GUJCET-ME-2024

Test Booklet No. 1300350 **Test Booklet Set No.** **13**

This booklet contains 16 pages.

DO NOT open this Test Booklet until you are asked to do so.

Important Instructions :

1) The Mathematics test consists of 40 questions. Each question carries **1** mark. For each correct response, the candidate will get **1** mark. For each incorrect response, ¼ mark will be deducted. The maximum marks are **40**.
2) This Test is of **1 hour** duration.
3) Use **Black Ball Point Pen only** for writing particulars on OMR Answer Sheet and marking answers by darkening the circle '●'.
4) Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5) **On completion of the test, the candidate must handover the Answer Sheet to the Invigilator in the Room / Hall. The candidates are allowed to take away this Test Booklet with them.**
6) The Set No. for this Booklet is **13**. Make sure that the Set No. printed on the Answer Sheet is the same as that on this booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
7) The candidate should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet.
8) Do not write your Seat No. anywhere else, except in the specified space in the Test Booklet / Answer Sheet.
9) Use of White fluid for correction is not permissible on the Answer Sheet.
10) Each candidate must show on demand his / her Admission Card to the Invigilator.
11) No candidate, without special permission of the Superintendent or Invigilator, should leave his / her seat.
12) Use of Simple (Manual) Calculator is permissible.
13) The candidate should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and must sign the Attendance Sheet (Patrak - 01). Cases where a candidate has **not** signed the Attendance Sheet (Patrak - 01) will be deemed not to have handed over the Answer Sheet and will be dealt with as an unfair means case.
14) The candidates are governed by all Rules and Regulations of the Board with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of the Board.
15) No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
16) The candidates will write the Correct Test Booklet Set No. as given in the Test Booklet / Answer Sheet in the Attendance Sheet. (Patrak - 01)

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MATHEMATICS

1) The order and the degree of the differential equation $\sqrt{\frac{d^2y}{dx^2}} = \sqrt[3]{\left(\frac{dy}{dx}\right)^4 + 2}$ is respectively _____ and _____.

(A) 1, 8 (B) 3, 2

(C) 2, 8 (D) 2, 3

2) The general solution of the differential equation $\frac{x\,dy - y\,dx}{y} = 0$ is _____.

(A) $y = cx^2$ (B) $x = cy^2$

(C) $y = cx$ (D) $xy = c$

3) The Integrating Factor of the differential equation $(\tan^{-1}y - x)\,dy = (1 + y^2)\,dx$ is _____.

(A) $e^{\tan^{-1}y}$ (B) $\frac{1}{1+y^2}$

(C) $e^{\frac{1}{1+y^2}}$ (D) $\tan^{-1}y$

4) The angle 'θ' between the vectors $\vec{a} = \hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = \hat{i} + \hat{j} - \hat{k}$ is _____.

(A) $\sin^{-1}\left(-\frac{1}{3}\right)$ (B) $\cos^{-1}\left(-\frac{1}{3}\right)$

(C) $\sin^{-1}\frac{1}{3}$ (D) $\cos^{-1}\frac{1}{3}$

(Space for Rough Work)

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5) The area of a parallelogram, whose adjacent sides are given by the vectors $\vec{a} = 2\hat{i} + 3\hat{j} + 4\hat{k}$ and $\vec{b} = -\hat{j} - 2\hat{k}$, is _____.

(A) $2\sqrt{3}$ (B) $\sqrt{6}$

(C) 24 (D) $2\sqrt{6}$

6) The value of $\hat{j} \cdot (\hat{i} \times \hat{k}) + \hat{i} \cdot (\hat{j} \times \hat{j}) + \hat{k} \cdot (\hat{j} \times \hat{i}) + \hat{i} \cdot (\hat{k} \times \hat{j})$ is _____.

(A) –4 (B) –2

(C) –3 (D) –1

7) The angle, between the pair of lines, given by $\frac{x-3}{1} = \frac{y-2}{2} = \frac{z+4}{2}$ and $\frac{x-5}{3} = \frac{y+2}{2} = \frac{z}{6}$ is _____.

(A) $\cos^{-1}\left(-\frac{19}{21}\right)$ (B) $\cos^{-1}\left(\frac{19}{21}\right)$

(C) $\sin^{-1}\left(\frac{19}{21}\right)$ (D) $\cos^{-1}\left(\frac{\sqrt{19}}{21}\right)$

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8) If the lines $\frac{x-1}{-3} = \frac{y-2}{2k} = \frac{z-3}{2}$ and $\frac{x-1}{3k} = \frac{y-1}{1} = \frac{6-z}{5}$ are perpendicular, then the value of k is _____.

(A) $-\frac{10}{7}$ (B) $-\frac{7}{10}$

(C) $\frac{10}{7}$ (D) $\frac{7}{10}$

9) The Cartesian equation of the line which passes through the point (1, –3, 5) and parallel to the line given by $\frac{x+3}{3} = \frac{y-4}{5} = \frac{z+8}{6}$ is :

(A) $\frac{x-1}{-3} = \frac{y+3}{4} = \frac{z-5}{-8}$ (B) $\frac{x-1}{3} = \frac{y+3}{5} = \frac{z-5}{6}$

(C) $\frac{x+3}{-3} = \frac{y-4}{4} = \frac{z+8}{-8}$ (D) $\frac{x+3}{1} = \frac{y-4}{-3} = \frac{z+8}{5}$

10) The coordinates of the corner points of the bounded feasible region are (0, 6), (3, 3), (9, 9), (0, 12). The maximum of the objective function $z = 6x + 12y$ is :

(A) 166 (B) 152

(C) 144 (D) 162

(Space for Rough Work)

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11) Minimise objective function $z = 7x + 3y$ subject to the constraints :

$x + y \leq 5, x + y \geq 10, x \geq 0, y \geq 0$ is :

(A) No feasible region and hence no feasible solution

(B) 15

(C) 70

(D) 35

$z = 7x + 3y$

$x + y \leq 5$

$x + y \geq 10$

12) If, for independent events A and B, $P(A) = p$, $P(B) = \frac{1}{2}$ and $P(A \cup B) = \frac{3}{5}$ are given then, the value of p is _____.

(A) $\frac{1}{3}$

(B) $\frac{1}{10}$

(C) $\frac{3}{5}$

(D) $\frac{1}{5}$

13) The probability of obtaining an even prime number on each die, when a pair of dice is rolled is :

(A) $\frac{1}{36}$

(B) $\frac{1}{3}$

(C) $\frac{1}{12}$

(D) 0

(Space for Rough Work)

$P(A) = p$

$P(B) = \frac{1}{2}$

$P(A \cup B) = \frac{3}{5}$

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14) If A and B are two events such that $P(B) \neq 0$ and $P(A \mid B) = 1$, then _____.

(A) $B \neq \phi$ (B) $B \subset A$

(C) $A \neq \phi$ (D) $A \subset B$

15) The relation $R = \{(a, a), (b, b), (c, c), (a, c)\}$, is defined on the set $\{a, b, c\}$, is _____.

(A) An equivalence relation

(B) Reflexive and transitive but not symmetric

(C) Transitive and symmetric but not reflexive

(D) Reflexive and symmetric but not transitive

16) $f: Z \to Z, f(x) = x^3 + 2$ is defined then function f is _____.

(A) Neither one - one nor onto

(B) One - one but not onto

(C) Not one - one but onto

(D) One - one and onto

(Space for Rough Work)

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30 - π/6 60 - π/3
90 - π/2

17) If $y = \tan^{-1}x$ then _____.

(A) $-\pi/2 \le y \le \pi/2$ (B) $0 \le y \le \pi$

(C) $-\pi/2 < y < \pi/2$ (D) $0 < y < \pi$

18) The value of $\tan^{-1}(-1) + \sec^{-1}(-2) + \sin^{-1}\left(\frac{1}{\sqrt{2}}\right)$ is _____.

(A) $2\pi/3$ (B) $-\pi/6$

(C) π (D) $-\pi/3$

19) $\sin^{-1}\left(\sin\frac{23\pi}{6}\right) =$ _____.

(A) $-5\pi/6$ (B) $-\pi/6$

(C) $23\pi/6$ (D) $\pi/6$

20) If A is square matrix such that $A^2 = A$, then $(I-A)^3 - (I+A)^2 =$ _____.

(A) 0 (B) $2(I-A)$

(C) I (D) $I-A$

(Space for Rough Work)

$\tan^{-1}\left(-\frac{\pi}{6}\right) +$

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21) If $A = \begin{bmatrix} \sin\alpha & -\cos\alpha \\ \cos\alpha & \sin\alpha \end{bmatrix}$ and $A + A' = I$, then the value of $\cos\alpha$ is _____.

(A) 0 (B) $\frac{1}{2}$

(C) -1 (D) $\frac{\sqrt{3}}{2}$

22) If $A = \begin{bmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{bmatrix}$ then $I + A^2 =$ _____.

(A) $-I$ (B) 0

(C) A (D) I+A

23) If area of ΔPQR is 3 sq. units with vertices P (k, 1), Q (2, 4) and R (1, 1). Then value of k is _____.

(A) 1, 3 (B) –3, 1

(C) –1, 3 (D) 0, 2

24) If $\begin{vmatrix} 2017 & 2018 \\ 2019 & 2020 \end{vmatrix} + \begin{vmatrix} 2021 & 2022 \\ 2023 & 2024 \end{vmatrix} = 2k$, then $k^3 =$ _____.

(A) –64 (B) –8

(C) 0 (D) 8

(Space for Rough Work)

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25) If $A = \begin{bmatrix} 2 & -4 \\ -3 & 6 \end{bmatrix}$ then $A^{-1} =$ _____.

(A) Does not exist

(B) $\frac{1}{24}\begin{bmatrix} -2 & 4 \\ 3 & -6 \end{bmatrix}$

(C) $\frac{1}{24}\begin{bmatrix} -6 & 4 \\ 3 & -2 \end{bmatrix}$

~~(D)~~ $\frac{1}{24}\begin{bmatrix} 6 & 4 \\ 3 & 2 \end{bmatrix}$

26) If function f is continuous at point $x = \pi/2$ and $f(x) = \begin{cases} \frac{2k\cos x}{\pi - 2x}, & x \neq \pi/2 \\ 2024, & x = \pi/2 \end{cases}$; then the value of k is _____.

(A) 4048

(B) 1012

(C) 2024

(D) 506

27) $\frac{d}{dx}\left(e^{x\log x} + e^3\right) =$ _____.

(A) $x^x(1 + \log x) + e^3$

(B) $(1 + \log x)$

~~(C)~~ $x^x \log x$

(D) $x^x(1 + \log x)$

(Space for Rough Work)

$e^{\log x^x} + e^3$

$\log x^x + e^3$

$\pi - 2x$

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28) If $x = a(1 - \cos\theta), y = a(\theta + \sin\theta)$ then $\frac{dy}{dx} =$ _____.

(A) $-\tan \theta/2$

(B) $\cot \theta/2$

(C) $-\cot \theta/2$

(D) $\tan \theta/2$

29) If $\frac{d^2y}{dx^2} - my = 0$ satisfies for $y = 7\sin x + 5\cos x$ then the value of m is _____.

(A) -2

(B) 1

(C) -1

(D) 0

30) The rate of change of the surface area of a sphere with respect to its radius r, when $r = 6$ cm, is _____ cm^2/s.

(A) 144π

(B) 24π

(C) 48π

(D) 12π

(Space for Rough Work)

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31) For function $f(x) = \sin 3x$; $x \in \left[0, \frac{\pi}{2}\right]$, f is _____.

(A) Increasing in $\left[0, \pi/6\right)$ and decreasing in $\left(\pi/6, \pi/2\right)$

(B) Increasing in $\left[0, \frac{\pi}{2}\right]$

(C) Decreasing in $\left[0, \pi/6\right)$ and increasing in $\left(\pi/6, \pi/2\right)$

(D) Decreasing in $\left[0, \frac{\pi}{2}\right]$



32) The absolute maximum value of the function $f(x) = \sin x + \cos x$, $x \in [0, \pi]$ is _____.

(A) $\sqrt{2}$ (B) 0

(C) 1 (D) $\frac{1}{\sqrt{2}}$

33) $\int \frac{e^{2x}-1}{e^{2x}+1}\,dx =$ _____ + C

(A) $\log(e^{2x}-1) - x$ (B) $\log(e^{2x}-1) + x$

(C) $\log(e^{2x}+1) + x$ (D) $\log(e^{2x}+1) - x$

(Space for Rough Work)

$\sin x + \cos x$

$\cos x \cdot \sin x$

first $\Rightarrow$ $\cos(0) \cdot \sin(0)$

$1 - 0$

(1)

$\cos(\pi) - \sin(\pi)$

$\cos(\pi/2) - \sin(\pi/2)$

$1 - (-1)$

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34) $\int \frac{1}{\sqrt{4x - x^2}}\, dx =$ _____ + C

(A) $\frac{1}{4} \log \left| \frac{x}{x-4} \right|$

(B) $\sin^{-1}\left(\frac{x-2}{2}\right)$

(C) $\log \left| (x-2) + \sqrt{4x - x^2} \right|$

(D) $\frac{1}{2} \tan^{-1}\left(\frac{x-2}{2}\right)$

35) $\int e^x \left(\frac{1 + \sin x}{1 + \cos x}\right) dx =$ _____ + C

(A) $e^x \cot x$

(B) $e^x \tan \frac{x}{2}$

(C) $e^x \cot \frac{x}{2}$

(D) $e^x \tan x$

36) $\int_{-\pi/2}^{\pi/2} \left(x^5 - x^3 \cos x + \sin^3 x - 3\right) dx =$ _____

(A) 0

(B) 3π

(C) -3π

(D) $-\pi$

(Space for Rough Work)

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37) $\int_0^1 x e^x \, dx =$ _____

(A) -1 (B) 1

(C) e (D) 0

38) Area lying in the first quadrant and bounded by ellipse $9x^2 + 16y^2 = 1$ is _____

(A) 3π (B) $\frac{\pi}{12}$

(C) 12π (D) $\frac{\pi}{48}$

39) Area of the region bounded by the curve $x^2 = 4y$, X-axis and the line $x = 3$ is _____.

(A) $\frac{9}{2}$ (B) $\frac{9}{4}$

(C) $\frac{9}{3}$ (D) 2

40) The area bounded by the curve $y = \cos x$ between $x = -\pi/2$ and $x = \pi/2$ is _____

(A) 2 (B) 1

(C) 0 (D) 4

(Space for Rough Work)

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