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MATHS

BOOKS - GURUKUL BOOKS & PACKAGING

MATHS (HINGLISH)

MARCH 2014

Section I

1. Which of the following represents direction cosines of the line ?

A. $0, \frac{1}{\sqrt{2}}, \frac{1}{2}$

B. $0, \frac{-\sqrt{3}}{2}, \frac{1}{\sqrt{2}}$

C. $0, \frac{\sqrt{3}}{2}, \frac{1}{2}$

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

Answer: C

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2. Select and write the most appropriate answer from the given alternatives in each of the following :

$A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ and A (adj A) = kI, then the value or 'k' is

A. 2

B. -2

C. 10

D. -10

Answer: B

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3. The general solution of the trigonometric equation $\tan^2\theta = 1$ is

A. $\theta = n\pi \pm \frac{\pi}{3}, n \in z$

B. $\theta = n\pi \pm \frac{\pi}{6}, n \in z$

C. $\theta = n\pi \pm \frac{\pi}{4}, n \in z$

D. $\theta = n\pi, n \in z$

Answer: C

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4. If $\bar{a}, \bar{b}, \bar{c}$ are the position vectors of the points A, B, C respectively and $2\bar{a} + 3\bar{b} - 5\bar{c} = \bar{0}$, then find the ratio in which the point C divides line segment AB.

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5. The cartesian equation of a line is $\frac{x-6}{2} = \frac{y+4}{7} = \frac{z-5}{3}$, find its vector equation .

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6. Equation of a plane is $\bar{r}.\left(3\hat{i}-4\hat{j}+12\hat{k}\right)=8$. Find the length of the perpendicualr from the origin to the plane.

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7. Find the measure of a acute angle between the line direction ratios are 5, 12, -13 and 3, -4, 5.

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8. Write the dual of the following statements :

(i) $(p \vee q) \wedge T$

(2) Madhuri has curly hair and brown eyes.

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9. If the lines $\frac{x-1}{2}=\frac{y+1}{3}=\frac{z-1}{4} and \frac{x-3}{1}=\frac{y-k}{2}=\frac{z}{1}$ intersect, then find the value of k.

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10. Prove that three vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ are coplanar, if and only if, there exists a non-zero linear combination $x\bar{a}+y\bar{b}+z\bar{c}=\bar{o}$.

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11. Using truth table prove that $\sim p \wedge q$

$\equiv (p \vee q) \wedge \sim p$

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12. In any ΔABC, with usual notaions, prove that $b^2 = c^2 + a^2 - 2ac\cos B.$

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13. Show that the equation $x^2 - 6xy + 5y^2 + 10x - 14y + 9 = 0$ represents a pair of lines. Find the acute angle between them. Also find the point of intersection of the lines.

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14. Express the following equations in the matrix from and solve them by method of reduction :

$2x - y + z = 1, x + 2y + 3z = 8, 3x + y - 4z = 1$

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15. Show that a homogeneous equations of degree two in x and y , i.e., $ax^2 + 2hxy + by^2 = 0$ represents a pair of lines passing through the origin if $h^2 - 2ab \geq 0$.

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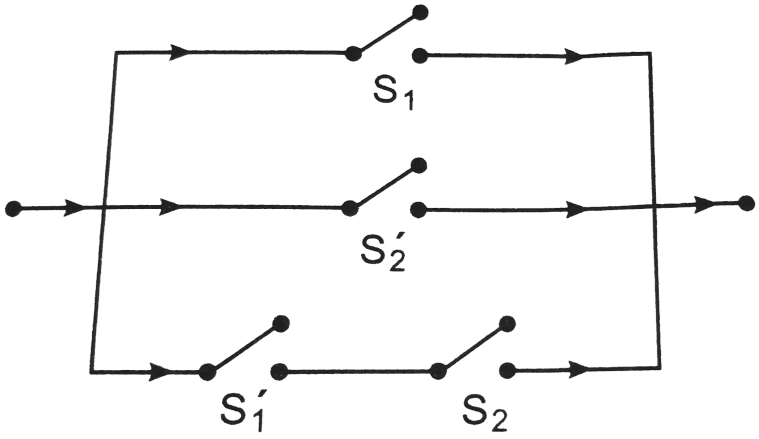
16. Find the symbolic form of the following switching circuit, construct its switching table and interpret it.



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17. If A,B,C,D are (1,1,1), (2,1,3), (3,2,2),(3,3,4) respectively, then find the volume of the parallelopiped with AB,AC and AD as the concurrent edges.

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18. The equation of plane passing through the line of intersection of planes $2x - y + z = 3, 4x - 3y - 5z + 9 = 0$ and parallel to the line $\frac{x+1}{2} = \frac{y+3}{4} = \frac{z-3}{5}$ is

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19. Minimize $z = 6x + 4y$, subject to

$3x + 2y \geq 12, x + y \geq 5, 0 \leq x \leq 4, 0 \leq y \leq 4.$

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20. Prove that: $\frac{\tan^{-1}4}{5} + \frac{\cos^{-1}(12)}{13} = \frac{\cos^{-1}(33)}{65}$

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Section Ii

1. If $y = 1 - \cos\theta, x = 1 - \sin\theta$, then $\frac{dy}{dx}$ at $\theta = \frac{\pi}{4}$ is

A. -1

B. 1

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

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

Answer: A

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2. The integrating factor of linear differential equation $\frac{dy}{dx} + y \sec x = \tan x$ is

A. $\sec x - \tan x$

B. $\sec x . \tan x$

C. $\sec x + \tan x$

D. $\sec x . \cot x$

Answer: C

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3. Find the equation of the tangent to the curve $y = 3x^2 - x + 1$ at P(1, 3).

A. $y = 5x + 2$

B. $y = 5x - 2$

C. $y = \frac{1}{5}x + 2$

D. $y = \frac{1}{5}x - 2$

Answer: B

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4. Examine the continuity of the funciton

$$f(x) = \sin x - \cos x, \quad \text{for} \quad x \neq 0$$

$$= -1 \qquad \text{,for} \quad x = 0$$

at the point x = 0

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5. Verify Rolle's theorem for the following function

$$f(x) = x^2 - 5x + 9, x \in [1, 4]$$

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6. $\int \sec^n x \tan x dx, n \neq 0$

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7. The probability mass function (p. m. f.) of X is given below :

$X = x$	1	2	3
$P(X = x)$	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{2}{5}$

find $E(X^2)$

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8. Given that X ~ B(n=10, p) .If E (x) = 8, find the value of p .

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9. If y =f(u) is differentiable function of u, and u=g(x) is a differentiable function of x, then proven that y= f [g(x)] is

a differentiable function of x and $\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$.

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10. Obtion the differential equation by elininating arbitrary constants A, B from the equation - $y = A\cos(\log x) + B\sin(\log x)$

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11. Evaluate $\int \frac{x^2+1}{(x^2+2)(2x^2+1)} dx$

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12. An open box is to be made out of a piece of a square card board of sides 18 cm by cutting off equal squares from the corners and turning up the sides. Find the maximum volume of the box.

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13. Property 6: If f(x) is a continuous function defined on $[0; 2a]$ then $\int_0^2 a = \int_0^a f(x)dx + \int_0^a f(2a - x)dx$

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14. If the function f(x) is continuous in the interval $[-2, 2]$. find the values of a and b where

$$f(x) = \frac{\sin ax}{x} - 2 \quad ,\text{for} \quad -2 \leq x < 0$$
$$= 2x + 1 \quad ,\text{for} \quad 0 \leq x \leq 1$$
$$= 2b\sqrt{x^2 + 3} - 1 \quad ,\text{for} \quad 1 < x \leq 2$$

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15. Solve the following differential equations :

(1) $\frac{dy}{dx} = \frac{y + \sqrt{x^2 + y^2}}{x}$

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16. A fiar coin is tossed 18 times. Find the probability that it shows least once.

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17. If $x^p y^q = (x+y)^{(p+q)}$ then $\frac{dy}{dx} = ?$

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18. Find the area bounded by the cirxle $x^2 + y^2 = 16$ and the line y=x in the first quadrant .

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19.

$$\int \sqrt{x^2 - a^2} = \frac{1}{2} x \sqrt{x^2 - a^2} - \frac{1}{2} a^2 \log\left(x + \sqrt{x^2 - a^2} + c\right.$$

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20. A random variable X has the following probability distribution : (a) Find k (b) Find P (O

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