MATHS

BOOKS - GURUKUL BOOKS & PACKAGING

MATHS (HINGLISH)

JULY 2017

Section I

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

The inverse of the matrix $\begin{pmatrix} 1 & -1 \\ 2 & 3 \end{pmatrix}$ is

A. $\frac{1}{5}\begin{bmatrix} 3 & -1 \\ -2 & 1 \end{bmatrix}$

B. $\frac{1}{5}\begin{bmatrix} 3 & 1 \\ -2 & 1 \end{bmatrix}$

C. $\frac{1}{5}\begin{bmatrix} -3 & 1 \\ -2 & 1 \end{bmatrix}$

D. $\frac{1}{5}\begin{bmatrix} 3 & -1 \\ 2 & -1 \end{bmatrix}$

Answer:

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

if

$\hat{a} = 3\hat{i} - \hat{j} + 4\hat{k}, \bar{b} = 2\hat{i} + 3\hat{j} - \hat{k}, \bar{c} = -5\hat{i} + 2\hat{j} + 3\hat{k}$

then $\bar{a}.\left(\bar{b} \times \bar{c}\right)$ = ...

A. 100

B. 101

C. 110

D. 109

Answer:

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3. If a line makes angles $90o, \quad 135o, \quad 45o$ with the x, y and z-axes respectively, find its direction cosines.

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

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

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

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

Answer:

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4. If the line $\bar{r} = \left(\hat{i} - 2\hat{j} + 3\hat{k}\right) + \lambda\left(2\hat{i} + \hat{j} + 2\hat{k}\right)$ is parallel to the plane $\bar{r} \cdot \left(3\hat{i} - 2\hat{j} + p\hat{k}\right)$ find the value of p.

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5. If a line makes angles α, β, γ with the coordinate axes, prove that $\cos 2\alpha + \cos 2\beta + \cos 2\gamma + 1 = 0$.

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6. the negation of $\forall, n \in N, n + 7 > 6$ is ...

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7. Find the angle between the vectors with direction ratios proportional to $4, \ -3, 5 and 3, 4, 5$.

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8. If $\bar{a}, \bar{b}, \bar{c}$ are the position vectors of the points A,B,C respectively such that $3\bar{a} + 5\bar{b} = 8\bar{c}$, the ratio in which A divides BC is

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9. If $\tan^{-1}(2x) + \tan^{-1}(3x) = \frac{\pi}{4}$, then find the value of x.

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10. Write the convere, inverse and contrapositive following statement:

"If it rains then match will be cancelled."

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11. Find P and k if the equation

$px^2 - 8xy + 3y^2 + 14x + 2y + k = 0$

represents a pair of perpendicular lines.

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12. Find the equation of the plane through the intersection of the planes $3x \quad y \quad + \quad 2z \quad 4 \quad = \quad 0$ and $x \quad + \quad y \quad + \quad z \quad 2 \quad = \quad 0$ and the point (2, 2, 1).

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13. Let $A(\bar{a})$ and $B(\bar{b})$ be any two points in the space and $R(\bar{r})$ be a point on the line segment AB dividing it internally in the ration m : n the prove that $\bar{r} = \frac{m\bar{b} + n\bar{a}}{m+n}$. Hence find the position vector of R which divides the line segment joining the point A(1,-2,1) and B(1,4,-2) internally in the ratio 2: 1 .

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14. The angles of $\triangle ABC$ are in A.P. and $b : c = \sqrt{3} : \sqrt{2}$ find $\angle A, \angle B, \angle C$.

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15. Find the vector wuation of the line passing through the points A(3,4, -7) and B (6,-1, 1)

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16. Find the general solution of $\cot x + \tan x = 2\cos ecx$

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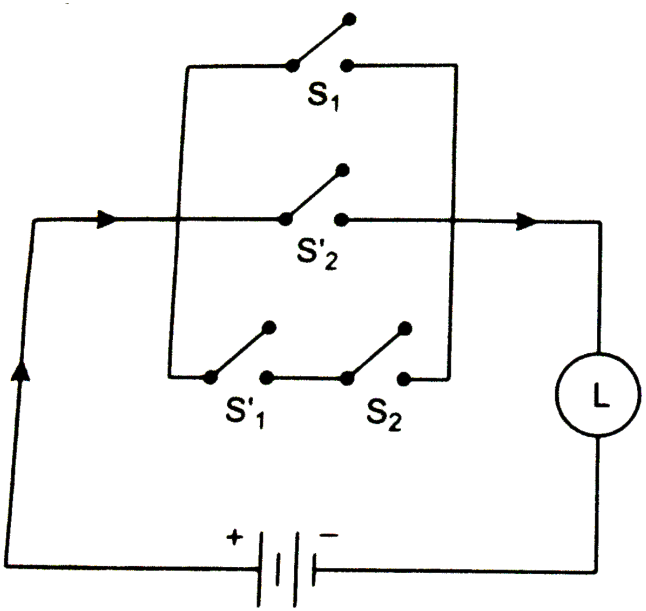
17. Express the following switching circuit in symbolic form of logic . Costruct its switching table and write your

conlusion form it :



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18. If $A = \begin{pmatrix} 1 & -1 & 2 \\ 3 & 0 & -2 \\ 1 & 0 & 3 \end{pmatrix}$, verify that A (adj A) = $|A| \cdot I$.

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19. A company manufacture is bicyles and tricycles each of which must be processed through machines A and B. Machine A has maximum of 120 hours avaiable and machine B has maximum of 180 hours available hours on machine A and 3 hours on machine B. Machine A and 10 hours on machine B.

If profit are ₹ 180 for a bicyle and ₹ 220 for a tricyle , formulate and solve the L.P.P to determine the number of bicycles and tricycle that should be manufactured in order to maximize the profit .

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20. If θ is the measure of acute angle between the pair of line repseented by $ax^2 + 2hxy + by^2 = 0$, then prove that

$$\tan\theta = \left|\frac{2\sqrt{h^2 - ab}}{a+b}\right|, a + b \neq 0$$

Hence find the acture angle between the lines $x^2 - 4xy + y^2 = 0$

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Section Ii

1. Given $f(x) = 2x, x > 0$, $0, x \leq 0$ then f(x) is .....

A. discontinus and not differentiable at x = 0

B. continuous and differentiable at x = 0

C. discontinous and differentiable at x = 0

D. continuous and not differentiable at x= 0

Answer:

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2. If $\int_0^{\propto} \left(3x^2 + 2x + 1\right) dx = 14$, then $\propto = \ldots\ldots$

A. 1

B. 2

C. -1

D. -2

Answer:

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3. Prove that the function given by $f(x) = x^3 - 3x^2 + 3x - 100$is increasing in R.

A. increasing

B. decreasing

C. increasing and decreasing

D. neither increasing nor decreasing

Answer:

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4. Differentiate 3^x w.r.t.log(3x)

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5. Check whether the conditions of Rolle's theorem are satisfied by the following functions or not :

$f(x) = (x-1)(x-2)(x-3), x \in [1, 3]$

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6. Evaluate $\int \frac{\sqrt{\tan x}}{\sin x . \cos x} dx$

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7. Find the area of the region bounded by the curve $x^2 = 16y$, lines $y = 2, y = 6$ and Y - axis lying in the first quadrant.

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8. Given X~ B (n,P)

If n= 10 and p=0.4 , find E(X) and Var (X) .

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9. It the function $f(x) = \frac{\left(5^{\sin x} - 1\right)^2}{x \log(1 + 2x)}$ for $x \neq 0$ is continous at x = 0 find f(0).

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10. The probability mass function for X number of major defects in a randomly selected appliance of a certain type is :

$X = x$	0	1	2	3	4
$P(X = x)$	0.08	0.15	0.45	0.27	0.05

Find the expected value and variance of X.

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11. Suppose that 80% of all families own a television set. If 5 families are inervised at random, find the probability that :

(a) three families own a television set.

(b) at least two families own a television set.

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12. Find the approximate values of :

$\cos(60^\circ 30'), \quad \text{given} \quad 1^\circ = 0.0175^c \quad \text{and} \quad \sin 60^\circ = 0.8660$

.

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13. The rate o growth of bacteria is proportional to the number present . IT intially, there were 1000 bacteria and

the number doubles in 1 hours. Find the number of bacteria after $2\frac{1}{2}$ hours . [take $\sqrt{2} = 1.414]$

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14. $\int_{-a}^{a} f(x)dx = 2\int_{0}^{a} f(x)dx,$ if f is an even function 0, if f is an odd function.

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15. If f (x) is continuous on $0 - 4, 2],$ defined as

$f(x) = 6b - 3ax,$ for $-4 \leq x < -2$

$= 4x + 1, \quad \text{for} -2 \leq x \leq 2,$

find the value of $a + b.$

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16. If u and v are two functions of x then prove that:

$$\int uvdx = u\int vdx - \int\left[\frac{du}{dx}\int vdx\right]dx$$

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17. Probability distribution of X is given by

$X = x$	1	2	3	4
$P(X = x)$	0·1	0·3	0·4	0·2

Find $P(X \leq 2)$ and obtain cumulative distribution function of X.

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18. Solve the differential equation. $\frac{dy}{dx} - y = e^x$ Hence find the particluar solution for x = 0 and y = 1 .

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19. If y = f(x) and x = g(y), where g is the inverse of f, i.e., $g = f^{-1}$ and if $\frac{dy}{dx}$ and $\frac{dx}{dy}$ both exist and $\frac{dx}{dy} \neq 0$, show that $\frac{dy}{dx} = \frac{1}{(dx/dy)}$.

Hence, (1) find $\frac{d}{dx}\left(\tan^{-1} x\right)$

(2) If $y = \sin^{-1} x, \ -1 \leq x \leq 1, \ -\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$, then show that $\frac{dy}{dx} = \frac{1}{\sqrt{1-x^2}}$ where $|x| < 1$.

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20. $\int \frac{8}{(x+2)(x^2+4)} dx$

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