Rise 'n' Shine Convent School - Dhamdha

Pre – Board Examination (2020-2021)

Class – XII

Subject - Mathematics

Date:- 07/01/2021	Time:-3 hrs	Max. Marks : 80

General Instructions :-

1. This question paper contains two **parts A and B**. Each part is compulsory. Part A carries **24** marks and Part B carries **56** marks
2. **Part-A** has very short answer type Questions and **Part -B** has Descriptive Type Questions
3. Both Part A and Part B have choices.

Part -A

1. It consists of two sections**- I and II**.
2. Section **I** comprises of **16** very short answer type questions
3. Section **II** contains **2** case studies. Each case study comprises of 5 case-based MCQs. An examinee is to attempt any 4 out of 5 MCQs.

Part -B

1. It consists of three sections**- III, IV and V.**
2. Section **III** comprises of 10 questions of **2 marks** each.
3. Section **IV** comprises of 7 questions of **3 marks** each.
4. Section **V** comprises of 3 questions of **5 marks** each.

PART – A
SECTION – I

Q. No 1 to Q No. 16 are very short answer types questions.

Q.1 Find the domain of $\cos^{-1}\left[\log_3\left(\frac{x}{3}\right)\right]$

Q.2 Find $\int \frac{(\log x)^2}{x}\,dx$

Q.3 If $\tan^{-1} x + \cot^{-1}\left(\frac{3}{4}\right) = \frac{\pi}{2}$ for some $x \in R$ then find the value of x

Q.4 If $A = \begin{bmatrix} 2 & 4 \\ 5 & 6 \end{bmatrix}$, show that $(A - A^T)$ is a skew symmetric , where A^T is transpose of matrix A

OR

If A be a square order 3×3 and $|A| = 2$ then find the value of $|adj(A)|$

Q.5 Find $\frac{dy}{dx}$ if $y = \sin^{-1} x$

Q.6 What is the degree of the differential equation $\left(\frac{d^2x}{dx^2}\right)^3 + \sin\left(\frac{dy}{dx}\right) + 1 = 0$

OR

How many number of arbitrary constant in the particular solution of a differential equation of second order will be .

Q.7 Let $\vec{a}$, $\vec{b}$ and $\vec{c}$ be three vectors such that $|\vec{a}| = 3$, $|\vec{b}| = 4$, $|\vec{c}| = 5$ and each of them being perpendicular to sum of the other two ,find $|\vec{a} + \vec{b} + \vec{c}|$

Q.8 Find the equation of line which passes through the point (1, 2 ,3) and parallel to the vector $3\hat{\imath} + 2\,\hat{\jmath} - 2\hat{k}$

Q.9 Find $\int e^x \left(\frac{1}{x} - \frac{1}{x^2}\right) dx$

OR

Evaluate $\int \frac{(\cos x - \sin x)}{(\sin x + \cos x)} dx$

Q.10 Evaluate $\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} sin^5 x$

Q.11 Evaluate $\cos^{-1}\left(\cos\frac{7\pi}{4}\right)$

Q.12 Write the cofactors of elements A_{23} of the determinant $\begin{vmatrix} 2 & 5 & -1 \\ 2 & -1 & 4 \\ 3 & 1 & -7 \end{vmatrix}$

Q.13 Let R be a relation on set { 1 , 2 , 3 , 4 , 5 } defined by $x + 2y = 8$. find the domain of R

OR

If f be the greatest integer function defined as f(x) = [x] and g be the modulus function defined as g(x) = |x| , then find the value of $gof\left(-\frac{5}{4}\right)$

Q.14 Show that the function $f(x) = 2x - 3$ is strictly increasing .

Q.16 Write two different vectors having same direction.

Q.16 Let X represent the difference between the number of heads and number of tails obtained when a coin is tossed 6 times. What are the possible value of X .

SECTION – II

Case study based questions

Q.17 Based on the below information answer the following (Attempt any 4 out of 5)

A tank with a rectangular base and rectangular sides, open at the top is to be constructed so that its height in 2 m and volume is 8 m^3.If building of tank cost Rs 700 per square metre for the base and Rs 450 per square metre for sides. Let x and y be the length and breadth of the least expensive tank.

(i) The for cost of constructing the tank depends on the length is

(A) $2800 + 900\left(x + \frac{4}{x}\right)$ (B) $2800 + 1800\left(x + \frac{4}{x}\right)$ (C) $\frac{2800}{x} + 1800x$ (D) $\frac{2800}{x} + 3600\left(x + \frac{4}{x}\right)$

(ii) The length of the tank will be

(A) 2 m (B) 3 m (C) 4 m (D) 1 m

(iii) Breadth of the tank will be

(A) 1m (B) 2m (C) 3m (D) 4m

(iv) The minimum cost of the tank in rupees

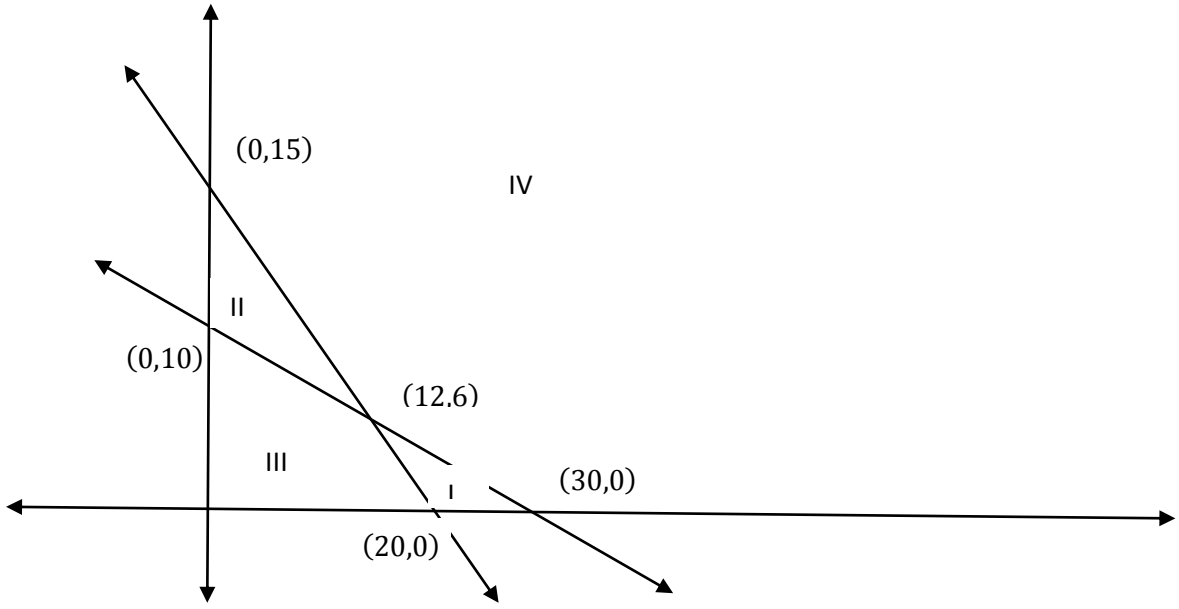
(A) 15100 (B) 11800 (C) 7300 (D) 10,000

(v) If rate of painting is Rs 200 per Square metre then the cost of its outer surface will be

(A)Rs 3200 (B) 4800 (C) 8000 (D) 5000

Q.18 Based on the below information answer the following (Attempt any 4 out of 5)

A manufacturing company makes two types of teaching aids A and B of mathematics for class XII. Each types of A requires 9 labours hours for fabricating and 1 labour hour for finishing. Each types of B requires 12 labour hours for fabricating and 3 labor hours for finishing. For fabricating and finishing , the maximum labour hours available are 180 and 30 respectively. The company makes a profit of Rs 80 on each piece of types of A and Rs 120 on each piece of types of B. Let x and y be the number of pieces of type A and Manufactured per week respectively.



(i) The objective function of company is

(A) Z = 120 $x + 80y$ (B) Z = 180 $x + 30y$ (C) Z = 80 $x + 120y$ (D) Z = 30 $x + 180y$

(ii) Which of the following is not a constraints of the company

(A) $x \geq 0$ (B) $y \geq 0$ (C) $x + 3y \leq 30$ (D)) 3 $x + 4y \geq 60$

(iii) Which of the following region is feasible region

(A) region I (B) region II (C) region III (D) region IV

(iv) The number of pieces of types A and B are

(A) (12,6) (B) (12,10) (C) (15,0) (D) (30,0)

(v) The company will expected to attain maximum profit in rupees is

(A) 1920 (B) 1680 (C) 2340 (D) 1200

PART – B
SECTION – III

Q.19 Let A and B independent events P(A) = 0.3 and P(B) = 0.4. Find P (A | B)

Q.20 Evaluate $\begin{vmatrix} 1 & -2 & 3 \\ 5 & 1 & -1 \\ 10 & 2 & -2 \end{vmatrix}$

Q.21 If tangent to the curve $y^2 - 3x + 7 = 0$ at the point $(h, k)$is parallel to line $x - y = 4$, then find the value of k

Q.22 Write an example which is symmetric but neither reflexive nor transitive.

Q23 Integrate $\int \frac{\sec^2 x}{\sqrt{4-\tan^2 x}} dx.$

Q.24 If $f(x) = [x^2 - 1]$ is the greatest integer function then find the value of $f(0.1)$

Q.25 Evaluate $tan^{-1}\sqrt{3} - sec^{-1}(-2)$

OR

Find the value of $\sin^{-1}\left(\frac{1}{2}\right) + 2\cos^{-1}\left(\frac{1}{2}\right)$

Q.26 For what value of k is following function is continuous at $x = -\frac{\pi}{6}$

$$f(x) = \begin{cases} \frac{\sqrt{3}\sin x + \cos x}{x + \frac{\pi}{6}}, & x \neq -\frac{\pi}{6} \\ k, & x = -\frac{\pi}{6} \end{cases}$$

OR

Find the values of a and b such that the function f defined by

$$f(x) = \begin{cases} \frac{x-4}{|x-4|} + a, & if \ x < 4 \\ a + b & if \ x = 4 \\ \frac{x-4}{|x-4|} + b & if \ x > 4 \end{cases}$$ is continuous

Q.27 Find the area bounded by the curve $y^2 = 4x$ and lines $x = 1, x = 4$

Q.28 Through the vector prove the points A(1 , 2 ,7) , B (2 , 6 ,3) and C (3 , 10 , −1) are collinear.

OR

Find the angle between the vectors $(\hat{\imath} - 2\hat{\jmath} + 3\hat{k})$ and $(3\hat{\imath} - 2\hat{\jmath} + \hat{k})$

SECTION – IV

Q.29 The line $y = x + 1$ is a tangent to the curve $y^2 = 4x$ then find the point of contact.

Q.30 If 4 cards are drawn one by one with replacement from a well shuffled deck of 52 cards .Find the probability that only one card is diamond.

Q.31 Find $\int e^x \left(\frac{1+\sin x}{1+\cos x}\right) dx.$

OR

Differentiate $\sin^{-1}\left\{\frac{2^{x+1}.}{1+4^x}\right\}$ $w.r.t\ x$

Q.32 Find the general solution of differential equation $\frac{dy}{dx} = \frac{1+y^2}{1+x^2}$

Q.33 Find the matrix A satisfying the equation $\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix} A \begin{bmatrix}4 & 7\\ 3 & 5\end{bmatrix} = \begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$

Q.34 Find the intervals in which the function f(x) = 6 – $9x$ – x^2 is strictly increasing or decreasing

Q.35 If $\vec{a} = 2\hat{\imath} + 2\,\hat{\jmath} + 3\,\hat{k}$, $\vec{b} = -\hat{\imath} + 2\,\hat{\jmath} + \hat{k}$ and $\vec{c} = 3\hat{\imath} + \hat{\jmath}$ are such that $\vec{a} + \lambda\vec{b}$ is perpendicular to $\vec{c}$, then find the value of λ

SECTION – V

Q.36 Using Integration find area of the circle of circle $x^2 + y^2 = 16$ interior to the parabola $y^2 = 6x$

OR

Find the coordinates of the point P where the line through $A(3,-4,-5)$ and $B(2,-3,1)$ crosses the plane passing through three points $L(2,2,1), M(3,\ 0,1)$ and $N(4,-1,0)$

Q.37 Let $f : \mathbf{R} \to \mathbf{R}$ be a function defined by $f(x) = x^3 - 1$, then prove that f^{-1} exist and find f^{-1} Also find value of $f^{-1}(26)$ and $f^{-1}(-9)$

OR

If $y = log\sqrt{\frac{1+\tan x}{1-\tan x}}$ prove that $\frac{dy}{dx} = \sec 2x$

Q.38 A bag contains 4 white and 5 black balls. Another bag contains 9 white and 7 black balls. A ball is transferred from the first bag to the second and then a ball is drawn at random from the second bag. Find the probability that the ball drawn is white.

OR

A letter is known to have come either from TATA NAGAR or from CALCUTTA. On the envelope, just two consecutive letter TA are visible. What is the probability that the letter came from TATA NAGAR.

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