a cube with sides 1 cm, has a magnetic dipole moment of 20×10^{-6} J/T, when a magnetic intensity of 60×10^3 A/m is applied. Its magnetic susceptibility is

Options :

1. ✘ 3.3×10^{-2}
2. ✘ 2.3×10^{-4}
3. ✘ 2.3×10^{-2}
4. ✔ 3.3×10^{-4}

Question Number : 97 Question Id : 3330086697 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Estimate the surface area of a spherical nanoparticle with a diameter of 10 nm.

Options :

1. ✘ 100nm^2
2. ✘ 250nm^2
3. ✔ 314nm^2
4. ✘ 400nm^2

Question Number : 98 Question Id : 3330086698 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

What is the primary challenge in synthesizing nanoparticles using the bottom-up approach?

Options :

1. ✓ Controlling the size distribution
2. ✗ Achieving high purity
3. ✗ Scaling up the production
4. ✗ Reducing the energy consumption

Question Number : 99 Question Id : 3330086699 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following statements best describes the effect of increasing the temperature on the conductivity of an intrinsic semiconductor?

Options :

1. ✗ Conductivity decreases
2. ✗ Conductivity remains constant

3. ✓ Conductivity increases

4. ✗ Conductivity first increases then decreases

Question Number : 100 Question Id : 3330086700 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

What is the primary mechanical advantage of cross-linked polymers over linear polymers?

Options :

1. ✗ Increased solubility

2. ✗ Decreased thermal stability

3. ✓ Enhanced elastic modulus

4. ✗ Reduced electrical conductivity

Question Number : 101 Question Id : 3330086701 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which factor is most critical when selecting a matrix material for a high-temperature composite application?

Options :

1. ✘ Electrical conductivity
2. ✔ Thermal expansion coefficient
3. ✘ Optical transparency
4. ✘ Magnetic responsiveness

Question Number : 102 Question Id : 3330086702 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which characteristic differentiates thermosetting polymers from thermoplastic polymers?

Options :

1. ✘ Thermosetting polymers can be reshaped with heat
2. ✘ Thermoplastic polymers are primarily used in adhesives
3. ✔ Thermosetting polymers are cross-linked and do not melt upon heating
4. ✘ Thermoplastic polymers have higher tensile strength

Question Number : 103 Question Id : 3330086703 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

What distinguishes hard magnetic materials from soft magnetic materials in terms of their application?

Options :

1. ✘ Hard magnetic materials are easier to magnetize and demagnetize.
2. ✘ Soft magnetic materials are typically used in permanent magnets.
3. ✔ Hard magnetic materials retain their magnetism and are used in permanent magnets.
4. ✘ Soft magnetic materials have higher coercivity than hard magnetic materials.

Question Number : 104 Question Id : 3330086704 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

What is a significant environmental challenge associated with the bottom-up approach in nanotechnology?

Options :

1. ✘ It requires high-energy conditions which are not sustainable.
2. ✘ It produces nanoparticles that can be difficult to recycle.
3. ✔

It involves toxic chemicals that can contaminate water sources.

4. ✘ It is highly labor-intensive and not scalable.

Question Number : 105 Question Id : 3330086705 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

A block of mass 5 kg is placed on a frictionless inclined plane. The angle of inclination of the plane is 30 degrees. Calculate the force required to keep the block in equilibrium.

Options :

1. ✘ 25.5 N

2. ✔ 24.5 N

3. ✘ 26.5 N

4. ✘ 27.5 N

Question Number : 106 Question Id : 3330086706 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The velocity profile for a Bingham plastic fluid flowing (under laminar conditions) in a pipe.

Options :

1. ✘

Parabolic

- 2. ✘ Flat
- 3. ✘ Flat near the wall and parabolic in the middle
- 4. ✔ Parabolic near the wall and flat in the middle

Question Number : 107 Question Id : 3330086707 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Which of the following properties is typically NOT enhanced by the addition of carbon in steel?

Options :

- 1. ✘ Strength
- 2. ✔ Ductility
- 3. ✘ Hardness
- 4. ✘ Corrosion resistance

Question Number : 108 Question Id : 3330086708 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Time : 0

Calculate the drift velocity of the free electrons with mobility of $3.5 \times 10^{-3} \text{ m}^2/\text{Vs}$ in copper for an electric field strength of 0.5 V/m .

Options :

1. ✘ 3.5 m/s
2. ✘ $1.75 \times 10^3 \text{ m/s}$
3. ✘ 11.5 m/s
4. ✔ $1.75 \times 10^{-3} \text{ m/s}$

Question Number : 109 Question Id : 3330086709 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

If λ is an eigenvalue of a non-singular matrix A . Then the eigenvalue of $(\text{adj}A)$ is

Options :

1. ✘ $-\frac{1}{\lambda}$
2. ✔ $\frac{|A|}{\lambda}$
3. ✘ 1

4. ✘ 0

Question Number : 110 Question Id : 3330086710 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Let A and B be two real symmetric matrices of order n. Then which of the following is true?

Options :

1. ✘ $AA^T = 1$

2. ✘ $A = A^{-1}$

3. ✘ $AB = BA$

4. ✔ $(AB)^T = BA$

Question Number : 111 Question Id : 3330086711 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

If any function is even, in Fourier series it contains

Options :

1. ✘ Only b_n

2. ✘ Only a_n

3. ✔ Both a_0 and a_n

4. ✘ Only a_0

Question Number : 112 Question Id : 3330086712 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Probability that a leap year has 53 Sundays is

Options :

1. ✘ $\frac{1}{7}$

2. ✔ $\frac{2}{7}$

3. ✘ $\frac{5}{7}$

4. ✘ $\frac{6}{7}$

Question Number : 113 Question Id : 3330086713 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction

Time : 0

If $\vec{a}, \vec{b}, \vec{c}$ are unit vectors, then $|\vec{a} - \vec{b}|^2 + |\vec{b} - \vec{c}|^2 + |\vec{c} - \vec{a}|^2$ does not exceed

Options :

1. ✘ 4

2. ✔ 9

3. ✘ 8

4. ✘ 6

Question Number : 114 Question Id : 3330086714 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction

Time : 0

Find the greatest value of the directional derivative of the function $f = x^2yz^3$ at $(2,1,-1)$

Options :

1. ✘ $5\sqrt{11}$

2. ✔ $4\sqrt{11}$

3. ✘ $3\sqrt{11}$

4. ✘ $2\sqrt{11}$

Question Number : 115 Question Id : 3330086715 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

By eliminating a & b from $z = ax + by + (a/b)$ then, P.D.E formed is _____

Options :

1. ✔ $z = px + qy + \left(\frac{p}{q}\right)$

2. ✘ $z = px + qy + \log(pq)$

3. ✘ $z = ax + by + \left(\frac{a}{b}\right)$

4. ✘ $z = ax + by + \log(ab)$

Question Number : 116 Question Id : 3330086716 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

The particular integral for the differential equation $(D^2 - 2D + 1)y = x^2e^{3x}$ is

Options :

1. ✘ $\frac{1}{8}e^{3x}(2x^2 + 4x - 3)$

2. ✘ $\frac{1}{8}e^{3x}(2x^2 + 4x + 3)$

3. ✔ $\frac{1}{8}e^{3x}(2x^2 - 4x + 3)$

4. ✘ $\frac{1}{8}e^{3x}(2x^2 - 4x - 3)$

Question Number : 117 Question Id : 3330086717 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

$$\text{Laplace transform of } g(t) = \begin{cases} \cos\left(t - \frac{\pi}{3}\right), & \text{if } t > \frac{\pi}{3} \\ 0, & \text{if } t < \frac{\pi}{3} \end{cases}$$

Options :

1. ✔ $\frac{s e^{-\frac{s\pi}{3}}}{s^2 + 1}$

2. ✘ $\frac{e^{-\frac{s\pi}{3}}}{s^2 - 1}$

3. ✘

$$\frac{s e^{\frac{-\pi}{3}}}{s^2 + 1}$$

$$\frac{s e^{\frac{\pi}{3}}}{s^2 - 1}$$

4. ✘

Question Number : 118 Question Id : 3330086718 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Let X be a continuous random variable denoting the temperature measured. The range of temperature is $[0, 100]$ degree Celsius and let the probability density function of X be $f(X) = 0.01$ for $0 \leq X \leq 100$. The mean is

Options :

1. ✘ 5.0

2. ✘ 2.5

3. ✘ 25.0

4. ✔ 50.0

Question Number : 119 Question Id : 3330086719 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction

Time : 0

The Laplace transform of the function $f(t) = t \sin t$ is

Options :

1. ✓ $\frac{2s}{(s^2+1)^2}$

2. ✗ $\frac{1}{s^2(s^2+1)}$

3. ✗ $\frac{1}{s^2} + \frac{1}{(s^2+1)}$

4. ✗ $\frac{1}{(s-1)^2+1}$

Question Number : 120 Question Id : 3330086720 Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction

Time : 0

If the mean and variance of a binomial variate are 12 & 4, then the distribution is _____

Options :

1. ✗ $\left(\frac{1}{3} + \frac{2}{3}\right)^{15}$

2. ✗ $\left(\frac{1}{3} + \frac{2}{3}\right)^{16}$

3. ✘ $\left(\frac{1}{3} + \frac{2}{3}\right)^{17}$

4. ✔ $\left(\frac{1}{3} + \frac{2}{3}\right)^{18}$