Total No. of Questions - 26 Total No. of Pages 05

Pre Board Exam 2019-20
Class - 12th
Subject -Mathematics

Time:03 Hours **Maximum Marks :100**

Instruction

(i) All questions are compulsory.

(ii) Question paper has two Sections - Section – "A" and Section – "B"

(iii) In the Section - "A" Question No. 1 to 5 are objective type each question carries 5 marks.

(iv) In the Section - "B" Question No. 6 to 26 have internal option.

(v) Draw neat and clean diagram whenever necessary.

SECTION-"A"

Q 1 Choose the correct option. **(1x5=5)**

(i) If $f(x) = 8x^3$ and $g(x) = x^{\frac{1}{3}}$ then the value of gof will be

(a) x (b) $2x$ (c) $3x$ (d) $4x$

(ii) The value of $\sin\left\{\frac{\pi}{3} - \sin^{-1}\left(-\frac{1}{2}\right)\right\}$ will be-

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) 1

(iii) The number of all possible matrices of order 3x3 with each entry 0 or 1 is-

(a) 27 (b) 81a (c) 18 (d) 512

(iv) Value of $\begin{vmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{vmatrix}$ will be -

(a) 1 (b) 2 (c) 3 (d) 4

(v) If $P(A) = \frac{1}{2}$, P(B) = 0 then the value of P(A/B) will be-

(a) $\frac{1}{2}$ (b) 0a (c) 1 (d) Not defined

Q2. Fill in the blanks. **(1x5=5)**

(i) The maximum r minimum value of objective function is called...........

(ii) Distance between two planes 2x+3y+4z = 4 and 4x +6y+8z = 12 is.........unit.

(iii) Formula use in approximation...........

(iv) $\int e^x \sec x(1 + \tan x)dx =$ ....

(v) The slope of the tangent to the curve y = $3x^4$ - 4x at x = 4 will be.......

Q3. Write True / False in the following statements. **(1x5=5)**

(i) Every continuous function is differentiable.

(ii) The power of differential $\frac{dy}{dx} + \sin\left(\frac{dy}{dx}\right) = 0$ is 1.

(iii) The feasible region of a Linear Programming Problem is always a linear polygon.

(iv) The point on the curve $x^2 = 2y$ which is nearest to the point (0, 5) is $(2\sqrt{2}, 0)$.

(v) The maximum value of function $\sin x + \cos x$ is $\sqrt{2}$.

Q4 Match the correct pairs **(1x5=5)**

Column 'A'	Column 'B'
(i) $\int \sqrt{a^2 - x^2}\, dx$	a) $\log\lvert x + \sqrt{a^2 + x^2}\rvert + C$
(ii) $\int \tan x\, dx$	b) $\frac{1}{a}\tan^{-1}\frac{x}{a} + C$
(iii) $\int \frac{1}{a^2+x^2}\, dx$	c) $\frac{1}{2a}\log\left\lvert\frac{a+x}{a-x}\right\rvert + C$
(iv) $\int \frac{1}{\sqrt{a^2+x^2}}\, dx$	d) $\log\lvert\sec x\rvert + C$
(v) $\int \frac{1}{a^2-x^2}\, dx$	e) $\frac{1}{2}x\sqrt{a^2 - x^2} + \frac{1}{2}a^2\sin^{-1}\frac{x}{a} + C$
	f) $\sin^{-1}\frac{x}{a} + C$

Q5. Write the answer in one word / sentence each. **(1x5=5)**

(i) A point C in the domain of a function f at which either f(c) =0 or f is not differentiable. What is called the point of f

(ii) The area of circle $x^2 + y^2 = a^2$ is.

(iii) If $\vec{a} = \hat{\imath} - 7\hat{\jmath} + 7\hat{k}$ and $\vec{b} = 3\hat{\imath} - 2\hat{\jmath} + 2\hat{k}$ then write down the value of $\vec{a}\,.\,\vec{b}$

(iv) Write the vector equation of a planes in normal form.

(v) If A and B area independent events, then the value of P(A∩ B) will be.

SECTION-"B"

Q6. Find X and Y, if **(2)**

$$X+Y = \begin{bmatrix} 5 & 2 \\ 0 & 9 \end{bmatrix}$$

and $$X-Y = \begin{bmatrix} 3 & 6 \\ 0 & -1 \end{bmatrix}$$

or

If A = $\begin{vmatrix} \sin\alpha & \cos\alpha \\ -\cos\alpha & \sin\alpha \end{vmatrix}$ the find AA'.

Q7. Find derivatives of cos (sin$x$) **(2)**

Or

Check the continuity of the function f given by $f(x) = 2x^2 - 1$ at $x = 3$

Q8. Evaluate. **(2)**

$$\int \frac{1-\sin x}{\cos^2 x}\, dx$$

Or

Evaluate.

$$\int_0^1 \frac{\tan^{-1} x}{1+x^2}\, dx$$

Q9. Find the unit vector in the direction of vector $\vec{a} = 2\hat{\imath} + 3\hat{\jmath} + \hat{k}$ **(2)**

Or

- If $\vec{a} = \hat{i} - 7\hat{j} + 7\hat{k}$ and $\vec{b} = 3\hat{i} - 2\hat{j} + 2\hat{k}$ then find $|\vec{a} \times \vec{b}|$

Q10. If a line makes angle 90^0, 60^0 and 30^0 with the positive direction of x, y and z – axis respectively, find its direction cosines. (2)

Or

- Find the equation of the plane with intercepts 2, 3 and 4 on the X, Y and Z-axis respectively.

Q11. A stone is dropped into a quiet lake and waves move in circles at a speed of 4cm per second. At the instant, when the radius of the circular wave is 10 cm how fast is the enclosed area increasing? (3)

Or

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

Q12. Find the slope of the normal to the curve $x = a\cos^3\theta,\ y = a\sin^3\theta$ at $\theta = \frac{\pi}{4}$ (3)

Or

- Use differential to approximate $\sqrt{36.6}$

Q13. Show that the points $\vec{A}(2\hat{i} - \hat{j} + \hat{k}), \vec{B}(\hat{i} - 3\hat{j} - 5\hat{k})$ and $\vec{C}(3\hat{i} - 4\hat{j} - 4\hat{k})$, are the vertices of a right-angle triangle. (3)

Or

$\vec{a}, \vec{b}$ and $\vec{c}$ are three vectors such that $|\vec{a}| = 3, |\vec{b}| = 4, |\vec{c}| = 5$ and each one of them being perpendicular to the sum of the other two, Find $|\vec{a} + \vec{b} + \vec{c}|$

Q14. If the lines $\frac{x-1}{-3} = \frac{y-2}{2k} = \frac{z-3}{2}$ and $\frac{x-1}{3k} = \frac{y-1}{1} = \frac{z-6}{-5}$ are perpendicular, Find the value of K. (3)

Or

- Find the vector equation for the line passing through the points (−1, 0, 2) and (3, 4, 6).

Q15. Let $f : N \to Y$, be a function defined as $f(x) = 4x + 3$, Wher, $Y = \{y \in N : y = 4x + 3$ for some $x \in N\}$ Show that f is invertible. Find the inverse. (4)

Or

Consider $f : N \to Y,\ g : N \to Y$ and $h : N \to R$ define as $f(x) = 2x,\ g(y) = 3y + 4$ and $h(z) = \sin z, \forall\ x, y$ and $z \in N$. Show that ho(gof) = (hog)of.

Q16. Show that $\sin^{-1}\frac{3}{5} - \sin^{-1}\frac{8}{17} = \cos^{-1}\frac{84}{85}$ (4)

Or

If $\tan^{-1}\left(\frac{x-1}{x-2}\right) + \tan^{-1}\left(\frac{x+1}{x+2}\right) = \frac{\pi}{4}$ than find the value of, x

Q17. Salve the following system of equation by matrix method. (4)

$2x + 5y = 1$
$3x + 2y = 7$

Or

Prove that $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$

Q18. Find the shortest distance between the line $\vec{r} = (\hat{i} + 2\hat{j} + \hat{k}) + \lambda(\hat{i} - \hat{j} + \hat{k})$ and $\vec{s} = (2\hat{i} - \hat{j} - \hat{k}) + \mu(2\hat{i} + \hat{j} + 2\hat{k})$ **(4)**

Or

Prove that if a plane has the intercepts a, b, c, and is at a distance of P units from the origin, then $\frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2} = \frac{1}{p^2}$

Q19. Solve the following linear programming problem graphically.
Maximise $z = 4x + y$, Subject to the constraints.
$x + y \leq 50$
$3x + y \leq 90$
$x \geq 0,\ y \geq 0$ **(4)**

Or

A cooperative society of farmers has 50 hectares of land to grow two crop X and Y. the profit from crops X and Y per hectare are estimate as Rs. 10,500 and Rs. 9,000 respectively. To control weeds, a liquid herbicide has to be used for crops X and Y at rates of 20 litres and 10 litres per hectare. Further, no more than 800 litres of herbicide should be used in order to protect fish and wild life using a pond which collects drainage from this land. How much land should be allocated to each crop so as to maximise the total profit of the society?

Q20. If P(A) = 0.8, P(B)=0.5 and P(B|A) = 0.4 then find **(4)**

(i) $P(A \cap B)$ (ii) $P(A/B)$ (iii) $P(A \cup B)$

Or

Find the probability distribution of number of doublets in three throws of a pair of dice

Q21. A random variable X has the following probability distribution. **(4)**

X	0	1	2	3	4	5	6	7
P(X)	0	K	2K	2K	3K	K^2	$2K^2$	$7K^2+K$

Find.

(i) K (ii) P (x<3) (iii) P (x> 6) and P (0 < x < 3)

Or

Find the mean of the binomial distribution is $B\left(4, \frac{1}{3}\right)$.

Q22. If $A' = \begin{bmatrix} 3 & 4 \\ -1 & 2 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 & 1 \\ 1 & 2 & 3 \end{bmatrix}$ then verify that. (5)

(i) $(A+B)' = A' + B'$ and (ii) $(A-B)' = A' - B'$

Or

If $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$ then prove that

$A^n = \begin{bmatrix} 1+2n & -4n \\ n & 1-2n \end{bmatrix}$

Q23. Discuss the continuity of following function. (5)

$$f(x) = \begin{cases} x^2 \sin\frac{1}{x}, & if\, x \neq 0, \\ 0, & if\, x = 0, \end{cases}$$

Or

Differentiate the function $x^{\sin x} + (\sin x)^{\cos x}$ with respect to x.

Q24. Evaluate $\int \sqrt{3 - 2x - x^2}\, dx$ (5)

Or

Evaluate $\int_{\pi/6}^{\pi/3} \frac{1}{1+\sqrt{\tan x}} dx$

Q25. By using the integration find the area of triangle whose vertices are $(-1,0), (1,3)$ and $(3,2)$. (5)

Or

Find the area of the region bounded by the two parabolas $y^2 = 4ax$ and $x^2 = 4ay$

Q26. Find the general solution of the differential equation $x\frac{dy}{dx} + 2y = x^2 \log x$. (5)

Or

Solve the differential $e^x \tan y\, dx + (1 - e^x)\sec^2 y\, dy = 0$.

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