MATHS

BOOKS - BITSAT GUIDE

QUESTION-PAPERS-2013

Mathematics

1. The value of $\sum_{k=1}^{6}\left(\sin\frac{2\pi k}{7}-i\cos\frac{2\pi k}{7}\right)$ is

A. -1

B. 0

C. $-i$

D. i

Answer: D

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2. The mean life of a sample of 60 bulbs was 650 and the standard deviation was 8 h. A second sample of 80 bulbs has a mean life of 660 h and standard deviation 7h. Find the over all standard deviation.

A. 8.97

B. 8.98

C. 8.94

D. None of the above

Answer: C

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3. Let R be the relation on the set R of all real numbers, defined by $a \to b$ if $|a - b| \leq 1$. Then, R is

A. Reflexive and symmetric only

B. Reflexive and transitive only

C. Equivalence

D. None of the above

Answer: A

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4. $\int_1^{10\pi} \left(\left[\sec^{-1} x \right] + \left[\cot^{-1} x \right] \right) dx$, where [.] denotes the greatest integer function, is equal to:

A. $10\pi - \tan^{-1} x$

B. $8\pi - \sec 1$

C. $10\pi - \sec 1$

D. $10\pi + \sec 1$

Answer: C

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5. The value of the expression $\sin\left[\cot^{-1}\left(\cos\left(\tan^{-1}1\right)\right)\right]$ is

A. 0

B. 1

C. $\frac{1}{\sqrt{3}}$

D. $\sqrt{\frac{2}{3}}$

Answer: D

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6. Sum of the series $1 + 2.2 + 3.2^2 + 4.2^3 + \ldots + 100.2^{99}$ is

A. $100 \cdot 2^{100} + 1$

B. $99 \cdot 2^{100} + 1$

C. $99 \cdot 2^{99} - 1$

D. $100 \cdot 2^{100} - 1$

Answer: B

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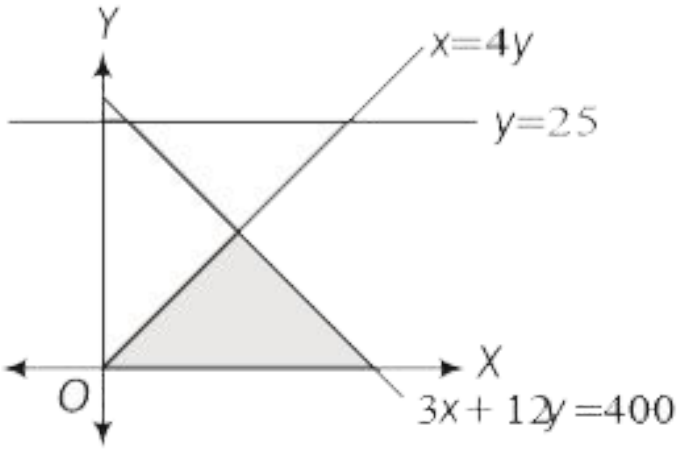
7. The shaded region given below represents the constraints (other than $x \geq 0, y \geq 0$)



A. $3x + 4y \leq 400, y \leq 25, x \leq 4y$

B. $3x + 12y \geq 400, y \leq 25, x \geq 4y$

C. $3x + 12y \leq 400, y \leq 25, x \geq 4y$

D. None of the above

Answer: C

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8. The coefficient of x^n in the expansion of $\log_e\left(\frac{1}{1+x+x^2+x^3}\right)$, when n is odd is

A. $-\frac{2}{n}$

B. $-\frac{1}{n}$

C. $\frac{1}{n}$

D. None of these

Answer: B

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9. The maximum value of $f(x) = \frac{\log x}{x} (x \neq 0, x \neq 1)$ is

A. 1

B. $\frac{2}{e}$

C. e

D. $\frac{1}{e}$

Answer: D

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10. Let $\vec{a}$, $\vec{b}$ and $\vec{c}$ be non-zero vectors such that no two are collinear and

$$\left(\vec{a} \times \vec{b}\right) \times \vec{c} = \frac{1}{3}\left|\vec{b}\right|\left|\vec{c}\right|\vec{a}$$

If θ is the acute angle between the vectors $\vec{b}$ and $\vec{c}$ then $\sin\theta$ equals

A. $\frac{2\sqrt{2}}{3}$

B. $\frac{\sqrt{2}}{3}$

C. $\frac{2}{3}$

D. $\frac{1}{2}$

Answer: A

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11. $\lim_{x \to 0} \left(\frac{1 + 5x^2}{1 + 3x^2} \right)^{1/x^2} =$

A. e^2

B. e

C. $\frac{1}{e}$

D. $\frac{1}{e^2}$

Answer: A

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12. An object is observed from the points A, B and C lying in a horizontal straight line which passes directly underneath the object. The angular elevation at B is twice that at A and at C three times that at A. If AB=a, BC=b, then the height of the object is

A. $\frac{3a}{2b}\sqrt{(a+b)(3b-a)}$

B. $\frac{3b}{2a}\sqrt{(a+b)(3a-b)}$

C. $\frac{a}{2b}\sqrt{(a+b)(3b-a)}$

D. None of the above

Answer: C

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13. The function $f:(-\infty,-1)\to\left(0,e^5\right]$ defined by $f(x)=e^{x^{3-3x+2}}$ is

A. many-one and onto

B. many-one and into

C. one-one and onto

D. one-one and into

Answer: D

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14. The foci of the conic $25x^2 + 16y^2 - 150x = 175$ are :

A. $(0, \pm 3)$

B. $(0, \pm 2)$

C. $(3, \pm 3)$

D. $(0, \pm 1)$

Answer: C

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15. The system of equations $x - y + 3z = 4, x + z = 2\ x + y - z = 0$ has

A. A unique solution

B. Finitely many solution

C. Infinitely many solutions

D. None of the above

Answer: C

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16. The sum of the sequence upto 5, 55, 555, ... upto n infinite terms is

A. $\frac{5}{9}\left[\frac{10(10^n - 1) + n}{9}\right]$

B. $\frac{5}{9}\left[\frac{10(10^n - 1)}{9} - n\right]$

C. $\frac{5}{9}\left[\frac{10\left(10^{n \pm 1} - 1\right)}{9} - n\right]$

D. $\frac{5}{9}\left[\frac{10\left(10^{n-1}-1\right)}{9}-n\right]$

Answer: B

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17. A plane passes through the point (1,-2,3) and is parallel to the plane $2x-2y+z=0$. The distance of the point (-1,2,0) from the plane, is

A. 2

B. 3

C. 4

D. 5

Answer: D

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18. Distance between the pair of lines represented by the equation $x^2 - 6xy + 9y^2 + 3x - 9y - 4 = 0$, is

A. $\frac{15}{\sqrt{10}}$

B. $\frac{1}{2}$

C. $\sqrt{\frac{5}{2}}$

D. $\frac{1}{\sqrt{10}}$

Answer: C

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19. If $A = \{x \in \mathbb{C} : x^4 - 1 = 0\}$

$B = \{x \in \mathbb{C} : x^2 - 1 = 0\}$

$C = \{x \in \mathbb{C} : x^2 + 1 = 0\}$

Where $\mathbb{C}$ is complex plane.

A. $A = B \cup C$

B. $C = A \cap B$

C. $B = A \cap C$

D. $A = B \cap C$

Answer: A

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20. The general solution of the differential equation $\frac{dy}{dx} + \frac{\sin(x+y)}{2} = \frac{\sin(x-y)}{2}$ is (a) $(b)(c)\log\tan\left((d)(e)(f)\frac{y}{g}2(h)(i)(j)\right) = c - 2\sin x(k)$ (l) (m) *[Math Processing Error]* (ee) (ff) *[Math Processing Error]* (uu) (vv) $(ww)(\times)\log\tan\left((yy)(zz)(aaa)\frac{y}{bbb}4(ccc)(ddd) + (eee)\frac{\pi}{fff}4(ggg)(hhh)\right.$ (rrr)

A. $\log\tan\left(\frac{y}{2}\right) = C - 2\sin x$

B. $\log\tan\left(\frac{y}{4}\right) = C - 2\sin\left(\frac{x}{2}\right)$

C. $\log\tan\left(\frac{y}{2} + \frac{\pi}{4}\right) = C - 2\sin x$

D. None of the above

Answer: B

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21. The set of all real x satisfying the inequality $\frac{3-|x|}{4-|x|} \geq 0$

A. $[-3, 3] \cup (-\infty, -4) \cup (4, \infty)$

B. $(-\infty, -4) \cup (4, \infty)$

C. $(-\infty, -3) \cup (4, \infty)$

D. $(-\infty, -3) \cup (3, \infty)$

Answer: A

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22. If N is any four digit number say x_1, x_2, x_3, x_4, then the maximum value ofis equal to $\frac{N}{x_1 + x_2 + x_3 + x_4}$ is equal to

A. 1000

B. $\frac{1111}{4}$

C. 800

D. None of these

Answer: A

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23. If A and B are two events such that $P(A) = 0.6, P(B) = 0.2$ and $P\left(\frac{A}{B}\right) = 0.5$, then $P\left(\frac{A'}{B'}\right)$ equal to

A. $\frac{1}{10}$

B. $\frac{3}{10}$

C. $\frac{3}{8}$

D. $\frac{6}{7}$

Answer: C

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24. What is quartile deviation for the datsa

x	2	3	4	5	6
f	3	4	8	4	1

A. 0

B. $\frac{1}{4}$

C. $\frac{1}{2}$

D. 1

Answer: D

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25. If $\int f(x)\cos x dx = \frac{1}{2}f^2(x) + C$, then $f(x)$ can be

A. x

B. 1

C. $\cos x$

D. $\sin x$

Answer: D

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26. There are 10 points in a plane, out of which 6 are collinear. If N is the number of triangles formed by joining these points, then :

A. $n \leq 100$

B. $100 < n < 140$

C. $140 < n \leq 190$

D. $n > 190$

Answer: A

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27. Find the value of

$$\frac{{}^8C_0}{6} - {}^8C_1 + {}^8C_2 \times 6 - {}^8C_3 \times 6^2 + \ldots\ldots + {}^8C_8 6^7$$

A. 0

B. 6^7

C. 6^8

D. $\frac{5^8}{6}$

Answer: D

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28. A committee of 4 students is selected at random from a grourp consisting of 8 boys and 4 girls. Given that there is at least one girl in the committee, calculate the probability that there are exactly 2 girls in the committee.

A. $\frac{68}{125}$

B. $\frac{56}{165}$

C. $\frac{63}{625}$

D. $\frac{168}{425}$

Answer: D

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29. What are the values of c for which Rolle's theorem for the function $f(x) = x^3 - 3x^2 + 2x$ in the interval $[0, 2]$ is verified?

A. $c = \pm 1$

B. $c + 1 \pm \frac{1}{\sqrt{3}}$

C. $c = \pm 2$

D. None of these

Answer: B

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30. If $\int \frac{4}{\sin^4 x + \cos^4 x} dx = a \tan^{-1}\left(\frac{\tan x - \frac{1}{\tan x}}{b}\right) + C$, then find the value of a and b, respectively.

A. $2\sqrt{2}, \sqrt{2}$

B. $\sqrt{2}, 2$

C. $\sqrt{3}, \sqrt{2}$

D. $\sqrt{2}, 4$

Answer: A

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31. If $A = \begin{bmatrix} -5 & -8 & 0 \\ 3 & 5 & 0 \\ 1 & 2 & -1 \end{bmatrix}$, then A is

A. idempotent

B. nilpotent

C. involutory

D. periodic

Answer: C

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32. The radius of the circle passing through the foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ and having its centre (0, 3) is

A. 4

B. $\frac{3}{7}$

C. $\sqrt{12}$

D. $\frac{7}{2}$

Answer: A

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33. Let L be the line of intersection of the planes $2x + 3y + z = 1$ and $x + 3y + 2z = 2$. If L makes an angles $\alpha$with the positive x-axis, then cos α equals $\frac{1}{\sqrt{3}}$ $\frac{1}{2}$ 1 $\frac{1}{\sqrt{2}}$

A. $\frac{1}{2}$

B. 1

C. $\frac{1}{\sqrt{2}}$

D. $\frac{1}{\sqrt{3}}$

Answer: D

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34. If OAB is an equilateral triangle inscribed in the parabola $y^2 = 4ax$ with O as the vertex, then the length of the side of the ΔOAB is

A. $8a\sqrt{3}$

B. $4a\sqrt{3}$

C. $2a\sqrt{3}$

D. $a\sqrt{3}$

Answer: A

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35. If $f(x+y)=f(x)f(y)$ for all x,y and $f(0)\neq 0,$ and $F(x)=\frac{f(x)}{1+(f(x))^2}$ then:

A. even function

B. odd function

C. odd, if $f(x)>0$

D. neither even nor odd

Answer: A

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36. If $f(x) = \left(\tan^{-1} x\right)^2 + \frac{2}{\sqrt{x^2+1}}$ then f(x) is increasing in

A. $(0, \infty)$

B. $(-\infty, 0)$

C. $(-\infty, -5)$

D. None of these

Answer: A

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37. Find the number of solutions of $\cos x = |1 + \sin x|, 0 \leq x \leq 3\pi$

A. 1

B. 2

C. 3

D. 4

Answer: C

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38. If a, b c are in GP and $a^{\frac{1}{x}} = b^{\frac{1}{y}} = c^{\frac{1}{z}}$, then x, y, z are in

A. AP

B. GP

C. HP

D. None of these

Answer: A

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39. The angle between the lines whose directionn cosines are given by $2l - m + 2n = 0, lm + mn + nl = 0$ is

A. $\frac{\pi}{6}$

B. $\frac{\pi}{4}$

C. $\frac{\pi}{3}$

D. $\frac{\pi}{2}$

Answer: D

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40. The equation of the lines through ((1,1) and making angles of 45° with the line x+y=0 are

A. $x - 1 = 0, x - y = 0$

B. $x - y = 0, y - 1 = 0$

C. $x + y - 2 = 0, y - 1 = 0$

D. $x-1=0, y-1=0$

Answer: D

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41. Determine the area of the figure bounded by two branches of the curve $(y-x)^2=x^3$ and the straight line $x=1$.

A. $\frac{4}{5}$ sq unit

B. $\frac{4}{7}$ sq unit

C. $\frac{4}{9}$ sq unit

D. $\frac{4}{11}$ sq unit

Answer: A

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42. If $(x+iy)^{1/3}=2+3i,$ then $3x+2y$ is equal to

A. -20

B. -60

C. -120

D. 60

Answer: C

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43. In a town of 10,000 families it was found that 40% family buy newspaper A, 20% buy newspaper B and 10% families buy newspaper C, 5% families buy A and B, 3% buy Band Cand 4% buy A and C. If 2% families buy all the three newspapers, then number of families which buyA only is

A. 3100

B. 3300

C. 2900

D. 1400

Answer: B

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44. If $\left|\vec{a}\right| = 2\left|\vec{b}\right| = 5$ and $\left|\vec{a} \times \vec{b}\right| = 8$, then $\left|\vec{a} . \vec{b}\right|$ is equal to :

A. 3

B. 4

C. 5

D. 6

Answer: D

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45. The equation of circle which passes through the origin and cuts off intercepts 5 and 6 from the positive parts of the x-axis and y-axis respectively is $\left(x-\frac{5}{2}\right)^2=(y-3)^2=\lambda$, where λ is

A. $\frac{61}{4}$

B. $\frac{4}{6}$

C. $\frac{1}{4}$

D. 0

Answer: A

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