Airforce Group X

Previous Year Paper
MBT 14-Jul-2021 Shift 3

70 Questions

Que. 1 The efficiency of the Carnot engine is

1. $1 - \frac{T_1}{T_2}$

2. $1 - \frac{T_2}{T_1}$

3. $1 + \frac{T_2}{T_1}$

4. $1 + \frac{T_1}{T_2}$

Solution　　　　　Correct Option - **2**

Que. 2 Consider a long solenoid of 'n' turns per unit length and carrying a current 'I'. The magnetic field in the interior of the solenoid was shown to be given

by B_o= _____.

1. $\mu_o nI^2$

2. nI/μ_o

3. $\mu_o nI$

4. nI^2/μ_o

Solution　　　　　Correct Option - **3**

Que. 3 If we increase the temperature of the liquid, its surface tension will _____.

1. first increase then decrease

2. first decrease then increase

3. increase

4. decrease

Solution　　　　　Correct Option - **4**

Que. 4 Alternating current is converted to direct current by _____.

1. rectifier

2. dynamo

3. ammeter

4. motor

Solution　　　　　Correct Option - **1**

Que. 5 A simple pendulum performs simple harmonic motion about x = 0 with an amplitude a and time period T. The time taken by the pendulum to reach x = a/2 from the mean postion will be:

1. T/6

2. 6/T

3. 12/T

4. T/12

Solution Correct Option - **4**

Que. 6 The phase difference in electric and magnetic force fields of an electromagnetic wave is-

1. 0
2. $\frac{\pi}{4}$
3. $\frac{\pi}{2}$
4. π

Solution Correct Option - **3**

Que. 7 In the given nuclear reaction $^{238}_{92}U \rightarrow ^{A}_{Z}X$, $_{92}U^{238}$ undergoes alpha decay, Find what is A and Z?

1. A = 234 and Z = 90
2. Z = 234 and A = 90
3. A = 238 and Z = 90
4. A = 234 and Z = 92

Solution Correct Option - **1**

Que. 8 If the object is placed between the pole and the focus of the concave mirror, then the image formed will be:

1. Real and inverted
2. Virtual and errected
3. Virtual and inverted
4. Real and magnified

Solution Correct Option - **2**

Que. 9 What is the Moment of Inertia of a thin circular disc of mass 'M' and radius 'R' about an axis perpendicular to its plane and passing through its centre?

1. $MR^2/4$
2. $MR^2/3$
3. $MR^2/2$
4. $MR^2/6$

Solution Correct Option - **3**

Que. 10 When temperature is held constant, the pressure and volume of a quantity of gas are related as PV = constant. This relationship is known as?

1. Charles' law
2. Boyle's law
3. Combined G as Law
4. Gay-Lussac's Law

Solution Correct Option - **2**

Que. 11 The time period of a simple pendulum becomes half when:

1. Its length becomes four times
2. Its length becomes one-fourth
3. Mass of the bob becomes four times
4. Mass of the bob becomes one-fourth

Solution Correct Option - **2**

Que. 12 Which of the following has maximum specific heat?
1. Water
2. Alcohol
3. Glycerene
4. Oil

Solution Correct Option - **1**

Que. 13 An object with a force of 20 N on it is accelerating at 100 cm/s^2. What is the mass of the object?
1. 10 kg
2. 20 kg
3. 30 kg
4. 40 kg

Solution Correct Option - **2**

Que. 14 Time period of a satellite does not depends on?
1. Mass of orbiting body
2. Mass of a central body
3. The radius of the orbit
4. All of these

Solution Correct Option - **1**

Que. 15 Which one of the following is not a derived unit
1. Frequency
2. Plank's constant
3. Gravitational constant
4. Electric current

Solution Correct Option - **4**

Que. 16 The power of a pump, which can pump 200 kg of water to a height of 80 m in 9.8 sec, will be:
1. 15.6 kW
2. 16 kW
3. 18 kW
4. 20 kW

Solution Correct Option - **2**

Que. 17 The speech signal of a man is transmitted after modulation and it sounded like that of a woman to the receiver. This discrepancy is due to

1. wrong bandwidth selection of amplifiers
2. attenuation of sound wave
3. poor selection of carrier frequency
4. varying modulation index

Solution   Correct Option - **1**

Que. 18 In a magnetic field, a charge does not experience any force, then which of the following is not possible?

1. Charge is at rest
2. Motion of charge is perpendicular to a non-zero magnetic field
3. Motion of charge ls parallel to a non-zero magnetic field
4. Motion of charge is parellel to a zero magnetic field

Solution   Correct Option - **2**

Que. 19 1 Tesla equals to

1. 10^4 Gauss
2. 10^{-4} Gauss
3. 10^{-3} Gauss
4. 10^2 Gauss

Solution   Correct Option - **1**

Que. 20 Which of the following statement states the first law of thermodynamics? (given: heat provided to the system is ΔQ, work done by the system is ΔW, and change in internal energy of the system is ΔU)

1. $\Delta Q + \Delta U = \Delta W$
2. $\Delta Q = \Delta U + \Delta W$
3. $\Delta Q + \Delta U + \Delta W = constant$
4. All of the above statement can be correct

Solution   Correct Option - **2**

Que. 21 A convex lens of power 4D is placed at a distance of 40 cm from a wall. At what distance from the lens should a candle be placed so that its image is formed on the wall?

1. $\frac{100}{3} \, cm$
2. $\frac{200}{3} \, cm$
3. $\frac{400}{3} \, cm$
4. $\frac{800}{3} \, cm$

Solution   Correct Option - **2**

Que. 22 If the mass of a planet is four times the mass of the earth and the radius is half of the earth, then the gravitational acceleration of the planet is:

1. 16g
2. g/16
3. 4g
4. g

Solution Correct Option - **1**

Que. 23 Which of the following electromagnetic waves have the maximum wavelength:
1. Ultraviolet
2. X-Rays
3. Microwaves
4. Gamma Rays

Solution Correct Option - **3**

Que. 24 On which of the followings Resistivity does not depend?
1. The dimensions of the conductor
2. The material of the conductor
3. Temperature
4. None of the above

Solution Correct Option - **1**

Que. 25 Two objects are dropped from heights h and 2h respectively. Then the ratio of the time taken by them to reach the ground is
1. $1:2$
2. $2:1$
3. $1:\sqrt{2}$
4. $\sqrt{2}:1$

Solution Correct Option - **3**

Que. 26 If $f(x) = 16x^4$, $g(x) = x^{1/4}$ then gof (x) is
1. $16x$
2. $2x^4$
3. $4x^2$
4. $2x$

Solution Correct Option - **4**

Que. 27 The value of the following is cos 24° + cos 55° + cos 125° + cos 204° + cos 300°
1. $-1/2$
2. $\frac{1}{2}$
3. 2
4. 1

Solution Correct Option - **2**

Que. 28 If $\cot\left[\tan^{-1} a - \tan^{-1}\left(\frac{x-y}{x+y}\right)\right] = 1$, then

1. $a = \frac{y}{x}$
2. $a = \frac{x}{y}$
3. $a = \frac{x-y}{x}$
4. $a = \frac{x+y}{x-y}$

Solution　　　　Correct Option - **2**

Que. 29 Evaluate:

$$\int \frac{dx}{\sqrt{x^2 - 49}}$$

1. $\ln\left|x + \sqrt{x^2 - 49}\right| + C$
2. $\ln\left|x - \sqrt{x^2 - 49}\right| + C$
3. $\frac{1}{7}\ln\left|x + \sqrt{x^2 - 49}\right| + C$
4. $\frac{1}{7}\ln\left|x - \sqrt{x^2 - 49}\right| + C$

Solution　　　　Correct Option - **1**

Que. 30 The value of the integral $\int_0^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$ is

1. 0
2. $-\dfrac{\pi}{4}$
3. $\dfrac{\pi}{2}$
4. $\dfrac{\pi}{4}$

Solution　　　　Correct Option - **4**

Que. 31 If vectors $\vec{a} = \vec{b}$ then a_3 is ?

Where $\vec{a} = 5\hat{i} - 3\hat{j} + a_3\hat{k}$ and $\vec{b} = 5\hat{i} - 3\hat{j} - 2\hat{k}$

1. - 2
2. -1
3. 2
4. 1

Solution　　　　Correct Option - **1**

Que. 32 Equation of line passes through point (2, 5) and perpendicular to the line $2y = 4x + 3$

1. $-x + 2y = 12$
2. $x + 2y = 12$
3. $2x + y = 5$

4. 2y -x = 10

Solution Correct Option - **2**

Que. 33 Find $\frac{d^2 \tan^{-1} x}{dx^2}$

1. $\frac{-2x}{(1+x^2)^2}$

2. $\frac{-2}{(1+x^2)^2}$

3. $\frac{-1}{(1+x^2)^2}$

4. $\frac{2x}{(1+x^2)^2}$

Solution   Correct Option - **1**

Que. 34 What is $\lim_{x \to 0} \frac{\sqrt{1+x}-1}{x}$ equal to?

1. 0
2. 1 / 2
3. 1
4. -1 / 2

Solution   Correct Option - **2**

Que. 35 The first term of a GP is 27 and its 8th term is 1/81. Find the sum of its first 10 terms ?

1. $\frac{27}{2} \cdot \left(1 - \frac{1}{3^{10}}\right)$

2. $\frac{81}{2} \cdot \left(1 - \frac{1}{3^{10}}\right)$

3. $\frac{81}{2} \cdot \left(1 - \frac{1}{3^9}\right)$

4. $\frac{27}{2} \cdot \left(1 - \frac{1}{3^9}\right)$

Solution   Correct Option - **2**

Que. 36 The imaginary part of $z = \frac{i-4}{2i-3}$ is –

1. 5/12
2. 5/13
3. 14/13
4. 13/14

Solution   Correct Option - **2**

Que. 37 Find derivative of $(x)^{\log x}$ with respect to x

1. $x^{x-1} (\log x^2)$
2. $x^{\log x - 1} (\log x^2)$
3. $x^{\log x} (\log x^2)$
4. None of these

Solution Correct Option - **2**

Que. 38 Evaluate: $\int \frac{1+\cos 2x}{1-\cos^2 x} \, dx$

1. -2 tan x – 2x + c
2. 2 cot x – 2x + c
3. -2 cot x + 2x + c
4. -2 cot x – 2x + c

Solution   Correct Option - **4**

Que. 39 What is the distance between the straight lines 3x + 4y = 9 and 6x + 8y = 15?

1.   3/2
2. 3/10
3. 6
4. 5

Solution   Correct Option - **2**

Que. 40 Find the equation of the parabola with vertex at origin and y + 3 = 0 as its directrix ?

1. $x^2 = 9y$
2. $y^2 = 12x$
3. $x^2 = 12y$
4. $y^2 = 9x$

Solution   Correct Option - **3**

Que. 41 Find the angle θ between the vectors $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$ and $\vec{b} = 3\hat{i} - 2\hat{j} + \hat{k}$?

1. $\cos^{-1}\left(\frac{4}{7}\right)$
2. $\cos^{-1}\left(\frac{5}{7}\right)$
3. $\cos^{-1}\left(\frac{5}{9}\right)$
4. None of these

Solution   Correct Option - **2**

Que. 42 Evaluate $\int_0^{\frac{\pi}{2}} \frac{\cos x}{1+\sin^2 x} \, dx$

1. 90°
2. 45°
3. $\tan^{-1}\left(\frac{1}{\sqrt{2}}\right)$
4. $-\tan^{-1}\left(\frac{1}{\sqrt{2}}\right)$

Solution   Correct Option - **2**

Que. 43 Find the value of i^{-1245}

1. 1
2. -i
3. i
4. -1

Solution   Correct Option - **2**

Que. 44 If $\frac{n!}{2(n-2)!}$ $and \frac{n!}{4!(n-4)!}$ are in the ratio 2 : 1 then find the value of n ?

1. 7
2. 8
3. 10
4. 5

Solution   Correct Option - **4**

Que. 45 If any two adjacent rows or columns of a determinant are interchanged in position, the value of the determinant:

1. Becomes zero
2. Remains the same
3. Changes its sign
4. Is doubled

Solution   Correct Option - **3**

Que. 46 If $A = \begin{bmatrix} 0 & -i \\ i & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$ are matrices, then $AB + BA$ is:

1. a diagonal matrix
2. an invertible matrix
3. a unit matrix
4. a null matrix

Solution   Correct Option - **4**

Que. 47 Find the interval in which the function $f(x) = 5x^2 - 2x$ is strictly increasing.

1. Strictly increasing on R
2. Strictly decreasing on R
3. Strictly increasing on $(1/5, \infty)$
4. Strictly decreasing on $(1/5, \infty)$

Solution   Correct Option - **3**

Que. 48 What is the area of the parabola $y^2 = x$ bounded by its latus rectum?

1. $\frac{1}{12}$ square unit

2. $\dfrac{1}{6}$ square unit

3. $\dfrac{1}{3}$ square unit

4. None of the above

Solution Correct Option - **2**

Que. 49 Find the domain and range of following function, $f(x) = 1/\sqrt{(x - 4)}$.

1. $D = R$

2. $[-\infty, \infty), (-\infty, \infty)$

3. None

4. $(4, \infty), [1, \infty]$

Solution Correct Option - **4**

Que. 50 For which value(s) of k will the roots of $3x^2 + 3 = 2kx$ be real and equal?

1. ± 2

2. ± 4

3. ± 3

4. ± 5

Solution Correct Option - **3**

Que. 51 **Choose the word that can substitute the given sentence.**

Soldiers who fight on horse back

1. Captain

2. Pilot

3. Major

4. Cavalry

Solution Correct Option - **4**

Que. 52 **Direction: Select the most appropriate option to fill in the blank.**

She is one of _____ doctors who served during the COVID 19 pandemic.

1. a

2. an

3. them

4. the

Solution Correct Option - **4**

Que. 53 **Select the most appropriate synonym of the given word.**

Replicate

1. Duplicate

2. Produce

3. Demolish

4.   Promise

Solution Correct Option **- 1**

Que. 54 | **Select the most appropriate option to fill in the blank.**

One of my friends _____ the owner of the house.

1.   Are
2.   Is
3.   Were
4.   have

Solution   Correct Option **- 2**

Que. 55 | **Select the most appropriate antonym of the given word.**

Timid

1.   Afraid
2.   Scared
3.   Fearful
4.   Fearless

Solution   Correct Option **- 4**

Que. 56 | **Direction: Choose the appropriate answer for the given sentence:**

She wants to become _____ doctor.

1.   a
2.   an
3.   the
4.   None of these

Solution   Correct Option **- 1**

Que. 57 | **Select the synonym of the given word.**

FUTILE

1.   Useless
2.   Airless
3.   Effective
4.   Calm

Solution   Correct Option **- 1**

Que. 58 | **In the following question, a word has been written in four different ways out of which only one is correctly spelt. Select the correctly spelt word.**

1.   Aggrression
2.   Aggrresion
3.   Aggression
4.   Agrresson

Solution   Correct Option **- 3**

Que. 59 **Direction: Fill in the blank with the correct answer:**

Does a boy like you if he smiled _____ you?

1. at
2. on
3. of
4. None of these

Solution Correct Option - **1**

Que. 60 **Some parts of the sentence have errors and some are correct. Find out which part has an error and mark that part as your answer. If there are no errors, mark 'No error' as your answer.**

Each of the students were given a chance to prove his talent.

1. Each of the students were
2. Given a chance to
3. Prove his talent
4. No error

Solution Correct Option - **1**

Que. 61 **Choose the option that is in the indirect form of the sentence.**

Deepak said to me, "I shall come to the office tomorrow."

1. Deepak told me that he would come to the office the next day.
2. Deepak told me that he should come to the office the next day.
3. Deepak told me that he shall come to the office the next day.
4. Deepak told me that he will come to the office the next day.

Solution Correct Option - **1**

Que. 62 **Direction: Read the passage given below and answer the question that follows:**

Communication is made up of more than just the words we use. It's maintaining eye contact with the person you're talking to, slouching on a video call, or your hand movements as you speak. Non-verbal cues such as tone of voice, gestures, and posture, all play their part. In this article, we define what body language is – and how you can interpret it to understand and communicate with people more effectively. Body language is the unspoken element of communication that we use to reveal our true feelings and emotions. It's the relaxed facial expression that breaks out into a genuine smile – with mouth upturned and eyes wrinkled. It can be a tilt of the head that shows you're listening, sitting, or standing upright to convey interest, or directing attention with hand gestures. It can also be taking care to avoid a defensive, arms-crossed posture, or restlessly tapping your feet. When you can "read" signs like these, you can understand the complete message of what someone is telling you. You'll be more **aware** of people's reactions to what you say and do. And you'll be able to adjust your body language to appear more positive, engaging, and approachable.

What is the most suitable title for the passage?

1. Communication and its importance
2. Ways to communicate
3. Ways to calm your mind
4. Body language and its interpretation

Solution Correct Option - **4**

Que. 63 What are the non-verbal cues?
1. dancing, talking and singing
2. voice, standing, and talking
3. tone of voice, gestures, and posture
4. talking, laughing, and arguing

Solution Correct Option - **3**

Que. 64 You'll be able to adjust your body language to appear:
1. more negative and non-engaging
2. more sophisticated and annoying
3. more negative and unapproachable
4. more positive, engaging, and approachable

Solution Correct Option - **4**

Que. 65 Which of the following words could replace the word **'aware'** as used in the passage?
1. keen
2. aweless
3. cogent
4. apprehensive

Solution Correct Option - **4**

Que. 66 **Direction: Find out which part has an error and mark it as your answer. If there is no error, mark 'No error' as your answer.**

A sum of thousand rupees (A) / are a large sum of money (B) / to earn in a month. (C) / No error (D)
1. (A)
2. (B)
3. (C)
4. (D)

Solution Correct Option - **2**

Que. 67 **Direction: Fill in the blank with the correct answer:**

When she was young, she _____ write poetry.
1. can
2. could
3. will
4. None of these

Solution Correct Option - **2**

Que. 68 **Direction: Change the Voice-**

The driver was blowing the horn.

1. The horn were being blown by the driver.
2. The horn was been blown by the driver.
3. The horn was being blown by the driver.
4. The horn was been blowed by the driver.

Solution Correct Option **- 3**

Que. 69 <u>**Direction**</u>**: Choose the most appropriate word and fill in the blank:**

_____ weight gain or weight loss is not good for your body.

1. Explosive
2. Excessive
3. Expressive
4. Eager

Solution   Correct Option **- 2**

Que. 70   **Direction: Choose the correct spelling of the word among the following:**

1. Terrifing
2. Terrifeing
3. Terifying
4. Terrifying

Solution   Correct Option **- 4**