MATHS

BOOKS - KCET PREVIOUS YEAR PAPERS

MODEL TEST PAPER 5

Mathematics

1. The median AD of a triangle ABC is perpendicular to AB.

Which one of the following relations is correct ?

A. tan C + 2tan A =0

B. $\tan A + 2\tan B = 0$

C. $\tan B + 2\tan A = 0$

D. None of these

Answer: B

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2. if $\tan\theta + \tan 2\theta = \sqrt{3}\tan\theta\tan 2\theta = \sqrt{3}$, then

A. $\theta = (6n+1).\pi/18 \forall n \in 1$

B. $\theta = (6n+1).\pi/9, \forall \in I$

C. $\theta = (3n+1).\pi/9, \forall \in I$

D. None of these

Answer: C

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3. If $f(x) = \sin^{-1}\sqrt{x-4}$, find the range of x .

A. $4 \leq x \leq 5$

B. $-5 \leq x \leq -4$

C. $-1 \leq x \leq 1$

D. $0 \leq x \leq 1$

Answer: A

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4. Solve the following equation for x , y and z :

$\log_2 x + \log_4 y + \log_4 z = 2$

$\log_3 y + \log_9 z + \log_9 x = 2$

$\log_4 z + \log_{16} x + \log_{16} y = 2$

A. $x = 2/3, y = 27/8, z = 32/3$

B. $x = 32/3, y = 27/8, z = 2/3$

C. $x = 27/8, y = 27/8, z = 27/8$

D. $x = 32/3, y = 27/8, z = 27/8$

Answer: A

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5. if $f(x)$ = cos (log x) then the value of $f(x)f(y) - (1/2)[f(x/y) + f(xy)]$ is

A. x^2

B. 0

C. $x^2 + 2x + 1$

D. None of these

Answer: B

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6. If $\bar{a} = a_1\hat{i} + a_2\hat{j} + a_3\hat{k}, \hat{b} = b_1\hat{i} + b_2\hat{k}$ and $\bar{c} = c_1\hat{i} + c_2\hat{j} + c_3\hat{k}$ are non-zero vectors such that $\bar{c}$ is a

unit vector perpendicular to both the vectors $\vec{a}$ and $\bar{b}$ and angle between $\bar{a}$, $\bar{b}$ is $\pi/6$ then, $\begin{vmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{vmatrix}^2$ =

A. 1

B. 0

C. $\frac{3}{4}\left(a_1^2+a_2^2+a_3^2\right)\left(b_1^2+b_2^2+b_3^2\right)$

D. $\frac{1}{4}\left(a_1^2+a_2^2+a_3^2\right)\left(b_1^2+b_2^2+b_3^2\right)$

Answer: D

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7. The value of the integral $\int_0^\infty \log\left(x+\frac{1}{x}\right)\frac{dx}{x^2+1}$ is

A. $\pi \log 2$

B. $2 \log \pi$

C. $4 \log \pi$

D. $\pi^2 \log 13$

Answer: A

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8. Domain of the function .

$f(x) = \left[\log_{10}\left(\frac{5x - x^2}{4}\right)\right]^{\frac{1}{2}}$ is

A. $-\infty \leq x \leq \infty$

B. $1 \leq x \leq 4$

C. $4 \leq x \leq 16$

D. $-1 \leq x \leq 1$

Answer: B

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9. If $\bar{p} + \bar{q} + \bar{r} = \bar{0}, |\bar{p}| = 3, |\bar{q}| = 5, |\bar{r}| = 7$. Then angle between $\bar{p}$ and $\bar{q}$ is

A. $\pi / 16$

B. $2\pi / 3$

C. $\pi / 6$

D. $\pi / 3$

Answer: D

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10. Let $a_n = \int_0^{\pi/2} \frac{1-\cos 2n\pi}{1-\cos 2\pi} dx$

The value of $\begin{vmatrix} \pi/2 & a_2 & a_3 \\ a_4 & a_5 & a_6 \\ a_7 & a_8 & a_9 \end{vmatrix}$ =

A. 0

B. 1

C. 3

D. None of these

Answer: A

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11. If a and b are roots of $x^2 - p(x+1) - c = 0$ then $(1+a)(1+b)$ and $\frac{a^2+2a+1}{a^2+2a+c} + \frac{b^2+2b+1}{b^2+2b+c}$ are,

A. 1-c, 1

B. 1-c, 0

C. 1+c, 1

D. 1+c, 0

Answer: A

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12.

$$\lim_{n \to \infty} \frac{1}{n}\left[\frac{\tan\pi}{4n} + \frac{\tan(2\pi)}{4n} + \frac{\tan(3\pi)}{4n} + \ldots + \frac{\tan(n\pi)}{4n}\right]$$

=

A. $\frac{2}{\pi}\log 2$

B. $\frac{\pi}{2}\log 2$

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

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

Answer: A

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13. $\lim_{x \to 0} \frac{(1+x)^{1/x} - e}{x}$ equals

A. $\pi/2$

B. 0

C. $2/e$

D. $-e/2$

Answer: D

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14. $\lim_{x \to 0} \left(\frac{e^{1/x} - 1}{e^{1/x} + 1} \right) =$

A. exists

B. does not exist

C. zero

D. None of these

Answer: B

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15. OX and OY are two coordinate axes . On OY is taken a fixed point P on OX any point Q . On PQ an equilateral triangle is described, its vertex R being on the side of PQ away from O, then the lacus of R will be,

A. straight line

B. circle

C. ellipse

D. parabola

Answer: A

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16. The locus of the point of intersection of tangents to the circles $x = a\cos\theta, y = a\sin\theta$ at points whose parametric angle differs by $\pi/4$ is

A. $3\left(x^2 + y^2\right) = 4a^2$

B. $4\left(x^2 + y^2\right) = 3a^2$

C. $x^2 + y^2 = 2\left(2 - \sqrt{2}\right)a^2$

D. None of these

Answer: C

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17. The locus of the centre of circle which cuts the circles $x^2 + y^2 + 4x - 6y + 9 = 0$ and $x^2 + y^2 - 4x + 6y + 4 = 0$ orthogonally is

A. $12x + 8y + 5 = 0$

B. $8x - 12y + 5 = 0$

C. $5x - 8y + 12 = 0$

D. None of these

Answer: B

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18. The equation of straight line passing through point of intersection of the straight lines $3x - y + 2 = 0$ and $5x - 2y + 7 = 0$ and having infinite slpe is

A. x=2

B. x+y=3

C. x=3

D. y=4

Answer: C

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19. The locus of mid-point of chords of constant length $'2l'$ of the parabola $y^2 = 4ax$ is

A. $\left(y^2 - 4ax\right)\left(y^2 + 4a^2\right) + 4a^2l^2 = 0$

B. $\left(y^2 + 4ax\right)\left(y^2 - 4a^2\right) - 4a^2l^2 = 0$

C. $\left(y^2 - 4ax\right)\left(y^2 - 4a^2\right) - 4a^2l^2 = 0$

D. None of these

Answer: A

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20. The equation of tangent at the point (5,2) of a circle is given by $3x - 2y - 11 = 0$ Therefore the equation of the

circle passing through origin would be

A. $x^2 + y^2 - 23x - 102y = 0$

B. $11x^2 + 11y^2 - 23x - 102y = 0$

C. $11x^2 + 11y^2 - 102x - 23y = 0$

D. $x^\circ + y^2 - 102x - 23y = 0$

Answer: B

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21. If $\lim_{x \to 0} \left[\frac{x(1 + 3a \cos x) - 5b \sin x}{x^3} \right] = 1$. The value of a and b will be

A. $-5/6, \ -3/10$

B. $-10/2,\ -6/5$

C. $5/6, 3/10$

D. $10/3, 6/5$

Answer: A

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22. A point is moving along the parabola $y^2 = 8x$ at the rate of 2m/s . The compoenent velocity parallel to the axis , when it is at the point (2,4) is

A. $\frac{2}{\sqrt{2}}$ m/s

B. 2 m/s

C. 4 m/s

D. 16 m/s

Answer: A

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23. The summation of the infinite series $1 + \frac{1.3}{6} + \frac{1.3.5}{6.8} + \ldots. \infty$ of

A. 1

B. 0

C. ∞

D. 4

Answer: D

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24. The comples number a+ib whose modulus is unity and $b \neq 0$ can be written in the form

where 'r' is a real number.

A. $a + ib = \frac{r + i}{r - i}$

B. $a + ib = \frac{(r + i)}{(r - i)^2}$

C. $a + ib = \frac{(r - i)}{(r + i)^2}$

D. $a + ib = \frac{(r + i)}{(r - i)^2}$

Answer: A

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25. $f(x) = e^{-1/x^2} \sin(1/x)$ for $x \neq 0$ and f(0) =0 .

The function f(x) is

A. differentiable at x = 0

B. not differentiable at x = 0

C. insufficient data

D. None of these

Answer: A

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26. Domain of the function ,$f(x) = \sqrt{\sin^{-1}(\log_2 x)}$ is

A. $0 \leq x \leq 1$

B. $-1 \leq x \leq 1$

C. $1 \leq x \leq 2$

D. $3 \leq x \leq 4$

Answer: C

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27. The value of the intergal

$$\int_0^{\pi/2} \frac{\phi(x)}{\phi(x) + \phi\left(\frac{\pi}{2} - x\right)} dx \text{ is}$$

A. $\pi/4$

B. $\pi/2$

C. $\pi/6$

D. π

Answer: A

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28. For positive integers n_1 and n_2 the value of the expression

$(1+i)^{n_1}+\left(1+i^3\right)^{n_1}+\left(1+i^5\right)^{n_2}+\left(1+i^7\right)^{n_2}$ is a real number if and only if

A. $n_1-n_2=1$

B. $n_1-n_2=0$

C. $n_2-n_1=1$

D. n_1, n_2 take any value

Answer: D

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29. For real x, the equation $\left|\frac{x}{x-1}\right| + |x| = \frac{x^2}{|x-1|}$ has

A. no solution

B. exactly one solution

C. not more than two solutions

D. infinite number of solutions

Answer: D

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30. If $a > 0, b > 0$ and $c > 0$, then both the roots of the equations $ax^2 + bx + c = 0$

A. are real and negative

B. have negative real parts

C. are rational numbers

D. are purely imaginary

Answer: B

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31. If $m + np_2 = 90$ and $m - np_2 = 30$, then (m,n) is given by

A. (7,3)

B. (16,8)

C. (9,2)

D. (8,2)

Answer: D

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32. If 'P' is a prime number such that $p \geq 23$ and $n + p! + 1$, then the number of primes in the list $n + 1, n + 2, \ldots\ldots, n + p - 1$ is

A. 0

B. 1

C. 2

D. None of these

Answer: A

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33. If the product of 'n' positive numbers is unity, then their sum is

A. positive integer

B. divisible by n

C. equal to $n + (1/n)$

D. never less than n

Answer: D

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34. A determinant is chosen at random from a set of all determinants of order 2 with elements 0 or 1 only. The probability that the determinant chosen is non-zero is

A. $3/16$

B. $3/8$

C. $1/4$

D. None of these

Answer: B

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35. The expression $\frac{(a+b+c)(b+c-a)(c+a-b)(a+b-c)}{4b^2c^2}$ for a triangle ABC is equal to

A. $\cos^2 A$

B. $\sin^2 A$

C. $\cos B \cos C$

D. $\sin B \sin C$

Answer: B

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36. The value of $\cos\left(\frac{1}{2}\cos^{-1}\frac{1}{8}\right)$ is equal to

A. $-3/4$

B. $3/4$

C. $1/16$

D. $1/4$

Answer: B

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37. If the base of an isosceles triangle is of length '2a' and the length of the altitude droped to the base is h (where $a > 0, h > 0$) , then the distance of each side from the midpoint of the base of the triangle is

A. h/2

B. a

C. $\sqrt{h^2 + a^2}$

D. $\frac{ah}{\sqrt{h^2 + a^2}}$

Answer: D

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38. PQ is double ordinate of the hyperbola $x^2/a^2 - y^2/b^2 = 1$ such that OPQ is an equilateral triangle , O being the centre of hyperbola . The eccentricity of the hyperbola satisfies

A. $1 < e < 2/\sqrt{3}$

B. $e = 2/\sqrt{3}$

C. $e = \sqrt{3}/2$

D. $e > 2/\sqrt{3}$

Answer: D

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39. If $\phi(x) = \int_{1/x}^{\sqrt{x}} \sin(t^2)\,dt$, then $\phi'(1)$ is equal to

A. sin 1

B. 2 sin 1

C. (1/2) sin 1

D. (3/2) sin 1

Answer: D

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40. If $\int \cos ec 2x dx = f(g(x)) + c$, then

A. $f(g'(x)) = (1/2)\log|\sec^2 x|$

B. $g(f'(x)) = \tan(1/2x)$

C. Both (a) and (b)

D. none of these

Answer: C

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41. If $y = e^{4x} + 2e^{-x}$ satisfies the relation $y_3 + Ay_1 + By = 0$ then

A. $4A + B + 64 = 0$

B. $A - B + 1 = 0$

C. Both (a) and (b)

D. none of these

Answer: C

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42. Let $\vec{a} = 2\hat{i} + \hat{j} - \hat{k}, \vec{b} = \hat{i} + 2\hat{j} - \hat{k}$, and $\vec{c} = \hat{i} + \hat{j} - 2\hat{k}$

, be three vectors . A vector in the plane of b and c whose projection an a is of magnitude $\sqrt{2/3}$ is

A. $2\hat{i}+3\hat{j}-3\hat{k}$

B. $-2\hat{i}-\hat{j}+5\hat{k}$

C. both are wrong

D. both are correct

Answer: D

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43. One diameter of the circle circumscribing the rectangle ABCD is $4y=x+7$. If A and B are the points (-3,4) and (5,4) respectively , then

A. radius of the circle is $2\sqrt{5}$

B. one side of the rectangle is double the other

C. area of the rectangle is 32 sq. units.

D. all are correct.

Answer: D

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44. P is a point on the given curve such that the normal at P to the curve meets the axist is 'x' at G. If the distance of P from the origin is same as its distance from G, then the curve is

A. a circle

B. a rectangle hyperbola

C. Both (a) and (b)

D. none of these

Answer: C

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45. If $4a^2 + 9b^2 - c^2 + 12ab$=0 , then the family of straight lines ax + by + c =0 is concurrent at

A. (2,3)

B. (-2,-3)

C. Both (a) and (b)

D. none of these

Answer: C

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46. If the circle $x^2 + y^2 = a^2$ intersects the hyperbola $xy = c^2$ in four points $P(x_1, y_1), Q(x_2, y_2), R(x_3, y_3)$ and $S(x_4, y_4)$ then

A. $x_1 + x_2 + x_3 + x_4 = 0$

B. $x_1 x_2 x_3 x_4 = 0$

C. $y_1 + y_2 + y_3 + y_4 = 0$

D. all the correct

Answer: D

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47. Let $a = (1/3)\left(-\hat{i} + 2\hat{j} + 2\hat{k} \right)$, then

A. a is a unit vector

B. makes acute angles with axis of y and z

C. is perpendicular to b $= 2\hat{i} - 2\hat{j} + 3\hat{k}$

D. all are correct.

Answer: D

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48. $F(X) = \left\{ \begin{matrix} |x-2| + a & \text{for} & x < 2 \\ b - |x-2| & \text{for} & x \geq 2 \end{matrix} \right\}$ then

A. f is not differentiable at x =2 for all real values of a , b

B. Rf' (2) = 1

C. Lf'(2) = 1

D. all are correct.

Answer: D

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49. The conic given by $y^2 + 8x - 12y + 20 = 0$

A. is a parabola

B. has vertex at (2,6)

C. has latus rectum equal to 8

D. all are correct.

Answer: D

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50. The number of solutions of $1 + \sin^6 x = \cos x$, in the interval $0 \leq x \leq 2\pi$, is

A. 3

B. 0

C. 1

D. 2

Answer: D

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51. a,b,c are the lengths of the sides of a non-degenerate triangle , If $k = \frac{a^2 + b^2 + c^2}{bc + ca + ab}$, then

A. $k < 1$

B. $k > 2$

C. $1 \leq k \leq 2$

D. $1 \leq k < 2$

Answer: D

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52. $k \neq -1$ is a constant. The value of $\lim_{n \to \infty} \frac{1^k + 2^k + \ldots. + n^k}{k(n^{k+1})}$ is

A. 0

B. $k/(k+1)$

C. $1/(k+1)^2$

D. None of these

Answer: A

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53. P(x) is a polynomial satisfying $P(x+3/20)=P(x)$, for all x. If P(5) =8 , then P(8) equals

A. 5

B. 19/2

C. 8

D. None of these

Answer: C

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54. The unit's digit of $1^2 + 2^2 + \ldots . + n^2$ is 5. The unit's digit of $1^{10} + 2^{10} + \ldots + n^{10}$ is

A. 1

B. 3

C. 7

D. 5

Answer: D

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55. The least +ve remainder of division of $100 \times 128 \times 37$ by 6 is

A. 8

B. 2

C. 3

D. 4

Answer: B

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56. If (3-x) $\equiv (2x-5)$ (mod 4) then one of the values of x is

A. 3

B. 4

C. 18

D. 5

Answer: B

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57. Given two integers a and b where a $>$ b , there exist unequal integers q and r such that b = qa + r where

$0 \leq r < a$ .This is known as

A. euclid's algorithm

B. division algroithm

C. archimedian property

D. none of these

Answer: B

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58. Divisibility by non-zero integers is

A. reflexive and symmetric

B. reflexive and transitive

C. transitive and symmetric

D. none of these

Answer: B

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59. $P \wedge (q \wedge r)$ is logically equivalent to

A. $p \vee (q \wedge r)$

B. $(p \wedge q) \wedge r$

C. $(p \vee q) \vee r$

D. $p \rightarrow (q \wedge r)$

Answer: B

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60. Let p : It is hot

q : He wants water.

Then the verbal meaning of $p \rightarrow q$is

A. it is hot or he wants water

B. it is hot and he wants water

C. if it is hot , then he want s water

D. if and only if it is hot he wants water

Answer: C

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