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/s². 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 $\sigma_x$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 Is Question

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. ✔ $0.064\ nm^3$

2. ✖

$0.016\ nm^3$

3. ✖ $0.064\ cm^3$

4. ✖ $0.004\ nm^3$

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

Decreased strength

3. ✔

Enhanced corrosion resistance

4. ✖

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 :

1. ✖ Twinning

2. ✔ Slip

3. ✖ Elastic bending

4. ✖ Cracking

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 :

1. ✖ Orthorhombic

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 $g=9.8\ m/s^2$, 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 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 $J°C^{-1}g^{-1}$

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 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

4. ✖ Electrical resistance of the coating

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/m^3 and the electron mobility is 0.0035 m^2/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

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

Options :

1. ✖ 3.5 m/s

2. ✖ 1.75×10^{3} m/s

3. ✖ 11.5 m/s

4. ✔ 1.75×10^{-3} 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 (adjA) 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. ✔ $\left(\frac{1}{3}+\frac{2}{3}\right)^{18}$