MATHS

BOOKS - SAI MATHS (TELUGU ENGLISH)

SAMPLE PAPER 2017

Mathematics

1. If $\tan 20^\circ = \lambda$, then $\frac{\tan 160^\circ - \tan 110^\circ}{1 + (\tan 160^\circ)(\tan 110^\circ)}$ =

A. $\frac{1+\lambda^2}{2\lambda}$

B. $\frac{1+\lambda^2}{\lambda}$

C. $\frac{1-\lambda^2}{\lambda}$

D. $\frac{1-\lambda^2}{2\lambda}$

Answer: D

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2. Consider the circle $x^2 + y^2 - 6x + 4y = 12$ the equations of a tangent of this circle that is parallel to the line $4x + 3y + 5 = 0$ is

A. 4x +3y +10 =0

B. 4x +3y -9 =0

C. 4x +3y +9 =0

D. 4x +3y -31 =0

Answer: D

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3. The mean deviation from the mean 10 of the data 6,7,11,12,13,alpha ,12,16` is

A. 3.5

B. 3.25

C. 3

D. 3.75

Answer: B

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4. Match the following

List - 1	List - II
I) $\int_{-1}^{1} x\|x\|dx$	a) $\frac{\pi}{2}$
II) $\int_0^{\frac{\pi}{2}} \left(1+\log\left(\frac{4+3\sin x}{4+3\cos x}\right)\right)dx$	b) $\int_0^{\frac{\pi}{2}} f(x)dx$
III) $\int_0^a f(x)dx$	c) $\int_0^a [f(x)+f(-x)]dx$
IV) $\int_{-a}^a f(x)dx$	d) 0
	e) $\int_0^a f(a-x)dx$

A. d a e c

B. d a c b

C. d c a e

D. a d b c

Answer: A

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5. If f is differentiable , $f(x+y) = f(x)f(y)$ for all $x, y \in R$, f(3) =3, f'(0) = 11, then f'(3) =

A. 3/11

B. 11/3

C. 8

D. 33

Answer: D

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6. $\int_0^{\pi} \frac{xdx}{4\cos^2 x + 9\sin^2 x} =$

A. $\frac{\pi^2}{12}$

B. $\frac{\pi^2}{4}$

C. $\frac{\pi^2}{6}$

D. $\frac{\pi^2}{3}$

Answer: A

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7. If $A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & -1 & 4 \end{bmatrix}$, $A = B + C$, $B = B^T$ and $C = -C^T$, then C=

A. $\begin{bmatrix} 0 & 0.5 & 0 \\ -0.5 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$

B. $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0.5 \\ 0 & -0.5 & 0 \end{bmatrix}$

C. $\begin{bmatrix} 0 & -0.5 & 0.5 \\ 0.5 & 0 & 0 \\ -0.5 & 0 & 0 \end{bmatrix}$

D. $\begin{bmatrix} 0 & 0.5 & 0 \\ -0.5 & 0 & 0.5 \\ 0 & -0.5 & 0 \end{bmatrix}$

Answer: B

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8. IF a is a unit vector , then $\left|a \times \hat{i}\right|^2 + \left|a \times \hat{j}\right|^2 + \left|a \times \hat{k}\right|^2 =$

A. 2

B. 4

C. 1

D. 0

Answer: A

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9. A bag contains 5 red balls , 3 black balls and 4 white balls . There balls are drawn at random. The propability that they are not of same colour is

A. 37/44

B. 31/44

C. 21/44

D. 41/44

Answer: D

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10. The radical centre of the circles

$x^2 + y^2 - 4x - 6y + 5 = 0,$

$x^2 + y^2 - 2x - 4y - 1 = 0$ and

$x^2 + y^2 - 6x - 2y = 0 = 0$ lies on the line

A. x +y -5 =0

B. 2x -4y +7 =0

C. 4x -6y +5 =0

D. 18x -12y +1=0

Answer: D

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11. If $\cos ec\theta - \cot\theta = 2017$, Then quadrant in which θ lies is

A. I

B. IV

C. III

D. II

Answer: D

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12. IF $\int e^{2x} f'(x) dx = g(x)$, then $\int \left(e^{2x} f(x) + e^{2x} f'(x)\right) dx =$

A. $\frac{1}{2}\left[e^{2x} f(x) - g(x)\right] + C$

B. $\frac{1}{2}\left[e^{2x} f(x) + g(x)\right] + C$

C. $\frac{1}{2}\left[e^{2x} f(2x) + g(x)\right] + C$

D. $\frac{1}{2}\left[e^{2x}f'(x) - g(x)\right] + C$

Answer: B

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13. IF $A = (5, 3), B = (3, -2)$ and a point P is such that the area of the triangle PAB is 9 then the locus of P represents

A. a circle

B. a pair of coincident lines

C. a pair of parallel lines

D. a pair of perpendicular lines

Answer: C

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14. A straight line makes an intercept on the Y- axis twice as long as that on X - axis and is at unit distance from the origin then the line is represented by the equations

A. $2x + 3y = \pm\sqrt{5}$

B. $x + y = \pm 2$

C. $x - y = \pm 2$

D. $2x + y = \pm\sqrt{5}$

Answer: D

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15. Let S and s' be the foci of an ellipse and B be one end of its minor axis . If SBS' is a isosceles right angled triangle then the eccentricity of the ellipse is

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

B. 1/2

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

D. 1/3

Answer: A

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16. For the parabola $y^2 + 6y - 2x + 5$ =0

I) The vertex is (-2,-3) $II)$ The directrix is y +3 =0

Which of the following is correct ?

A. Both I and II are true

B. I is true, II is false

C. Both I and II are falsse

D. I is false, II is true

Answer: B

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17. IF $\frac{x^2+5}{(x^2+1)(x-2)} = \frac{A}{x-2} + \frac{bx+C}{x^2+1}$ then A + B + C =

A. -1

B. 2/5

C. -3/5

D. 0

Answer: C

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18. IF the conjugate of $(x+iy)(1-2i)$ is (1 +i) then

A. $x+iy=1-i$

B. $x+iy=\frac{1-i}{1-2i}$

C. $x-iy=\frac{1-i}{1+2i}$

D. $x-iy=\frac{1-i}{1+i}$

Answer: B

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19. $\int x^4 e^{2x} dx =$

A. $\frac{e^{2x}}{4}\left(2x^4 - 4x^3 + 6x^2 - 6x + 3\right) + C$

B. $\frac{e^{2x}}{2}\left(2x^4 - 4x^3 + 6x^2 - 6x + 3\right) + C$

C. $\frac{e^{2x}}{8}\left(2x^4 + 4x^3 + 6x^2 + 6x + 3\right) + C$

D. $-\frac{e^{2x}}{4}\left(2x^4 + 4x^3 + 6x^2 + 6x + 3\right) + C$

Answer: A

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20. The side of a triangle are in the ratio $1 : \sqrt{3} : 2$, then the angles of the triangle are in the ratio

A. 1:2:3

B. 1:2:4

C. 1:4:5

D. 1:3:5

Answer: A

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21. The sum of the complex roots of the equations $(x-1)^2+64=0$ is

A. 6

B. 3

C. 6i

D. 3i

Answer: A

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22. The area of the region bounded by the curves $x = y^2 - 2$ and x=y is

A. 9/4

B. 9

C. 9/2

D. 9/7

Answer: C

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23. IF $a = x\hat{i} + y\hat{j} + z\hat{k}$ then $\left(a \times \hat{i}\right).\left(\hat{i} + \hat{j}\right) + \left(a \times \hat{j}\right).\left(\hat{j} + \hat{k}\right) + \left(a \times \hat{k}\right).\left(\hat{k} + \hat{i}\right) =$

A. x -y + z

B. x +y+ z

C. x + y -z

D. -x + y+ z

Answer: B

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24. If the imaginary part of $\frac{2z+1}{iz+1}$ is -2 , then the locus of the point representing z in the complex plane

A. a circle

B. a parabola

C. a straight line

D. an ellipse

Answer: C

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25. Let $f:(-1,1) \to IR$ be a differentiable function with f(0) =- 1 and f'(0) =1 IF $g(x) = \{f(2f(x)+2)\}^2$, then $g'(0)$ =

A. 0

B. -2

C. 4

D. -4

Answer: D

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26. IF the perpendicular distance between the point (1,1) to the line $3x + 4y + c = 0$ is 7, then the possible values of c are

A. -35, 42

B. 35,28

C. 42,-28

D. 28,-42

Answer: D

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27. The solution of $\frac{dy}{dx} = \frac{x+y}{x-y}$ is

A. $\tan^{-1}\left(\frac{y}{x}\right) = \log\sqrt{x^2+y^2} + C$

B. $\tan^{-1}\left(\frac{y}{x}\right) = \log\sqrt{x^2-y^2} + C$

C. $\sin^{-1}\left(\frac{y}{x}\right) = \log\sqrt{x^2+y^2} + C$

D. $\cos^{-1}\left(\frac{y}{x}\right) = \log\sqrt{x^2-y^2} + C$

Answer: A

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28. If $\frac{x^2}{a^2} + y^2b^2 = 1$, then $d^2\frac{y}{dx^2}$ =

A. $-\frac{b^4}{a^2y^3}$

B. $\frac{b^2}{ay^2}$

C. $-\frac{b^3}{a^2y^3}$

D. $\frac{b^3}{a^2y^3}$

Answer: A

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29. $\lim_{y \to 1} \left(\frac{1}{y^2 - 1} - \frac{2}{y^4 - 1} \right) =$

A. 1/2

B. 1/3

C. 1/4

D. 0

Answer: A

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30. The solution of $\left(y-3x^2\right)dx$ +xdy =0 is

A. $y(x)=\sin x+\frac{1}{x^2}+C$

B. $y(x)=\cos x-\frac{1}{x^2}+C$

C. $y(x)=x^2+\frac{C}{x}$

D. $y(x)=\sqrt{x}+\frac{C}{x}$

Answer: C

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31. If the coefficients of (2r +1) thterm and $(r+1)^{th}$ term in the expansion of $(1+x)^{42}$ are equal then r can be

A. 12

B. 14

C. 16

D. 20

Answer: B

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32. A point on the plane that passes through the points $(1, -1, 6), (0, 0, 7)$ and perpendicular to the plane $x - 2y + z = 6$ is

A. (1,-1,2)

B. (1,1,2)

C. (-1,1,2)

D. (1,1,-2)

Answer: B

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33. If the slope of the tangent of the curce $y = ax^3 + bx + 4at$ (2,14) is 21 then the values of a and b respectively

A. 2,-3

B. 3,-2

C. -3,-2

D. 2,3

Answer: A

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34. Let f(x) be a quadratic expression such that $f(0)+f(1)=0$. If $f(-2)=0$ then

A. f(-2/5)=0

B. f(2/5) =0

C. f(-3/5) =0

D. f(3/5) =0

Answer: D

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35. The equation of tangent to the curve $\left(\frac{x}{a}\right)^n + \left(\frac{y}{b}\right)^n =$ 2at the point (a,b) is

A. $\frac{x}{a} = -\frac{y}{b}$

B. $\frac{x}{a} + \frac{y}{b} = 2$

C. $\frac{x}{a} = \frac{y}{b}$

D. $\frac{x}{a} + \frac{y}{b} = n$

Answer: B

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36. IF the line $x + y + k = 0$ is a normal to the hyperbola $\frac{x^2}{9} - \frac{y^2}{4} = 1$ then $k =$

A. $\pm \frac{\sqrt{5}}{13}$

B. $\pm \frac{13}{\sqrt{5}}$

C. $\pm \frac{13}{5}$

D. $\pm \frac{5}{13}$

Answer: B

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37. The product of all the real roots of $x^2 - 8x + 9 - \frac{8}{x} + \frac{1}{x^2} = 0$ is

A. 2

B. 1

C. 3

D. 7

Answer: B

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38. If $\Delta = \begin{bmatrix} 1 & 5 & 6 \\ 0 & 1 & 7 \\ 0 & 0 & 1 \end{bmatrix}$ and $\Delta' \begin{bmatrix} 1 & 0 & 1 \\ 3 & 0 & 3 \\ 4 & 6 & 100 \end{bmatrix}$, then

A. $\Delta^2 - 3\Delta' = 0$

B. $\left(\Delta + \Delta^1\right)^2 - 3(\Delta + \Delta') + 2 = 0$

C. $\left(\Delta + \Delta^1\right)^2 + 3\left(\Delta + \Delta^1\right) + 5 = 0$

D. $\Delta + 3\Delta' + 1 = 0$

Answer: B

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39. A village has 10 players . A team of 6 players is to be formed . 5 members are chosen out of these 10 players from the remaining players . Them total number of ways of choosing such teams is

A. 1260

B. 210

C. $(10c_6)5!$

D. $(10c_5)6$

Answer: A

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40. The equation of the straight line passing through the point of intersection of $5x - 6y - 1$, $3x + 2y + 5 = 0$ and perpendicular to the line $3x - 5y + 11 = 0$ is

A. 5x+3y +18 =0

B. -5x -3y +18 =0

C. 5x + 3y +8 =0

D. 5x +3y -8 =0

Answer: C

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41. An integer is choosen from $\left\{2\frac{k}{9} \leq k \leq 10\right\}$. The probability that it is divided by both 4 and 6 is

A. 1/10

B. 1/20

C. 1/4

D. 3/20

Answer: D

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42. $\int \frac{dx}{x(x^4+1)} =$

A. $\frac{1}{4}\log\left(\frac{x^4+1}{x^4}\right)+c$

B. $\frac{1}{4}\log\left(\frac{x^4}{x^4+1}\right)+c$

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

D. $\frac{1}{4}\log\left(\frac{x^4}{x^4+2}\right)+c$

Answer: B

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43. $\frac{\sin^{-1}\left(\sqrt{3}\right)}{2}+\sin^{-1}\sqrt{\frac{2}{3}}=$

A. $\frac{\sin^{-1}\left(\sqrt{3}+\sqrt{2}\right)}{2\sqrt{3}}$

B. $\pi-\sin^{-1}\left(\frac{\sqrt{3}+\sqrt{2}}{2\sqrt{3}}\right)$

C. $-\pi-\sin^{-1}\left(\frac{\sqrt{3}+\sqrt{2}}{2\sqrt{3}}\right)$

D. $\pi + \sin^{-1}\left(\frac{\sqrt{3}+\sqrt{2}}{2\sqrt{3}}\right)$

Answer: B

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44. α and β are the roots of $x^2 + 2x + C = 0$. If $aplha^3 + \beta^3 = 4$, then the value of C is

A. -2

B. 3

C. 2

D. 4

Answer: C

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45. If the slope of the tangent to the circles S = $x^2 + y^2 - 13 = 0$ at (2,3) is m, then the point (m, -1/m) is

A. an external point with respect to the circle S =0

B. an internal point with respect to the circle S =0

C. the centre of the circle S=0

D. a point on the circle S =0

Answer: B

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46. Using the letters of the word TRICK , a five letter word with distinct letters is formed such that C is in the middle . In how many ways this is possible ?

A. 6

B. 120

C. 24

D. 72

Answer: C

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47. The angle between the curves $x^2 = 8y$ and xy =8 is

A. $\tan^{-1}\left(-\frac{1}{3}\right)$

B. $\tan^{-1}(3)$

C. $\tan^{-1}(-\sqrt{3})$

D. $\tan^{-1}\left(-\frac{1}{\sqrt{3}}\right)$

Answer: B

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48. $f:(-\infty, 0] \to [0, \infty)$ is defined as f(x) $=x^2$. The domain and range of its inverse is

A. Domain of $\left(f^{-1}\right) = [0, \infty)$, range of $\left(f^{-1}\right) = (-\infty, 0]$

B. Domain of $\left(f^{-1}\right) = [0, \infty)$, range of $\left(f^{-1}\right) = (-\infty, \infty)$

C. Domain of $\left(f^{-1}\right) = [0, \infty)$, range of $\left(f^{-1}\right) = [0, \infty)$

D. f^{-1} doesnot exist

Answer: A

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49. If $\bar{a}, \bar{b}$ and $\bar{c}$ are unit vectors such that $\bar{a}, \bar{b}$ and $\bar{c} = 0$ and $\left(\bar{a}, \bar{b}\right) = \frac{\pi}{3}$, then

A. 3/2

B. 0

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

D. 3

Answer: C

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50. The differential equation of the simple harmonic motion given by $x = A\cos(nt + \alpha)$ is

A. $d^2xdt^2 - n^2x = 0$

B. $d^2xdt^2 + n^2x = 0$

C. $\frac{dx}{dt} - d^2\frac{x}{dt^2} = 0$

D. $d^2\frac{x}{dt^2} - \frac{dx}{dt} + nx = 0$

Answer: B

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51. If a and b are unit vectors and α is the angle between them , then a+b is unit vector when $\cos\alpha$=

A. -1/2

B. 1/2

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

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

Answer: A

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52. A parallelogram has vertices A (4,4,-1), B(5,6,-1), C(6,5,1) and D(x,y,z). Then the vertex D is

A. (5,1,0)

B. (-5,0,1)

C. (5,3,1)

D. (5,1,3)

Answer: C

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53. IF $2x^2 - 10xy + 2\lambda y^2 + 5x - 16y - 3 = 0$ represents a pair of straight lines , then point of intersection of those lines is

A. (2,-3)

B. (5,-16)

C. (-10, -7/2)

D. (-10, -3/2)

Answer: C

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54. IF rank of $\begin{pmatrix} x & x & x \\ x & x^2 & x \\ x & x & x+1 \end{pmatrix}$ is 1 , then

A. x =0 (or) x=1

B. x =1

C. x =0

D. $x \neq 0$

Answer: C

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55. If the vectors $\bar{a} = \hat{i} + \hat{j} + \hat{k}, \bar{b} = \hat{i} - \hat{j} + 2\hat{k}$ and $\bar{c} = x\hat{i} + (x-2)\hat{j} - \hat{k}$ are coplanar, then x =

A. 1

B. 2

C. 0

D. -2

Answer: D

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56. In order to eliminate the first degree terms form the equation

$4x^2 + 8xy + 10y^2 - 8x - 44y + 14 = 0$ the point to which the origin has to be shifted is

A. (-2,3)

B. (2,-3)

C. (1,-3)

D. (-1,3)

Answer: A

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57. Two circles of equal radius a cut orthogonally . If their centres are (2,3) and (5,6) then radical axis of these circles passes through the point

A. (3a ,5a)

B. (2a ,a)

C. (a, 5a/3)

D. (a,a)

Answer: C

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58. If $\tan\theta_1 = k\cot\theta_2$ then $\frac{\cos(\theta_1+\theta_2)}{\cos(\theta_1-\theta_2)} =$

A. 1+k/1-k

B. 1-k / 1+k

C. k+1/k-1

D. k-1/k+1

Answer: B

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59. Let $\bar{a} = 2\bar{i} + \bar{j} - 3\bar{k}$ and $\bar{b} = \bar{i} + 3\bar{j} + 2\bar{k}$. then the volume of the parallelopiped having coterminous edge as $\bar{a}, \bar{b}$ and $\bar{c}, where \bar{c}$ is the vector perpendicular to the plane of $\bar{a}, \bar{b}|\bar{c}| = 2$ is

A. $2\sqrt{195}$

B. 24

C. $\sqrt{200}$

D. $\sqrt{195}$

Answer: A

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60. The local maximum of $y = x^3 - 3x^3 + 5$ is attained at

A. x=0

B. x=2

C. x=1

D. x=-1

Answer: A

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61. In the expansion of $(1+x)^n$, the coefficients of pth and (p+1) th terms are respectively p and q then p+q=

A. n+3

B. n+2

C. n

D. n+1

Answer: D

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62. if f(x) = $\begin{pmatrix} x & x & x \\ x & x^2 & x \\ x & x & x+1 \end{pmatrix}$ $\begin{matrix} \text{if} & x \leq 0 \\ \text{if} & 0 < x < 1 \\ \text{if} & 1 \leq x \leq 2 \\ \text{if} & x > 2 \end{matrix}$ is continuous on R, then a+ b + ab =

A. -2

B. 0

C. 2

D. -1

Answer: D

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63. IF$\cos h^{-1}x = 2\log_e\left(\sqrt{2}+1\right)$, then x=

A. 1

B. 2

C. 4

D. 3

Answer: D

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64. For any integer $n \geq 1$, $\sum_{k=1}^{n} K(K+2)$=

A. $\frac{n(n+1)(n+2)}{6}$

B. $\frac{n(n+1)(2n+7)}{6}$

C. $\frac{n(n+1)(2n+1)}{6}$

D. $\frac{n(n-1)(2n+8)}{6}$

Answer: B

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65. The foci of the ellipse

$25x^2 + 4y^2 + 100x - 4y + 100 = 0$ are

A. $\left(\frac{5 \pm \sqrt{21}}{10}, -2\right)$

B. $\left(-2, \frac{5 \pm \sqrt{21}}{10}\right)$

C. $\left(\frac{2 \pm \sqrt{21}}{10}, -2\right)$

D. $\left(-2, \frac{2 \pm \sqrt{21}}{10}\right)$

Answer: B

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66. $\left[\frac{1+\cos\left(\frac{\pi}{12}\right)+i\sin\left(\frac{\pi}{12}\right)}{1+\cos\left(\frac{\pi}{12}\right)-i\sin\left(\frac{\pi}{12}\right)}\right]^{72}$ =

A. 0

B. -1

C. 1

D. 1/2

Answer: C

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67. If the range of the function $f(x) = -3x - 3$ is { 3,-6,-9,-18}` , then which of the following elements is not in the domain of f ?

A. -1

B. -2

C. 1

D. 2

Answer: A

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68. In ΔABC if a=-1,b=2, $\angle C = 60^\circ$ then $4\Delta^2 + c^2$ =

A. 6

B. 3

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

D. 9

Answer: A

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69. If the magnitudes of $\bar{a}, \bar{b}$ and $\bar{a}+\bar{b}$ are respectively 3,4 and 5, then the magnitude of $\left(\bar{a}-\bar{b}\right)$ is

A. 3

B. 4

C. 6

D. 5

Answer: D

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70. IF $\int f(x)\cos x dx = \frac{1}{2}(f(x))^2 + C$ and $f(0) = 0$ then $f'(0) =$

A. 1

B. -1

C. 0

D. 2

Answer: A

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71. IF α and βare the roots of the equation $ax^2 + bx + c = 0$ and the equation having roots $\frac{1-\alpha}{\alpha}$ and $\frac{1-\beta}{\beta}$ is $px^2 + qx + r = 0$ then r=

A. a+2b

B. ab + bc +ca

C. a +b +c

D. abc

Answer: C

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72. IF $A\left(\frac{\pi}{3}\right), B\left(\frac{\pi}{6}\right)$ are the points on the circle represented in parametric from with centre (0,0) and radius 12 then the length of the chord AB is

A. $6\left(\sqrt{6}-\sqrt{2}\right)$

B. $6\left(\sqrt{6}-\sqrt{3}\right)$

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

D. $6(\sqrt{3}-1)$

Answer: A

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73. IF the pair of straight lines $xy-x-y+1=0$ and the line $x+ay-3=0$ are concurrent then the acute angle between the pair of lines $ax^2-13xy-7y^2+x+23y-6=0$ is

A. $\cos^{-1}\left(\frac{5}{\sqrt{218}}\right)$

B. $\cos^{-1}\left(\frac{1}{\sqrt{10}}\right)$

C. $\cos^{-1}\left(\frac{5}{\sqrt{173}}\right)$

D. $\cos^{-1}\left(\frac{1}{\sqrt{5}}\right)$

Answer: B

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74. The number of solutions of $\cos 2\theta = \sin\theta$ in $(0, 2\pi)$ is

A. 4

B. 3

C. 2

D. 5

Answer: B

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75. The length of the sides of a triangle are 13 , 14 and 15 if R and r respectively denote circumradius nad inradius of that triangle then $8R + r$=

A. 84

B. 65/8

C. 4

D. 69

Answer: D

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76. IF A and B are variances of the 1^{st} 'n' even number and 1^{st} 'n' odd numbers respectively then

A. A = B

B. $A > B$

C. $A < B$

D. A = B +1

Answer: A

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77. IF the line $x - y = -4k$ is a tangent to the parabola $y^2 = 8x$ at P , then the perpendicular distance of normal at P from (k , 2k) is

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

B. $\frac{7}{2}\sqrt{2}$

C. $\frac{9}{2}\sqrt{2}$

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

Answer: C

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78. IF A and B are events having probabilities P(A) = 0.6 ,P(B) = 0.4 and $P(A \cap B) = 0$, then probability that neither A nor B occurs is

A. 1/4

B. 1

C. 1/2

D. 0

Answer: D

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Physics

1. A force F is applied in a square plate of length L . If the percentage error in the determination of L is 3% and in F in 4% then permissible error in the calculation of pressure is

A. 0.13

B. 0.1

C. 0.07

D. 0.12

Answer: B

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2. A Positive charge Q is placed on a conducting spherical shell with inner radius R_1 and outer radius R_2 . A particle with charge q is placed at the center of the spherical cavity . The magnitude of the electric field at a point in the cavity , a distance r from center is

A. zero

B. $\frac{Q}{4}\left(\pi\varepsilon_{\circ}R^2\right)$

C. $\frac{q}{4\pi\varepsilon_{\circ}r^2}$

D. $\frac{q+Q}{4\pi\varepsilon_{\circ}r^2}$

Answer: C

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3. A swimmer wants to cross a 200 m wide river which is flowing at a speed of 2 m/s. the velocity of the swimmer with respect to the river is 1 m/s. how far from the point directly opposite to the starting point does the swimmer reach the opposite bank ?

A. 200m

B. 400m

C. 600m

D. 800m

Answer: B

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4. A coil having n trurns and resistance $R\Omega$ is connected with a galvanometer of resistance $4R\Omega$ this combination is moved in time t seconds from a magnetic flux ϕ_1 weber to ϕ_2 weber The induced current in the circult is

A. $\frac{\phi_2 - \phi_1}{5Rnt}$

B. $\frac{-n(\phi_2 - \phi_1)}{5Rt}$

C. $-\frac{\phi_2 - \phi_1}{Rnt}$

D. $n\frac{\phi_2 - \phi_1}{Rt}$

Answer: B

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5. A simple pendulum of length 1 m is freely suspended from the ceiling of an elevator the time period of small oscollations as the elevator moves up with an acceleration of $2m/s^2$ is (use $g = 10m/s^2$)

A. $\frac{\pi}{\sqrt{5}}$s

B. $\sqrt{\frac{2}{5}\pi s}$

C. $\frac{\pi}{\sqrt{2}}$s

D. $\frac{\pi}{\sqrt{3}}$s

Answer: D

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6. Consider a metal ball of radius r moving at a constant velocity v in a uniform magnetic field of induction of velocity forms an angle α with the direction of $\overline{B}$, the maximum potential difference between points on the ball is

A. $r\left|\overline{B}\right||\bar{v}|\sin\alpha$

B. $\left|\overline{B}\right||\bar{v}|\sin\alpha$

C. $2r\left|\overline{B}\right||\bar{v}|\sin\alpha$

D. $2r\left|\overline{B}\right||\bar{v}|\cos\alpha$

Answer: C

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7. Each of the six ideal batteries of emf 20V is connected to an external resistance of 4Ω as shown in the figure. The current through the resistance is

A. 6A

B. 3A

C. 4A

D. 5A

Answer: A

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8. The energy that should be added to an electron to reduce its de - broglie wavelength from 1 nm to 0.5 nm is

A. four times that initial energy

B. equal to the initial energy

C. two times the initial energy

D. three - times the initial energy

Answer: D

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9. In the given circuit, a charge of $+80\mu C$ is given to upper plate of a $4\mu F$ capacitor. At steady state the charge on the

upper plate of the $3\mu F$ capacitor is:

A. $60\mu C$

B. $48\mu C$

C. $80\mu C$

D. $0\mu C$

Answer: B

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10. The young's modulus of a material is $2 \times 10^{11} N/m^2$ and its elastic limit is $1 \times 10^8 N/m^2$ for a wire of 1m length of this material , the maximum elongation achievable is

A. 0.2mm

B. 0.3mm

C. 0.4 mm

D. 0.5 mm

Answer: D

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11. A wooden box lying at rest on an inclined surface of a wet wood is held at static equilibrium by a constant force F applied perpendicular to the angle of inclination is 30° and the box and the inclined plane is 0.2 , the minimum magnitude of F is

(Use $g = 10m/s^2$)

A. 0 N, as 30° is less than angle of repose

B. $\geq 1N$

C. $\geq 3.3N$

D. $\geq 16.3N$

Answer: D

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12. A meter scale made of steel , reads accirately at $25^\circ C$ Suppose in an experiment an accuracy of 0.06 mm in 1 m is required , the range of temperature in which the experiment can be performed with this meter scale is (Coefficient of linear expansion of steel is $11 \times 10^{-6} / {}^\circ C$)

A. $19^\circ C \rightarrow 31^\circ C$

B. $25^\circ C \rightarrow 32^\circ C$

C. $18^\circ C \rightarrow 25^\circ C$

D. $18^\circ C \rightarrow 32^\circ C$

Answer: A

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13. Consider a solenoid carrying current supplied k by a DC source with a constant emf containing iron core inside it when the core is pulled out of the solenoid the change in current will

A. remain same

B. decrease

C. increase

D. modulate

Answer: C

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14. A thermocal box has a total wall area (including the lid) of 1.0 m^2 and well thickness of 3 cm . It is filled with ice at $0^\circ C$. If the average temperature outside the box is $30^\circ C$ throughout the day , the amount of ice that melts in one day is

[Use $K_{\text{themocal}} = 0.03$ W/mk ,

$L_{\text{Fusion (ice)}} = 3.00 \times 10^5 j/KG$]

A. 1 kg

B. 2.88 kg

C. 25.92 kg

D. 8.64 kg

Answer: D

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15. An AC generator 10 V (rms) at (Rms) at 200 rad //s is connected in series with a 50 Ω Resistor , a $400mH$ inductor and a $200\mu F$ capacitor . The rms voltage across the inductor is

A. 2.5V

B. 3.4V

C. 6.7V

D. 10.8V

Answer: D

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16. A wire has resistance of 3.1 Ω at 30° C and 4.5Ω at $100^\circ C$. The temperature coefficient of resistance of the wire is

A. $0.0012^\circ c^{-1}$

B. $0.0024^\circ C^{-1}$

C. $0.0032^\circ C^{-1}$

D. $0.0064^\circ C^{-1}$

Answer: D

Watch Video Solution

17. An Object is thrown vertically upward with a speed of 30 m/s . The velocity of the object half -a - second before it reaches the maximum height is

A. 4.9 m/s

B. 9.8 m/s

C. 19.6 m/s

D. 25.1 m/s

Answer: A

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18. An electron colliodes with a hydrogen atom in its ground state and excites it to n=3 state . The energy given to the hydrogen atom in this inelastic collision

(neglecting the recoil of hydrogen atom) is

A. 10.2eV

B. 12.1eV

C. 12.5eV

D. 13.6eV

Answer: B

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19. Consider the motion of a particle described by $x = a\cos t, y = a\sin t$ and $z = t$. The trajectory traced by the particle as a function of time is

A. Helix

B. Circular

C. Elliptical

D. Straight line

Answer: A

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20. Consider a reversible engine of efficiency $\frac{1}{6}$ when the temperature of the sink is reduced by $62^\circ C$, its efficiency

gets doubled . The temperature of the source and sink respectively are

A. 372K and 310K

B. 273K and 300K

C. $99^\circ C$ and $10^\circ C$

D. $200^\circ C$ and $37^\circ C$

Answer: A

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21. Consider a light source placed at a distance of 1.5 m along the axis facing the convex side of a spherical mirror of radius of curvature 1m . The position (s') nature and magnification (m) of the image are

A. s' = 0.375m, Virtual, upright, m =0.25

B. s' = 0.375m, Real, inverted, m =0.25

C. s' = 3.75m, Virtual, inverted, m =2.5

D. s' = 3.75m, Real, upright, m = 2.5

Answer: A

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22. An office room contains about 2000 moles of air . The change in the internal energy of this much air when it is cooled from $34^\circ C$ to $24^\circ C$ at constant pressure of 1.0 atm is [Use $gamm_{\text{air}} = 1.4$ and universal gas constant $= 8.314 J/mol - K$]

A. $-1.9 \times 10^5 J$

B. $+1.9 \times 10^5 J$

C. $-4.2 \times 10^5 J$

D. $+0.7 \times 10^5 J$

Answer: C

Watch Video Solution

23. A ball is thrown at a speed of 20 m/s at an angle of 30° with the horizontal . The maximum height reached by the ball is

(Use $g = 10m/s^2$)

A. 2m

B. 3m

C. 4m

D. 5m

Answer: D

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24. A beam of light propagation at an angle α_1 from a medium 1 through to another medium 2 at an angle α_2 if the wavelength of light in medium 1 is λ_1 , then the wavelength of light in medium 2, (λ_2) is

A. $\frac{\sin \alpha_2}{\sin \alpha_1 \lambda_1}$

B. $\frac{\sin \alpha_1}{\sin \alpha_2 \lambda_1}$

C. $\left(\frac{\alpha_2}{\alpha_1}\right)\lambda_1$

D. λ_1

Answer: A

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25. An amplitude moduated signal consists of a message singnal of frequency 1 KHz and peak voltage of 5 V , moduating a carrier frequency of 1 MHz and peak voltage of 15 V . The correct description of this singnal is

A. $5\left[1+3\sin\left(2\pi 10^6 t\right)\right]\sin\left(2\pi 10^3 t\right)$

B. $15\left[1+\frac{1}{3}\sin\left(2\pi 10^3 t\right)\right]\sin\left(2\pi 10^6 t\right)$

C. $\left[5+15\sin\left(2\pi 10^3 t\right)\right]\sin\left(2\pi 10^6 t\right)$

D. $\left[15+5\sin\left(2\pi 10^6 t\right)\right]\sin\left(2\pi 10^3 t\right)$

Answer: B

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26. Which of the following principles is being used in sonar technology ?

A. Newton's laws of motion

B. Reflection of electromagnetic waves

C. Laws of thermodynamics

D. Reflection of ultrasonic waves

Answer: D

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27. A particle of mass M is moving in a horizontal circle of radius R with uniform speed v. When the particle moves from one point to a diametrically opposite point , its

A. momentum does not change

B. momentum changes by 2Mv

C. kinetic energy changes by $M\frac{v^2}{4}$

D. kinetic energy changes by Mv^2

Answer: B

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28. A billiard ball of mass M , moving with velocity v_1 collides with another ball of the same mass but at rest . If the collision is elastic , the angle of divergence after the collision is

A. 0°

B. 30°

C. 90°

D. 45°

Answer: C

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29. Consider a frictionless rampp on which a smooth object is made to slide down from an initial height h . The distance d necessary to stop the object on a flat track (of coefficient of friction μ) , kept at the ramp end is

A. $\frac{h}{\mu}$

B. μh

C. $\mu^2 h$

D. $h^2 \mu$

Answer: A

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30. A sound wave of frequency v Hz initially travels a distance of 1 km in air , then , it gets reflected into a water reservoir of depth 600 m . The frequency of the wave at the bottom of the reservoir is

$V_{\text{air}} = 340m/sV_{\text{water}} = 1484m/s)$

A. $> vHz$

B. $< vHz$

C. vHz

D. 0 (the sound wave gets attenuated by the water completely)

Answer: C

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31. A current carrying wire in its neighbourhood produces

A. electric field

B. electric and magnetic fields

C. magnetic fields

D. no field

Answer: C

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32. Consider a particle on which constant forces $F_1 = \hat{i} + 2\hat{j} + 3\hat{k}$ N and $F_2 = 4\hat{i} - 5\hat{j} - 2\hat{k}$ act together resulting in a displacement from position $r_1 = 20\hat{i} + 15\hat{j}$ cm $\rightarrow$ r_2 = 7 hatk ` cm . the total work done on the particle is

A. -0.48J

B. +0.48J

C. -4.8J

D. +4.8j

Answer: A

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Chemistry

1. Nitration of phenyl benzonate yields the product

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2. Which of the following are the correct representations of a Zero order reaction, where A represents the reactant?

A. a,b,c

B. a,b,d

C. b,c,d

D. a,c,d

Answer: B

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3. The vapour pressure of a non- ideal two component solution is given below Identify the correct T-X curve for the

same mixture,

Identify the correct T-X curve for the same mixutre.

A. 

B. 

C. 

D. 

Answer: A

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