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भारत सरकार GOVERNMENT OF INDIA अंतरिक्ष विभाग DEPARTMENT OF SPACE भारतीय अंतरिक्ष अनुसंधान संगठन INDIAN SPACE RESEARCH ORGANISATION





### अंतरिक्ष उपयोग केंद्र SPACE APPLICATIONS CENTRE अहमदाबाद AHMEDABAD

Participant Id	
Participant Name	
Test Center Name	
Test Date	21/06/2023
Test Time	12:30 PM - 2:00 PM
Subject	Scientist Engineer SC Mechanical

Section:	Scienti	st Engineer	SC Mechanical
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Q.1

The temperature at which ferromagnetic alpha iron transforms to paramagnetic alpha iron is

a) 770°C

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- b) 910°C
- c) 1050°C
- d) Below recrystallization temperature

Ans

- A. a
- **X** B. b
- X C. c
- X D. d

Question ID : 2141272511

Status : Answered

Chosen Option : B

Q.2

A helical spring has spring constant k. If the wire diameter, spring diameter, and the number of coils are doubled, then the spring constant of new spring becomes\_\_\_\_\_

- a) k/2
- b) k
- c) 8k
- d) 16k

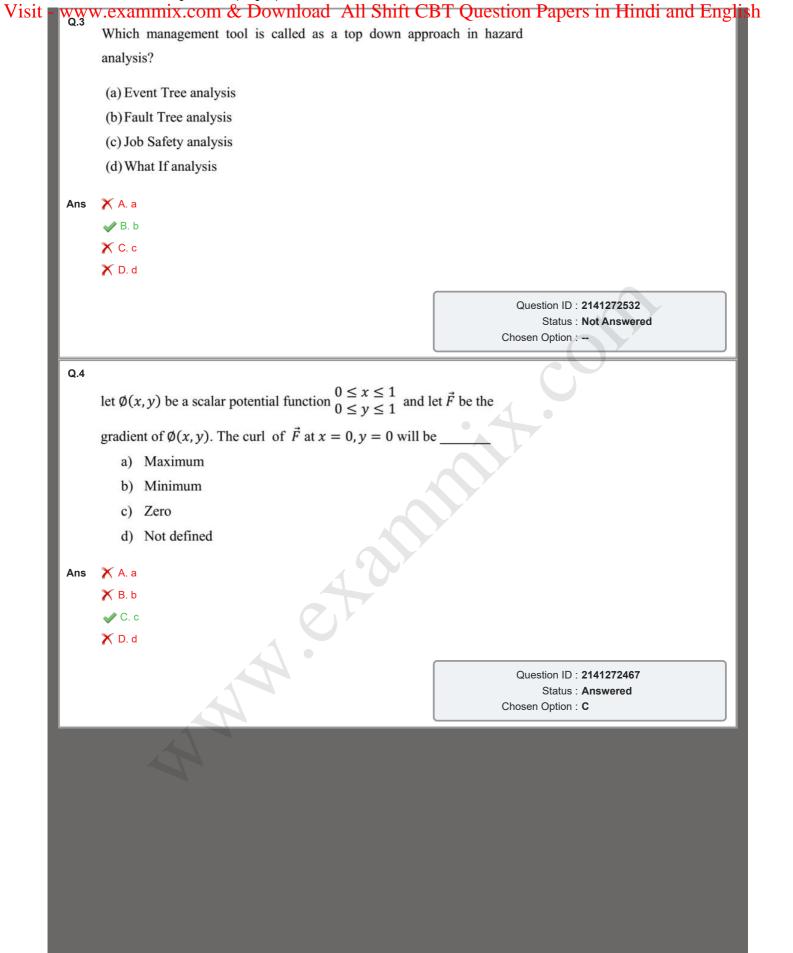
Ans

- X A. a
- **ℯℯ** B. b
- X C. c
- X D. d

Question ID : 2141272485

Status : **Answered** 

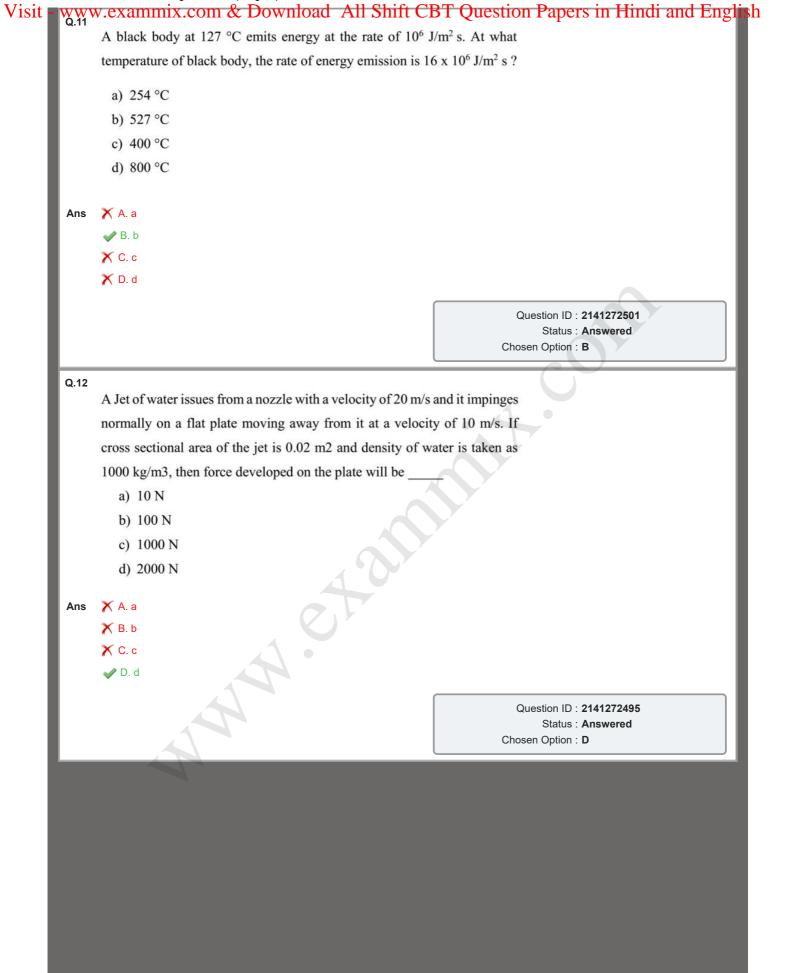
Chosen Option : B

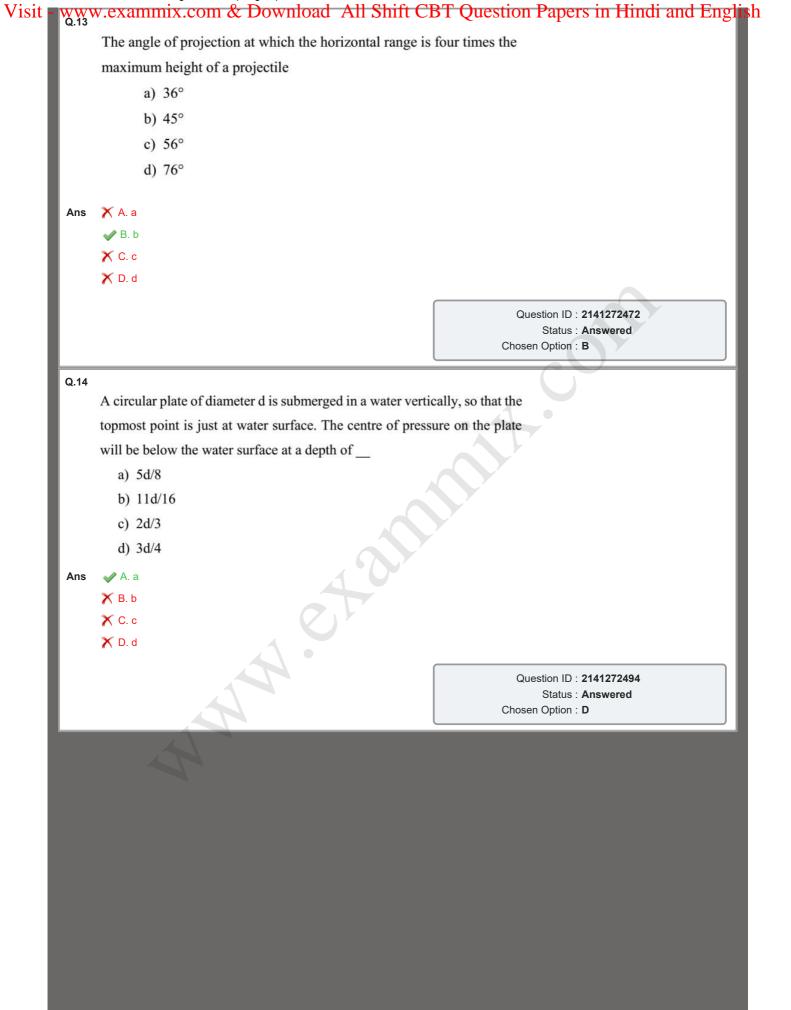


# Visit www.exammix.com & Download All Shift CBT Question Papers in Hindi and English A black body at 2000 K has maximum spectral emissive power approximately at what wavelength (Wien's displacement constant $b = 2.9 \times 10^{-3} \text{ m-K}$ ) a) 2.9 µm b) 5.8 μm c) 1.45 µm d) 145 µm **X** A. a Ans **X** B. b ✓ C. c X D. d Question ID: 2141272499 Status: Answered Chosen Option : C Q.10 The effect of setting a boring tool above centre height leads to a) Increase in the effective rake angle and a decrease in the effective clearance angle b) Increase in both effective rake angle and effective clearance angle c) Decrease in the effective rake angle and an increase in the effective clearance angle d) Decrease in both effective rake angle and effective clearance angle **X** A. a Ans X B. b ✓ C. c X D. d

Question ID : 2141272522 Status : Answered

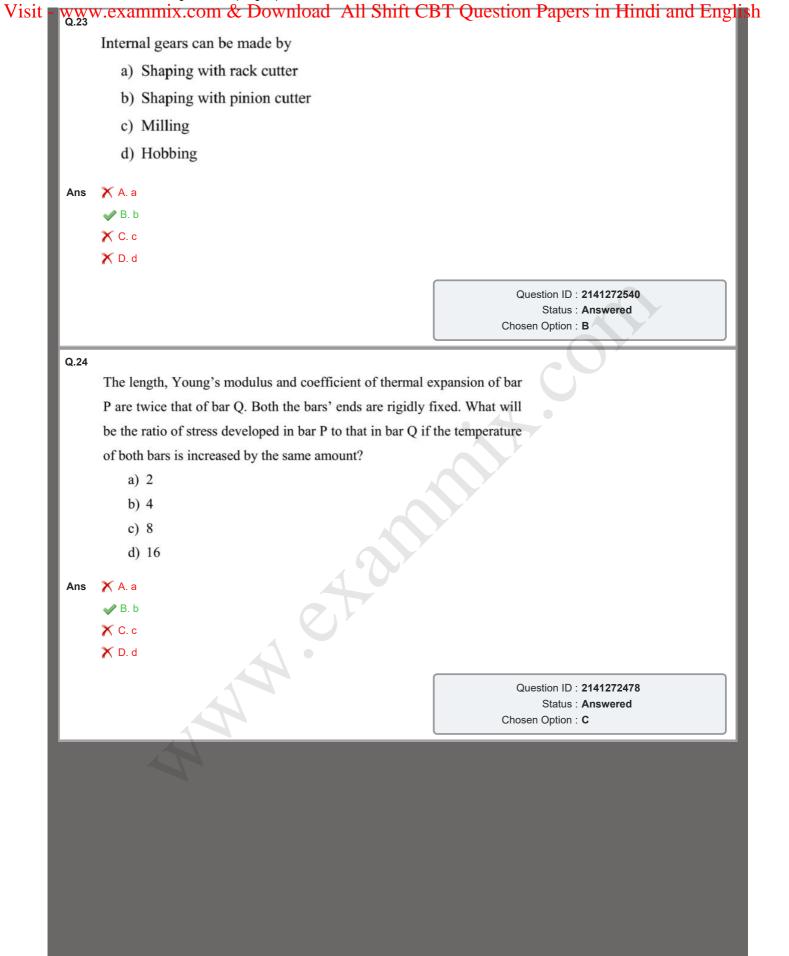
Chosen Option: C

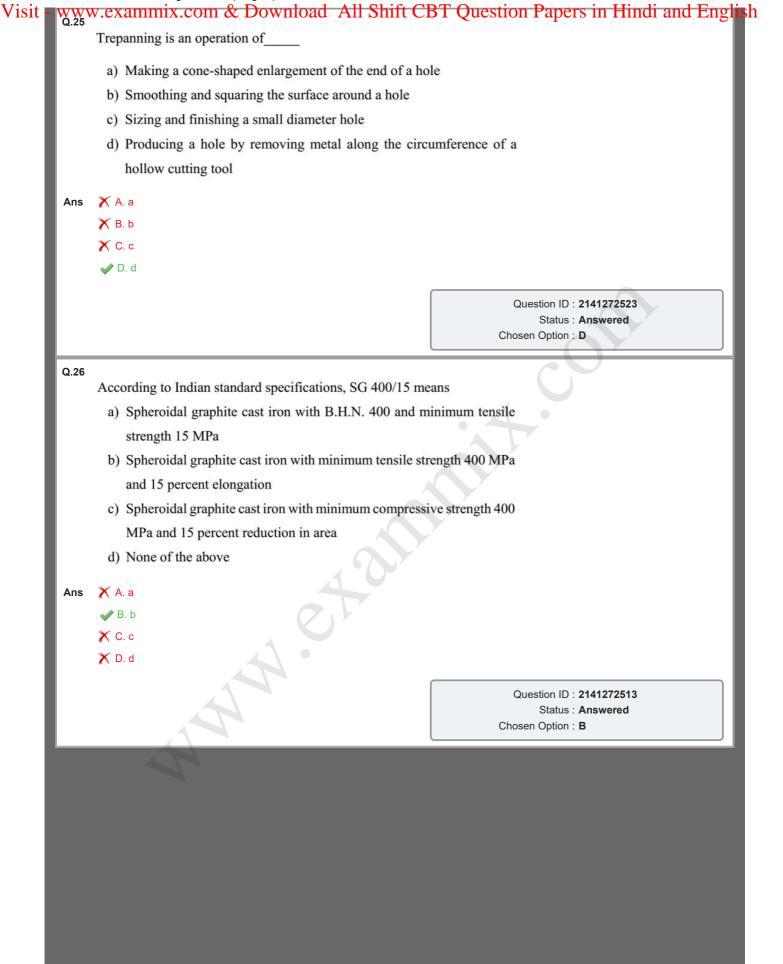




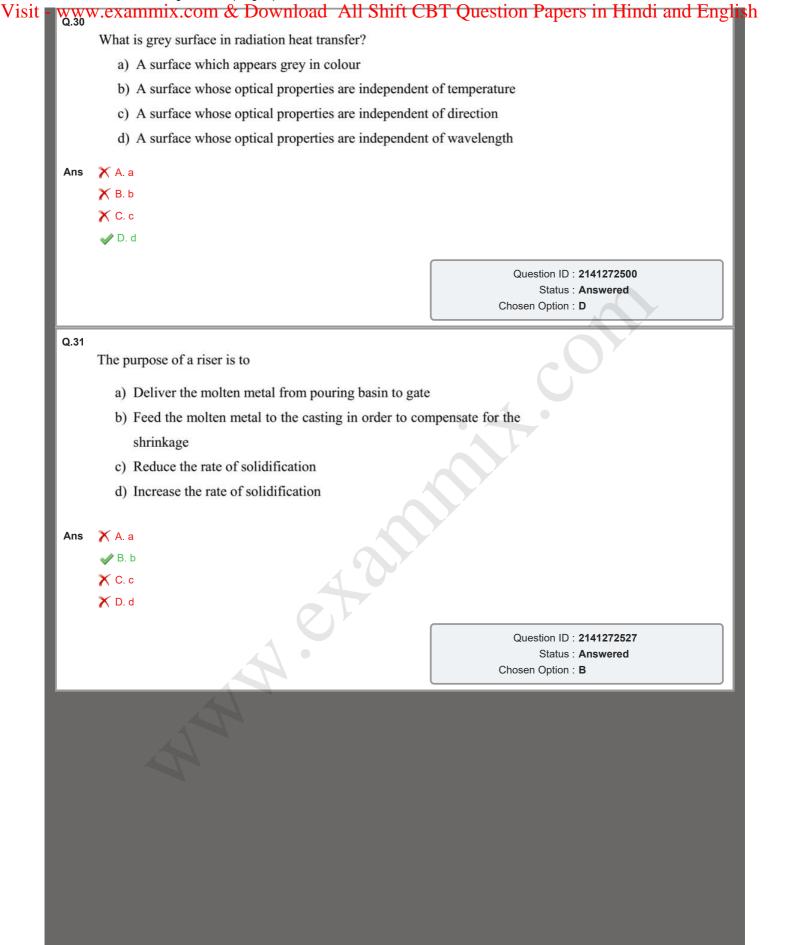
# Visit www.exammix.com & Download All Shift CBT Question Papers in Hindi and English The tangential velocity of the water element having a free vortex is a) Directly proportional to its distance from the centre b) Inversely proportional to its distance from the centre c) Directly proportional to square of its distance from the centre d) Inversely proportional to square of its distance from the centre Ans X A. a X C. c X D. d Question ID: 2141272489 Status: Answered Chosen Option: A Q.16 Rankine theory of failure is applicable for which of the following type of materials a) Ductile b) Brittle c) Plastic d) Tough Ans X A. a **⊘** B. b X C. c X D. d Question ID: 2141272482 Status: Answered Chosen Option: A Q.17 Mild Steel belongs to the following category a) Alloy Steel b) Low carbon steel c) Medium carbon steel d) High carbon steel Ans X A. a ✓ B. b. X C. c X D. d Question ID: 2141272515 Status: Answered Chosen Option: B

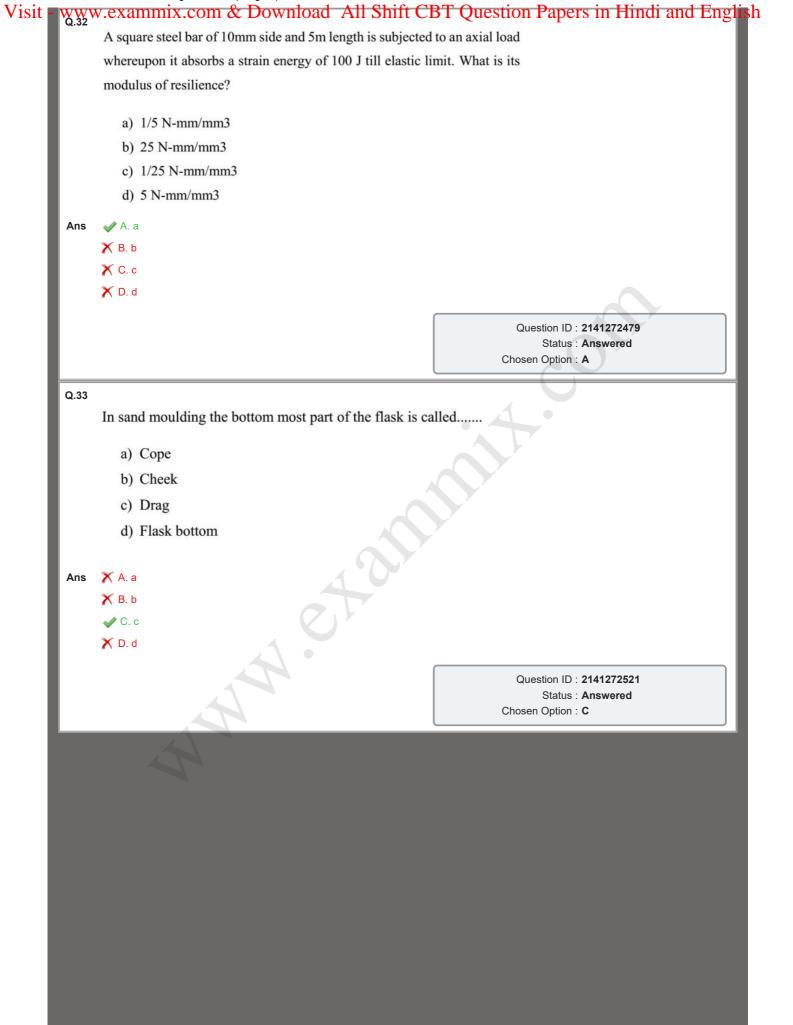
www.exammix.com & Download All Shift CBT Question Papers in Hindi and English Visit -A simply supported beam of span 4.0 m has a cross section 200 mm (width) x 300 mm (depth). If the maximum permissible bending stress in the material of beam is 20 N/m2, what will be the maximum uniformly distributed load it can carry? a) 60 kN/m b) 300 kN/m c) 150 kN/m d) 30 kN/m X A. a Ans X B. b X C. c ✓ D. d Question ID: 2141272476 Status: Answered Chosen Option: C Q.21 For fully saturated air a) Dry bulb and wet bulb temperature are equal b) Dry bulb temperature is greater than wet bulb temperature c) Wet bulb temperature is greater than dry bulb temperature d) None Ans X B. b X C. c X D. d Question ID: 2141272506 Status: Answered Chosen Option: A Q.22 The lower critical temperature a) Decreases as the carbon content in steel increases b) Increases as the carbon content in steel increases c) Is same for all steels d) Depends upon the rate of heating Ans X A. a X B. b ✓ C. c X D. d Question ID: 2141272510 Status: Answered Chosen Option: B





WWV Q.27	w.exammix.com & Download All Shift C	BT Question Papers in Hindi and Eng	
	The angular speed of a car taking a circular turn of radiu		
	km/hr will be		
	a) 0.1 rad/sec		
	b) 1 rad/sec		
	c) 10 rad/sec		
	d) 100 rad/sec		
	d) 100 fad/sec		
Ans	<b>✓</b> A. a		
	<b>★</b> B. b		
	<b>X</b> C. c		
	<b>X</b> D. d		
		Question ID : 2141272473	
		Status : Answered	
		Chosen Option : C	
Q.28			
	Closed packed hexagonal space lattice is found in		
	a) Zinc, magnesium, cobalt, cadmium, antimony and b	pismuth	
	b) Gamma-iron, aluminium, copper, lead, silver and n	ickel	
	c) Alpha-iron, tungsten, chromium and molybdenum		
	d) None of the above		
Ans	<b>✓</b> A. a		
	<b>X</b> B. b		
	<b>X</b> C. c		
	<b>X</b> D. d		
		Question ID : 2141272508	
		Status : Answered	
		Chosen Option : A	
Q.29			
	Thermal diffusivity gives the		
	a) Ability of a material to conduct thermal energy		
	b) Ability of a material to emit thermal energy		
	c) Ability of a material to conduct thermal energy relative to its ability to		
	store thermal energy		
	d) Ability of a material to conduct and radiate thermal ener	rgy	
Ans	<b>X</b> A. a		
	<b>★</b> B. b		
	<b>✓</b> C. c		
	<b>X</b> D. d		
		Question ID : 2141272497	
		Question ID : 21412/2497 Status : Answered	
		Chosen Option : C	





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Given 2 X 2 matrix,  $A = \begin{bmatrix} 1 & 2 \\ 5 & 3 \end{bmatrix}$  find its inverse  $A^{-1}$ 

- a)  $\begin{bmatrix} 1 & 5 \\ 2 & 3 \end{bmatrix}$
- b)  $\frac{1}{7} \begin{bmatrix} -3 & -2 \\ 5 & -1 \end{bmatrix}$
- c)  $-\frac{1}{13}\begin{bmatrix} 3 & -2\\ -5 & 1 \end{bmatrix}$
- d)  $\frac{1}{7}\begin{bmatrix} -3 & 2\\ 5 & -1 \end{bmatrix}$

Ans 🟋 A. a

**X** B. b

X C. c

✓ D. d

Question ID: 2141272463

Status: Answered

Chosen Option: D

Q.35

For a reversible adiabatic process, entropy

- a) Does not change
- b) Increases
- c) Decreases
- d) Can't say

Ans

**X** B. b

**X** C. c

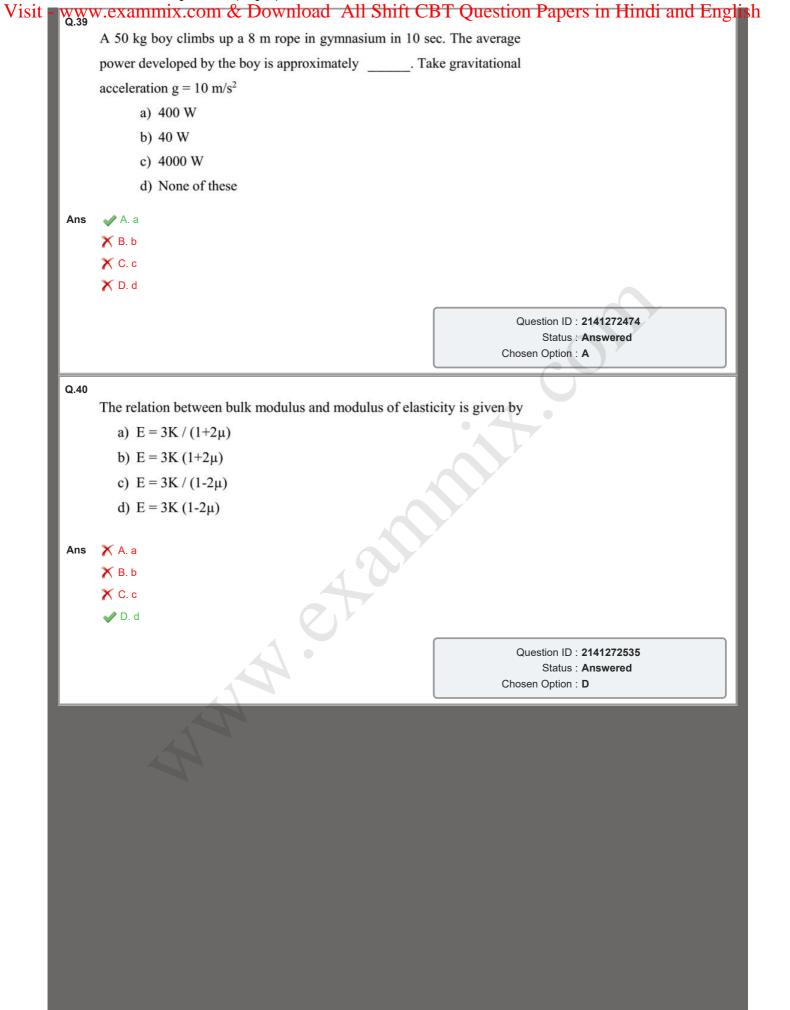
X D. d

Question ID: 2141272504

Status: Answered

Chosen Option: A

Visit www.exammix.com & Download All Shift CBT Question Papers in Hindi and English Law of conservation of energy is given by a) Zeroth law of thermodynamics b) Stefan Boltzmann law c) First law of thermodynamics d) Second law of thermodynamics X A. a Ans X B. b ✓ C. c X D. d Question ID: 2141272503 Status: Answered Chosen Option : C Q.37 Which one of the following processes is performed in powder metallurgy to produce self-lubricating properties in sintered parts? a) Infiltration b) Impregnation c) Plating d) Graphitization X A. a Ans **⊘** B. b X C. c **X** D. d Question ID: 2141272526 Status: Answered Chosen Option : A Q.38 What is Chemical name of FM 200 Fire Suppression agent? a) Penta Fluro Ethane b) Hepta Fluro Propane c) Chloro Difluro Methane d) Chloro Tetra Fluro Ethane X A. a Ans ✓ B. b X C. c X D. d Question ID: 2141272533 Status: Not Answered Chosen Option: --



The equation of free vibration of a system is given by  $\ddot{x} + 64 \pi 2x = 0$ . It's

natural frequency will be\_\_\_\_

- a) 1 Hz
- b) 2 Hz
- c) 4 Hz
- d) 8Hz

Ans

- **X** A. a
- **X** B. b
- ✓ C. c✗ D. d

Question ID : 2141272487

Status: Answered

Chosen Option: C

Q.42

What is the type of following partial differential equation

$$7u_{xx} + 2u_{xy} + \frac{1}{2}u_{yy} = F(x, y, u, u_x, u_y)$$

- a) Elliptic
- b) Parabolic
- c) Hyperbolic
- d) Trigonometric

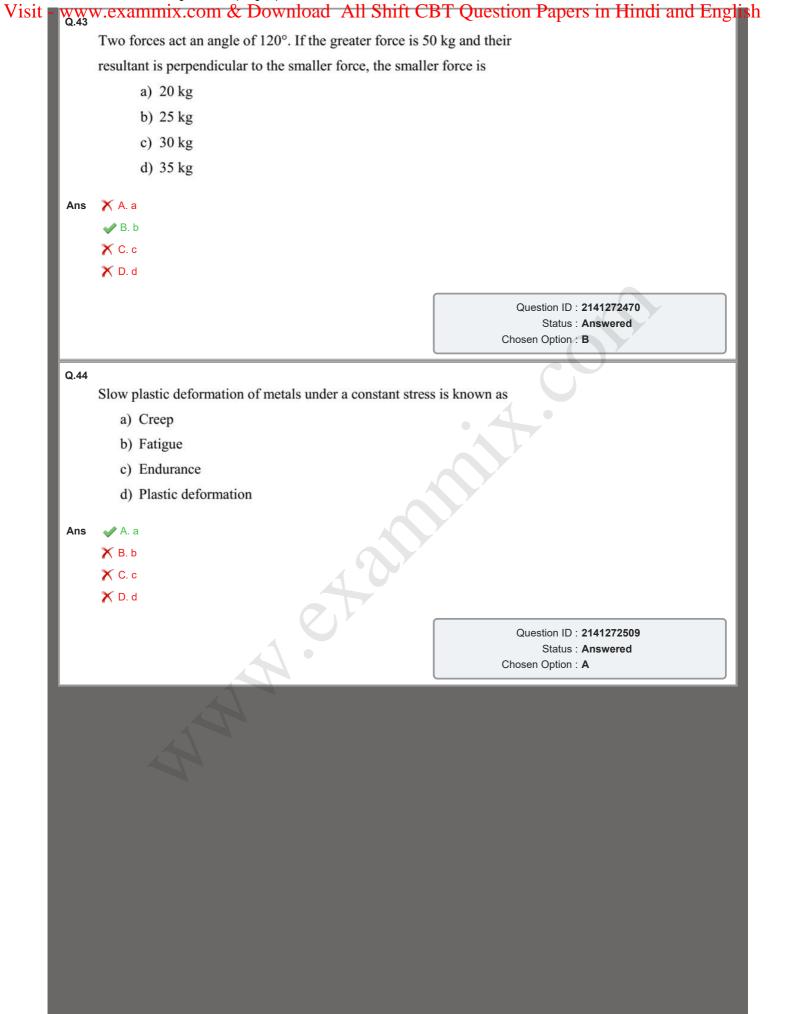
Ans

- ✓ A. a
- X B. b
- X C. c
- X D. d

Question ID: 2141272468

Status: Not Answered

Chosen Option: --



A Centrifugal pump used to lift water against static head of 40 m. The loss of head in suction pipe, delivery pipe and inside the pump is 10m. The speed of pump is 1400 rpm. The discharge rate of water is 30 litre/sec. If the efficiency of pump is 75%, power required at pump shaft is \_\_\_\_\_\_

Note: Take value of g as 10 m/sec2

- a) 20 kW
- b) 200 kW
- c) 2000 kW
- d) 40 kW

Ans

- ✓ A. a
- **X** B. b
- X C. c
- X D. d

Question ID : 2141272493

Status : Answered

Chosen Option : A

Q.46

Given the Laplace transform  $\mathcal{L}(f) = \frac{1}{s(s^2 + \omega^2)}$ , find the function of f(t).

- a)  $\omega^2(1-\cos\omega t)$
- b)  $\omega^2(1+\cos\omega t)$
- c)  $\frac{1}{\omega^2}(1-\sin\omega t)$
- d)  $\frac{1}{\omega^2}(1-\cos\omega t)$

Ans

- **X** A. a
- 🟋 B. I
- X C. (
- ✓ D. (

Question ID : 2141272465

Status: Not Answered

Chosen Option : --

Visit www.exammix.com & Download All Shift CBT Question Papers in Hindi and English If the angular distance,  $\theta = 2t3 - 3t^2$ , the angular acceleration at t = 1 sec. a) 1 rad/sec<sup>2</sup> b) 4 rad/sec<sup>2</sup> c) 6 rad/sec<sup>2</sup> d) 12 rad/sec<sup>2</sup> Ans X A. a **X** B. b √ C. c X D. d Question ID: 2141272471 Status: Answered Chosen Option : C Q.48 Air standard Otto cycle consists of a) Two constant pressure processes, two constant volume processes b) Two constant pressure processes, two constant temperature processes c) Two constant temperature processes, two isentropic processes d) Two constant volume processes, two isentropic processes **X** A. a Ans X B. b X C. c ✓ D. d Question ID: 2141272505 Status: Answered Chosen Option : D Q.49 The unit of dynamic viscosity of fluid is \_\_\_\_ a) m2/sec b) N.sec/m2 c) Pa.sec/m2 d) kg.sec2/m2 Ans X A. a ✓ B. b X C. c X D. d Question ID: 2141272492 Status: Answered Chosen Option: B

t - www	w.exammix.com & Download All Shift C	BT Question Papers in Hindi and Eng
Q.50	A large Reynold number is indication of	
	a) Smooth and streamline flow	
	b) Laminar flow	
	c) Steady flow	
	d) Highly turbulent flow	
Ans	<ul><li>★ A. a</li><li>★ B. b</li></ul>	
	<b>X</b> C. c	
	<b>✓</b> D. d	
	·	
		Question ID : 2141272491 Status : Answered
		Chosen Option : D
Q.51	A simple pendulum of length 8 m, with a bob of mass 3 k	g is undergoing
	a simple harmonic motion. Bob has a speed of 10 m/s at	
	The net force on the bob at mean position is	1
	a) 3 N	
	b) Zero	
	c) 30 N	
	d) 1N	
Ans	<b>X</b> A. a	
Alls	✓ B. b	
	<b>X</b> C. c	
	<b>X</b> D. d	
		Question ID : 2141272486 Status : Answered
		Chosen Option : B
Q.52		
	Head loss in sudden expansion from 8 cm diameter to 16 cm	m diameter pipe
	in terms of velocity V1 in smaller pipe is	
	a) $1/4(V1^2/2g)$	
	b) $3/16(V1^2/2g)$	
	c) 1/64(V1 <sup>2</sup> /2g)	
	d) 9/16(V1 <sup>2</sup> /2g)	
Ans	<b>X</b> A. a	
Allo	<b>★</b> B. b	
	<b>X</b> C. c	
	<b>少</b> D. d	
		Out 25 11 12 2444272422
		Question ID : 2141272496 Status : Answered
		Chosen Option : <b>D</b>

Which point on the stress strain curve of mild steel occurs immediately after the proportionality limit?

- a) Upper yield point
- b) Lower yield point
- c) Elastic limit
- d) Ultimate point

Ans

**X** A. a

**X** B. b

**✓** C. c

X D. d

Question ID: 2141272477

Status: Answered

Chosen Option :  ${\bf C}$ 

Q.54

Solve the following initial value problem

$$3x^2ydx + 2x^3dy = 0, \quad y(1) = 3$$

a) 
$$y = \frac{3}{\sqrt[3]{x^2}}$$

b) 
$$y = \frac{1}{\sqrt[2]{x^3}} + 3$$

c) 
$$x^3y^2 = 9$$

d) 
$$x^3y^2 = 3$$

Ans

**X** A. a

**X** B. b

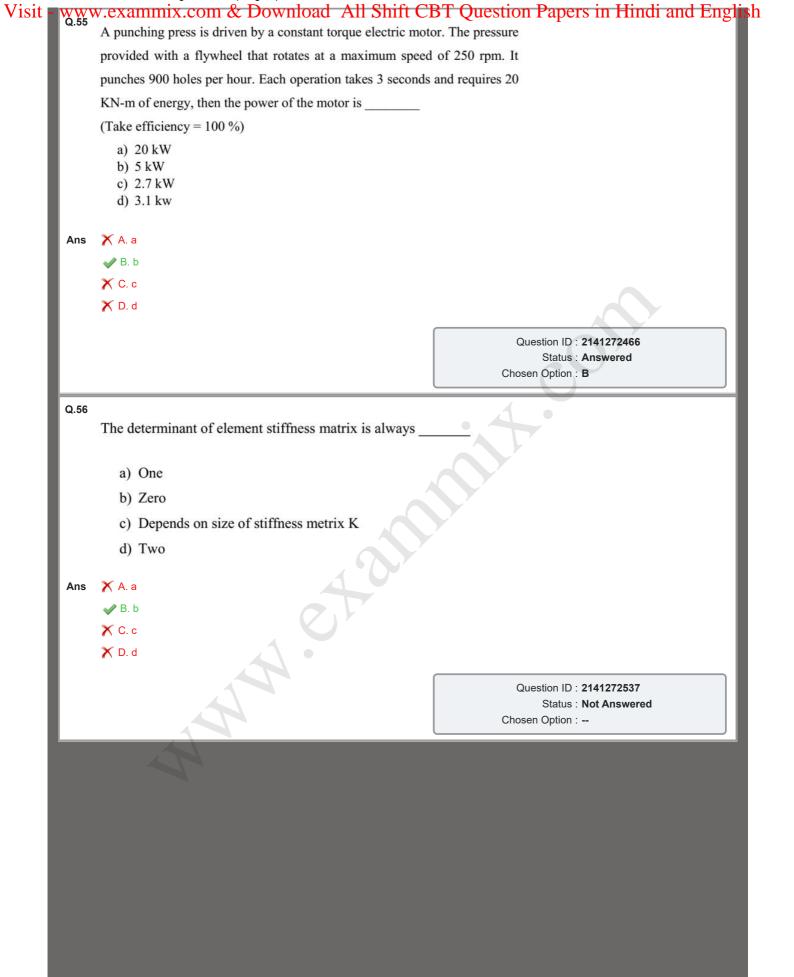
✓ C. c

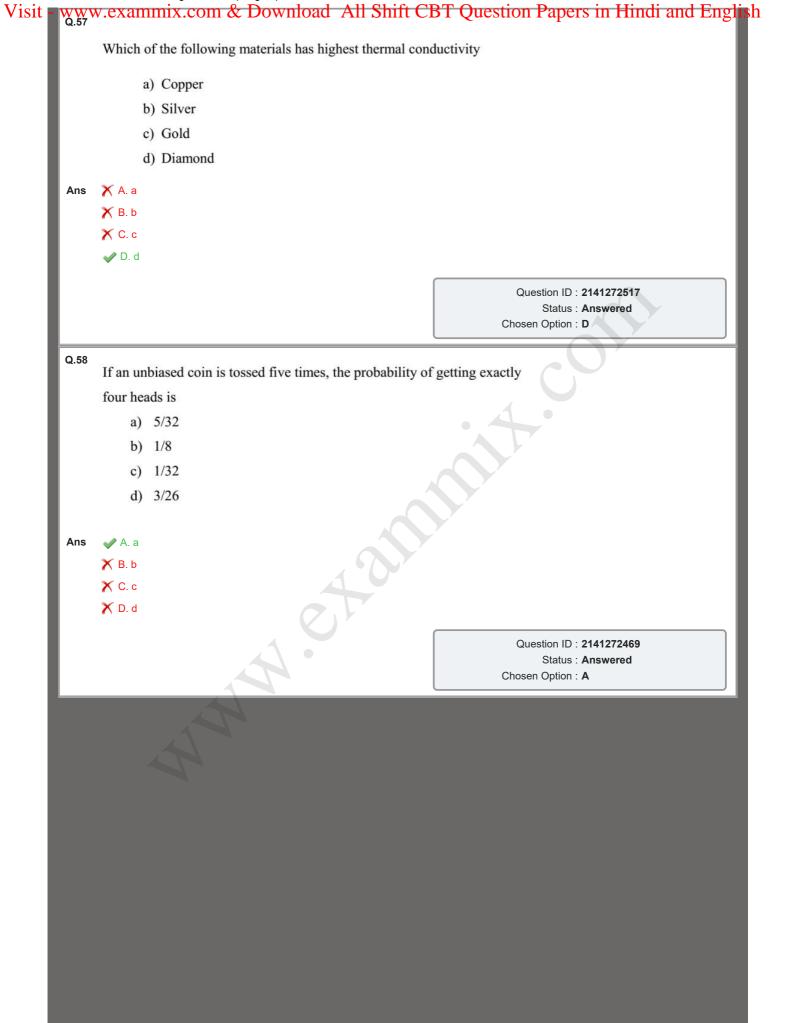
**X** D. d

Question ID : 2141272461

Status : **Answered** 

Chosen Option : C





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Find b such that f(x) given below is Continuous.

$$f(x) = \begin{cases} 2x^2 + b & x \ge -1 \\ -x^3 & x < -1 \end{cases}$$

- a) -1
- b)
- c)
- d)

Ans

- X B. b
- **X** C. c
- **X** D. d

Question ID: 2141272464

Status: Answered

Chosen Option: A

Q.60

Which of the following is a source of Ionizing Radiation?

- a) Micro waves
- b) Radio waves
- c) Infrared Rays
- d) Gamma Rays

**X** A. a Ans

**X** B. b

X C. c

**✓** D. d

Question ID: 2141272534

Status: Answered

Chosen Option : D

Visit www.exammix.com & Download All Shift CBT Question Papers in Hindi and English Water is used to extinguish which class of fire a) Class A b) Class B c) Class C d) All of above Ans X C. c **X** D. d Question ID: 2141272529 Status: Answered Chosen Option: A Q.62 The ability of a material to resist softening at high temperature is known as a) Creep b) Hot tempering c) Hot Hardness d) Super hardening Ans X A. a X B. b √ C. c X D. d Question ID: 2141272514 Status: Answered Chosen Option: C Q.63 During the torsional vibration of a shaft, the node is characterized by the a) Maximum angular velocity b) Maximum angular displacement c) Maximum angular acceleration d) Zero angular displacement Ans **X** A. a X B. b X C. c **৶** D. d Question ID: 2141272481 Status: Answered Chosen Option: D

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Q.04	A thermodynamic system undergoes		
- 1	a) Changes in pressure		
- 1	b) Changes in volume		
- 1	c) Changes in internal energy		
- 1	d) All of the above		
Ans	X A.a		
- 1	<b>★</b> B. b <b>★</b> C. c		
- 1	✓ D. d		
- 1	·		
- 1		Question ID : 2141272502 Status : Answered	
- 1		Chosen Option : D	
0.05			
Q.65	It is required to cut screw threads of 2 mm pitch on a lathe.	The lead screw	
- 1	has a pitch of 6 mm. If the spindle speed is 60 RPM, then th	e speed of lead	
- 1	screw will be (RPM= Revolution Per Minute)	1	
- 1	-\ 10 PPM		
- 1	a) 10 RPM		
- 1	<ul><li>b) 20 RPM</li><li>c) 120 RPM</li></ul>		
- 1	d) 180 RPM		
- 1		Y	
Ans	X A. a		
- 1	<b>✓</b> B. b <b>×</b> C. c		
- 1	X D. d		
- 1			
- 1		Question ID : 2141272518 Status : Answered	
- 1		Chosen Option : B	
0.55			
Q.66	Materials with following crystal lattice are most ductile		
- 1			
- 1	a) Body Centered Cubic		
- 1	b) Face Centered cubic		
- 1	c) Hexagonal Close Pack		
- 1	d) None of the above		
Ans	<b>X</b> A. a		
	<b>✓</b> B. b		
	<b>X</b> C. c		
	<b>X</b> D. d		
		Question ID : 2141272516	
		Status : <b>Answered</b> Chosen Option : <b>B</b>	

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Q.67	In annealing, hypo eutectoid steel is		
_	a) Heated from 30°C to 50°C above the upper critical temperature and then cooled in still air		
- 1			
- 1	b) Heated from 30°C to 50°C above the upper critical temperature and		
- 1	then cooled suddenly in a suitable cooling medium		
- 1	c) Heated from 30°C to 50°C above the upper critical temperature and		
- 1	then cooled slowly in the furnace		
-	d) Heated below the lower critical temperature and then cooled slowly		
Ans	<b>X</b> A. a		
- 1	<b>X</b> B. b		
- 1	<b>✓</b> C. c		
- 1	<b>X</b> D. d		
- 1	Question ID : 2141272507		
- 1	Status : Answered		
- 1	Chosen Option : C		
Q.68	In FEM, Sum of all the shape functions at any point within an element is		
- 1	equal to		
- 1			
- 1	a) Zero		
- 1	b) -1		
- 1	c) +1		
- 1	d) 2		
Ans	<b>X</b> A. a		
	X B.b		
- 1	✓ C. c		
- 1	<b>X</b> D. d		
- 1	Question ID : 2141272536		
- 1	Status : Not Answered		
- 1	Chosen Option :		

- WWV Q.69	w.exammix.com & Download All Shift CBT Que	stion Papers in Hindi and Eng
	If L is number of links in a mechanism, then the number of possible	
	inversions would be	
	a) L	
	b) L/2	
	c) L + 2	
	d) L+1	
Ans	<ul><li>✓ A. a</li><li>X B. b</li></ul>	
	<b>X</b> C. c	
	<b>★</b> D. d	
		Question ID : 2141272480
		Status : <b>Answered</b> Chosen Option : <b>A</b>
Q.70		
	The magnitude of water hammer depends upon the	
	a) Elastic properties of the pipe material	
	b) Elastic properties of the liquid flowing through the pipe	
	c) Speed at which the valve is closed	
	d) All of the above	
Ans		
Allo	<b>★</b> B. b	
	<b>★</b> C. c	
	<b>✓</b> D. d	
		0 11 15 04445540
	11.	Question ID : 2141272490 Status : Answered
		Chosen Option : D
Q.71		
	In a CNC program block "N10 G02 G91 X52 Y100", G02 repre	sents
	a) Linear Interpolation	
	b) Clockwise Circular Interpolation	
	c) Anticlockwise Circular Interpolation	
	d) None of the above	
Ans	<b>X</b> A. a	
	<b>✔</b> B. b	
	<b>X</b> C. c	
	<b>X</b> D. d	
		Question ID : 2141272539
		Status : Answered
		Chosen Option : C

www.exammix.com & Download All Shift CBT Question Papers in Hindi and English Fire of Combustible metals such as magnesium, titanium, sodium, lithium, etc. belongs to which class of fire a) Class A b) Class B c) Class C d) Class D Ans X B. b X C. c **৶** D. d Question ID: 2141272528 Status: Answered Chosen Option : C Q.73 In order to have interference fit, it is essential that the lower limit of the shaft should be a) Greater than the upper limit of the hole b) Lesser than the upper limit of the hole c) Greater than the lower limit of the hole d) Lesser than the lower limit of the hole Ans X B. b **X** C. c X D. d Question ID: 2141272519 Status: Answered Chosen Option: A Q.74 For a circular shaft of diameter d subjected to torque T, the maximum value of shear stress is a)  $32T/\pi d3$ b) 32T/ πd4 c) 16T/ πd3 d) 16T/ πd4 X A. a Ans X B. b ✓ C. c X D. d Question ID: 2141272488 Status: Answered Chosen Option : C

How many nodes are there in Linear Tetrahedron element?

- a) 3
- b) 4
- c) 5
- d) 6

Ans **X** A. a

- ✓ B. b
- X C. c
- X D. d

Question ID: 2141272538

Status: Not Answered

Chosen Option: --

Q.76

Given a second order differential equation y'' + ay' + by = 0 and given a, b such that they satisfy the relation  $a = 2\sqrt{b}$  what are the basis of the solution?

- a)  $e^{-ax/2}$ ,  $xe^{-ax/2}$
- b)  $e^{ax}$ ,  $e^{-ax}$
- c)  $c_1 e^{-ax/2}$ ,  $c_2 e^{ax/2}$
- d)  $e^{-ax/2}$ ,  $e^{ax/2}$

✓ A. a Ans

**X** B. b

**X** C. c

X D. d

Question ID: 2141272462

Status: Not Answered

Chosen Option : --

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Q.77	In A-B-C analysis, which class of items are generally large in number?
_	a) A
_	b) B
	c) C
_	d) None of these
_	
Ans	X A. a
_	<ul><li>✗ B. b</li><li>✔ C. c</li></ul>
	<b>X</b> D. d
_	Question ID : 2141272530 Status : Answered
_	Chosen Option : C
0.79	
Q.78	A flywheel gives up 20 KJ of energy in changing its speed from 122 to
_	120 rpm, then the Moment of Inertia of flywheel is
	a) 5517 kg-m2
_	b) 6119 kg- m2
	c) 7536 kg- m2
_	d) 9132 kg- m2
Ans	<b>X</b> A. a
7	<b>★</b> B. b
_	<b>✓</b> C. c
_	<b>★</b> D. d
	Question ID : 2141272483
	Status : Answered
	Chosen Option : A
Q.79	
	Which one among the following welding processes uses non-consumable
_	electrode?
_	a) Gas metal arc welding
	b) Submerged arc welding
_	c) Gas tungsten arc welding
	d) Flux coated arc welding
Ans	X A. a
	<ul><li>✗ B. b</li><li>✔ C. c</li></ul>
	<b>X</b> D. d
	Question ID : 2141272524 Status : Answered
	Chosen Option : C

