MATHS

BOOKS - GURUKUL BOOKS & PACKAGING

MATHS (HINGLISH)

MARCH 2015

Section I

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

If $A = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{pmatrix}$, then $A^6 =$ .....

A. 6A

B. 12A

C. 16A

D. 32A

Answer: D

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2. Select and write the correct answer from the alternatives in each of the following :

The principal solution of $\cos^{-1}\left(-\frac{1}{2}\right)$ is :

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

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

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

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

Answer: C

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3. Select and write the correct answer from the alternatives in each of the following :

If an equation hxy $+gx+fy+c=0$ represents a pair of lines, then .....

A. $fg=ch$

B. $gh=cf$

C. $fh = cg$

D. $hf = -cg$

Answer: A

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4. Write the converse and contrapositive of the statement -

" If two triangles are congruent , then their areas are equal."

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5. Find k, if the sum of slopes of the lines represented by the equation $x^2 + kxy - 3y^2 = 0$ I s twice their product.

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6. Find the acute angle between the planes $\bar{r} \cdot \left(2\hat{i} + \hat{j} - \hat{k}\right) = 3$ and $\bar{r} \cdot \left(\hat{i} + 2\hat{j} + \hat{k}\right) = 1.$

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7. The cartesian equation of a line is 3x - 1 = 6y + 2 = 1 - z . Find the vector equation of the line .

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8. If $\bar{a} = \bar{i} + 2\bar{j}, \bar{b} = -2\bar{i} + \bar{j}, \bar{c} = 4\bar{i} + 3\bar{j}$ find x and y such that $\bar{c} = x\bar{a} + y\bar{b}$.

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9. 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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10. Discuss the statement pattern, using truth table :

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

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11. If point $C(\bar{c})$ divides the segment joining the point A $(\bar{a})$ and $B(\bar{b})$ internally in the ratio m : n, then prove that $\bar{c} = \frac{m\bar{b} + n\bar{a}}{m + n}$.

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12. Find the direction cosines of the line perpendicular to the lines whose direction ratios are $-2, 1, -1$ and $-3, -4, 1$.

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13. In any $\triangle ABC$, if a^2, b^2, c^2 are in AP then that cot A , cot B , cot C are in are in A.P.

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14. The sum of three numbers is 6 . When second number is subtracted from thrice the sum of first and third number , we get number 10. Four times the third number is subtracted from five times the sum of first and second number , the result is 3 . Using above information, find these three numbers by matrix method.

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15. If θ is the measure of the acute angle between the lines represented by equation $ax^2 + 2hx + by^2 = 0$, then prove that $\tan\theta = \left|\frac{2\sqrt{h^2 - ab}}{a+b}\right|$ where $a + b \neq 0$ and $\neq 0$. Find the condition for coincident lines.

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16. 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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17. Construct the switching circuit for the following statement :

$[p \vee (\sim p \wedge q)] \vee [(\sim q \wedge r) \vee \sim p]$.

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18. Find the general solution of : $\cos x - \sin x = 1$.

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19. Find the equations of the planes parallel to the plane $x - 2y + 2z - 4 = 0$, which are at a unit distance from the point (1, 2, 3).

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20. A diet of a sick person must contains at least 48 units of vitamin A and 64 units of vitamin B. Two foods F_1 and F_2 are available. Food F_1 costs Rs. 6 per unit and Food F_2 costs Rs. 10 per unit. One unit of food F_1 contains 6 units of vitamin A and 7 units of vitamin B. One unit of food F_2 contains 8 units of vitamin A and 12 units of vitamin B. Find the minimum cost for the diet that consists of mixture of these two foods and also meeting the minimum nutritional requirements.

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Section Ii

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

A random variable X has the following probability distribution :

$X = x$	-2	-1	0	1	2	3
$P(x)$	0.1	0.1	0.2	0.2	0.3	0.1

Then E(x) = ...

A. 0.8

B. 0.9

C. 0.7

D. 1.1

Answer:

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2. Select and write the correct answer from the given alternatives in each of the following : If $\int_0^{\alpha} 3x^2 dx = 8$, then the value of α is :

A. 0

B. -2

C. 2

D. ± 2

Answer: C

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3. Select and write the correct answer from the given alternatives in each of the following :

The differential equation of $y = \frac{c}{x} + c^2$ is :

A. $x^4\left[\frac{dy}{dx}\right]^2 - x\frac{dy}{dx} = y$

B. $\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$

C. $x^3\left[\frac{dy}{dx}\right]^2 + x\frac{dy}{dx} = y$

D. $\frac{d^2y}{dx^2} + \frac{dy}{dx} - y = 0$

Answer: A

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4. Evaluate: $\int e^x \frac{\sqrt{1-x^2}\sin^{-1}x + 1}{\sqrt{1-x^2}}\,dx$

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5. If $y = \sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x + \dot{\longrightarrow} \infty}}}$, prove that $\frac{dy}{dx} = \frac{\cos x}{2y - 1}$

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6. Evaluate : $\int_0^{\pi/2} \frac{1}{1 + \cos x} dx$

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7. If $y = e^{ax}$ Show that $x \frac{dy}{dx} = y \log y.$

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8. A fair coin is tossed 5 times . Find the probability that it shows exactly three times head.

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9. Integrate $\sec^3 x$ w.r.t.x.

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10. If $y = \left(\tan^{-1}\right)^2$, show that

$$\left(1+x^2\right)\frac{d^2y}{dx^2} + 2x\left(1+x^2\right)\frac{dy}{dx} - 2 = 0$$

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11. $f(x) = \left[\tan\left(\frac{\pi}{4} + x\right)\right]^{\frac{1}{x}}, x \neq 0$ and $f(x) = k, x = 0$ is continuous at x=0 then k=

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12. Find the coordinates of the point on the curve $y = x - \frac{4}{x}$, where the tangent is parallel to the line $y = 2x$.

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13.

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

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14. Evaluate : $\int_0^{\pi} \frac{x \sin x}{1+\sin x} dx$

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15. Find α and β, so the function f (x) defined by

$f(x) = -2\sin x, \text{for} -\pi \leq x \leq -\frac{\pi}{2}$

$= \alpha \sin x + \beta \text{for} -\frac{\pi}{2} < x < \frac{\pi}{2}$

$= \cos x, \text{for} \frac{\pi}{2} \leq x \leq \pi,$

is continuous on $[-\pi, \pi]$.

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16. If $\log_{10}\left(\frac{x^3-y^3}{x^3+y^3}\right)=2$, then show that $\frac{dy}{dx}=\frac{-99x^2}{101y^2}$

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17. Let the p.m.f. (probability mass function) of random variable x be

$P(x)=\left(\frac{4}{x}\right)\left(\frac{5}{9}\right)^x\left(\frac{4}{x}\right)^{4-x}, x=0,1,2,3,4$

= 0 , otherwise

Find E(x) and Var.(x)

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18. Examine the maxima and minima of the function f (x) $= 2x^3 - 21x^2 + 36x - 20$. Also, find the maximum and minimum values of f (x).

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19. The solution of the differential equ $\left(x^2 + y^2\right)dx = 2xydy$ is-

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20. Given the probability density functio (p.d.f) of a continuos random variable X as. $f(x) = \frac{x^2}{3}, \ -1 < x < 2$

Determine the cumulative distribution function (c.d.f) X and hence find $P(X < 1), P(X > 0), P(1 < X < 2)$.

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