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PRE BOARD2 EXAM 2022-23

CLASS-XII MATHEMATICS (041)

Time Allowed: 3 Hours **Maximum Marks: 80**

General Instructions:

1. This Question paper contains - five sections A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.
2. **Section A** has 18 MCQ's and 02 Assertion-Reason based questions of 1 mark each.
3. **Section B** has 5 Very Short Answer (VSA)-type questions of 2 marks each.
4. **Section C** has 6 Short Answer (SA)-type questions of 3 marks each.
5. **Section D** has 4 Long Answer (LA)-type questions of 5 marks each.
6. **Section E** has 3 source based/case based/passage based/integrated units of assessment **(**4 marks each**)**.

SECTION: -A

Q1: If A and B are two matrices of same order then AB'–BA' is a

a) Symmetric matrix
b) Skew symmetric matrix
c) Null matrix
d) Identity matrix

Q2: If $\begin{vmatrix} x & 18 \\ 2 & x \end{vmatrix} = \begin{vmatrix} 6 & 18 \\ 2 & 6 \end{vmatrix}$ hen the value of x is

a) 6
b) -6
c) ± 6
d) 0

Q3: If A and B are two sets containing 4 and 5 elements respectively then number of bijective functions can be formed from A to B.

a) 4^5
b) 5!
c) 4!
d) 0

Q4: If a function f(x)={$\frac{Sin2x}{x}$, $if\ x \neq 0\ k$, $if\ x = 0$ is continuous at x=0 then the vale of k is

a) 1
b) 2
c) ½
d) 0

Q5: If p and q are the degree and order of the differential equation $\frac{d^2y}{dx^2} = \sqrt{1 + \frac{dy}{dx}}$, then the value of 3p –2q is

a)2
b)1

c)0
d)-2

Q6: The function f(x)=$2x^3 + 3x^2 + 12x + 4$ has
a) Two points of local maxima
b) Two points of local minima
c) One local max and local min
d) No max, No min

Q7: If $\lambda\hat{\imath} + 2\hat{\jmath} + 3\hat{k}$ and $\hat{\imath} + 6\hat{\jmath} + \mu\hat{k}$ are parallel the value of $\lambda\mu$ is
a) 3
b)1/3
c) 6
d) 9

Q8: If $\int_0^{\frac{\pi}{2}} \quad log\ (tanx) = k$, then the value of k is

a)0
b) log2
c) $\frac{\pi}{2}$
d)π

Q9: If y =$Sin^{-1}(Cosx) + Cos^{-1}(Sinx)$ where x is an acute angle then $\frac{dy}{dx}$ is

a)2x
b)2
c)-2
d)0

Q10: If $\vec{a}$ and $\vec{b}$ are two non zero vectors such that $\overrightarrow{|a+b|} = \overrightarrow{|a-b|}$ then angle between $\vec{a}$ and $\vec{b}$ is

a)0 b) $\frac{\pi}{2}$ c) π d) $\pi/4$

Q11: The number of all possible matrices of order 3x3 with each entry 0 or 1 is

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

Q12: The solution set of the inequality 4x+3y<5 is

a) An open half plane not containing the origin.
b) An open half plane containing the origin.
c) The whole *xy* plane not containing the line 4x+3y=5.
d) A closed half plane containing the origin.

Q13: The derivative of $tan^{-1}x$ with respect to $cot^{-1}x$ is

a)1
b)-1
c)$\frac{1}{1+x^2}$
d) $\frac{-1}{1+x^2}$

Q14: The area of parallelogram whose one diagonal is $2\hat{\imath} + \hat{\jmath} - 2\hat{k}$ and one side is $3\hat{\imath} + \hat{\jmath} - \hat{k}$.

a)3 sq. unit

b)$3\sqrt{2}$ sq. unit

c)$6\sqrt{2}$ sq. unit

d)6 sq. unit

Q15: If a line makes angles α, β, γ with the positive direction of co-ordinate axes, then the value of $sin^2\alpha + sin^2\beta + sin^2\gamma$ is

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

Q16: The straight line $\frac{x-3}{3} = \frac{y-2}{1} = \frac{z-1}{0}$ is

a) Parallel to x axis
b) Parallel to z axis
c) Perpendicular to x axis
d) perpendicular to z axis

Q17: The probability that a leap year will have 53 Tuesday or 53 Wednesday

a)1/7
b)2/7
c)3/7
d)4/7

Q18: Feasible region is the set of points which satisfy

a) The objective function
b) Some of the given constraints
c) All of the given constraints
d) None of the above

ASSERTION-REASON BASED QUESTIONS

In the following questions, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

Q19: **ASSERTION**: A vector in the direction of vector $\hat{\imath} + 2\hat{\jmath} + 2\hat{k}$ that has magnitude 1 is $\frac{\hat{\imath}+2\hat{\jmath}+2\hat{k}}{9}$.

REASON: The unit vector in the direction of the given vector $\vec{a}$ is $\frac{\vec{a}}{|\vec{a}|}$.

Q20: **ASSERTION**: If A=$\begin{bmatrix} sin\theta & -cos\theta \\ cos\theta & sin\theta \end{bmatrix}$ then $A^{-1} = \begin{bmatrix} sin\theta & cos\theta \\ -cos\theta & sin\theta \end{bmatrix}$

REASON: Inverse of a matrix A exist if detA≠0 ; $A^{-1} = \frac{adjA}{detA}$.

SECTION: - B

Q21: Express $tan^{-1}\left(\frac{cosx}{1-sinx}\right)$ in simplest form, where $-\frac{3\pi}{2} < x < \frac{\pi}{2}$.

OR

Show that the relation S in the set R of real numbers defined as S={(a,b): a,b∈R and $a \leq b^3$} is neither reflexive nor transitive.

Q22: A stone is dropped in a quiet lake and waves move in circles at a speed of 4cm/sec , at the instant when the radius of the circular wave is 10cm, then how fast is the enclosed area increasing?

Q23: Find the vector equation of line joining (1,2,3) and (-3,4,3) and show that the line is perpendicular to z axis.

OR

$\left|\vec{a} \times \vec{b}\right|^2 + \left(\vec{a} \cdot \vec{b}\right)^2 = 144$ and $|\vec{a}|=4$ then find the value of $\left|\vec{b}\right|$.

Q24: Find the absolute max and absolute min value of the function $f(x) = x^2 - 2x - 5$ in [0,3]

Q25: If $y\sqrt{1-x^2} + x\sqrt{1-y^2} = 1$ then prove that $\frac{dy}{dx} = -\frac{\sqrt{1-y^2}}{\sqrt{1-x^2}}$

SECTION: - C

Q26: Evaluate; $\int \frac{x^2+6}{(x^2+2)(x^2+4)}\, dx$

Q27: Let a pair of dice is thrown and X denote the sum of the numbers that appear on the two dice. Find the probability distribution and mean of X.

OR

A can hit a target 4 times in 5 shots, B 3 times in 4 shots and C 2 times in 3 shots.
Find the probability that i) The target is hit.
ii) Only one of them will hit the target.

Q28: Evaluate; $\int_1^3 |x^2 - 2x| dx$

OR

$$\int_{-2}^{2} \frac{x^2}{1+e^x} dx$$

Q29: Solve:

$$(1 + x^2)dy = (tan^{-1}x - y)dx$$

OR

$$\frac{dy}{dx} = \frac{x+y}{x-y}$$

Q30: Solve the following LPP graphically

Min Z=6x+3y

Subject to
$4x+y \geq 80$, $x+5y \geq 115$, $3x+2y \leq 150$, $x,y \geq 0$

Q31: Evaluate; $\int \sqrt{cotx} + \sqrt{tanx}\, dx$

SECTION: - D

Q32: Find the area bounded by $x^2 = 4y$ and $x = 4y - 2$.

OR

Find the area of the bounded region $\{(x,y): y^2 \leq 4x, x^2 \leq 4y\}$.

Q33: Let f: A->B be a function defined by $f(x) = \frac{4x+3}{3x-4}$ where A=R– $\{\frac{-4}{3}\}$ and B=R– $\{\frac{4}{3}\}$, Verify whether f is bijective or not.

Q34: Find the shortest distance between the following lines

$\vec{r} = (6+\lambda)\hat{\imath} + (2-2\lambda)\hat{\jmath} + (2+2\lambda)\hat{k}$ and $\vec{r} = (-4+3\mu)\hat{\imath} + (-2\mu)\hat{\jmath} - (1+2\mu)\hat{k}$

OR

Show that $\vec{r} = \hat{\imath} + 2\hat{\jmath} + 3\hat{k} + s(2\hat{\imath} + 3\hat{\jmath} + 4\hat{k})$ and $\vec{r} = 4\hat{\imath} + \hat{\jmath} + t(5\hat{\imath} + 2\hat{\jmath} + \hat{k})$ intersect.
Also find their point of intersection.

Q35: If A=$\begin{bmatrix} 3 & -2 & 3 \\ 2 & 1 & -1 \\ 4 & -3 & 2 \end{bmatrix}$ then find A^{-1}.

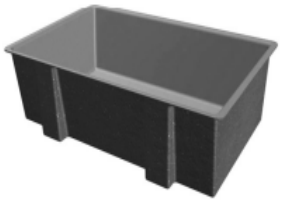
Also solve, 3x-2y+3z=8, 2x+y-z=1, 4x-3y+2z=4 using matrix method.

SECTION: - E

(This section comprises of 3 case-study/passage-based questions of 4 marks each with two sub-parts. First two case study questions have three sub-parts (i), (ii), (iii) of marks 1, 1, 2 respectively. The third case study question has two sub-parts of 2 marks each.)

Q36: Nitin wants to construct a rectangular plastic tank for his house that can hold 80 ft^3 of water.The top of the tank is open.The width of tank will be 5 ft but the length and heights are variables.Building the tank cost Rs20 per sq. foot for the base and Rs10 per sq. foot for the side.

Based on the above information answer the following questions.



i)Find the height of the tank at which the cost to make the tank is minimum.
ii)In order to make a least expensive tank, what need to be minimized.
iii)Find the cost of least expensive tank.
OR Find the dimension of least expensive tank.

Q37: A mirror in the shape of an ellipse represented by $\frac{x^2}{9}+\frac{y^2}{4}=1$ was hanging on the wall. Mukesh and his sister were playing with ball inside the house,even their mother refused to do so.All of sudden , ball hit the mirror and got a scratch in the shape of line represented by $\frac{x}{3}+\frac{y}{2}=1$.

Based on the above information answer the following questions.

i) Draw the rough sketch of the area of smaller region bounded by the ellipse and line.

ii)Write the point of intersection of line and Ellipse.

iii)By using definite integral find the area of smaller region bounded by mirror and scratch line..

OR

By using definite integral find the area of larger region in first quadrant bounded by mirror and scracth line.

Q38: A factory has three machines A, B and C to manufacture bolts.Machine A manufacture 30% , machine B manufacture 20% and machine C manufacture 50% of the bolts respectively. Out of their respective outputs 5%, 2% and 4% are defective.A bolt is drawn at random from total production and it is found to be defective.

Based on the above informations answer the following questions.

i)What is the probability of getting a defective item?

ii)What is the probability that a defective bolt is drawn and manufactured by machine A?

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