Model Question Paper
Mathematics (2024-25)
Class 10+2

Time : 3Hrs **MM : 80**

Special Instructions:-

1. This Question Paper contains 4 sections A, B, C & D. Each section is compulsory.
2. Sections A has 13 MCQ's and 3 Assertion Reason based questions of 1 marks each.
3. Section B has 12 Very Short answer questions of 3 marks each i.e. Q.17 to Q. 28.
4. Sections C has 2 short answer questions of 4 marks each i.e. Q.29 to Q.30.
5. Sections D has 4 Long answer questions of 5 marks each i.e. Q.31 to Q. 34.

Note: - Question no. 25, 26 and 32 are application based questions.

Section – A

Q.1) Let R be the relation in the Set N given by R = {(a,b): a=b-2,b>6}
Choose the correct answer:-

a) (2,4)∈ R b) (3,8) ∈ R C) (6,8)∈ R d) (8,7) ∈ R

Q.2) If $\sin^{-1} x=y$ then

a) $0 \leq y \leq \pi$ b) $-\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$ c) $0 < y < \pi$ d) $-\frac{\pi}{2} < y < \frac{\pi}{2}$

Q. 3) $\tan^{-1}\sqrt{3} - \cot^{-1}(-\sqrt{3})$ is equal to

a) π b) $-\frac{\pi}{2}$ c) 0 d) $2\sqrt{3}$

Q. 4)The number of all possible matrices of order 3x3 with each entry 0 or 1 is:-

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

Q. 5) If A, B are symmetric matrices of same order then AB-BA is a :-

a) Skew symmetric matrix b) Symmetric matrix
C) Zero matrix d) Identity matrix

Q. 6) If $f(x) = \cos^{-1}x$, then f(x) is´

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

Q. 7) The total revenue is Rupees received from the sale of x units of a product is given by $R(x) = 3x^2 + 36x + 5$. The marginal revenue when x=15 is: -

a) 116 b) 96 c) 90 d)126

Q. 8)The interval in which $y=x^2 e^{-x}$ is increasing:-

a) $(-\infty, \infty)$ b) (-2, 0) c) (2, ∞) d) (0, 2)

Q. 9)Choosethe correct answer $\int \frac{dx}{x^2+2x+2}$ equals:-

a) x $\tan^{-1}(x+1)$ +c b) $\tan^{-1}(x+1)$ +c

C)$(x+1)\tan^{-1}x$+c d) $\tan^{-1}x$+c

Q. 10) The degree of the differential equation: -

$\left(\frac{d^2y}{dx^2}\right)^3+\left(\frac{dy}{dx}\right)^2+\sin\left(\frac{dy}{dx}\right)+1=0$ is

a) 3 b) 2 c)1 d) Not Defined

Q. 11)The integrating factor of $x\frac{dy}{dx}+2y=x^2$is: -

a) x b) e^x c) e^{x^2} d) x^2

Q. 12)The vector $\vec{a}$ and $\vec{b}$ are perpendicular if:-

a) $\vec{a}\vec{b}=0$ b) $\vec{a}$ x $\vec{b}=0$ c) $\vec{a}\,.\,\vec{b}=0$ d) None of these

Q. 13)The Direction cosines of Z–axis are

b) (0, 1, 0) b) (0,0,1) c) (0,0,0) d) (1,0,0)

Assertion Reasons Based questions:

In the followings questions, a statement of assertion (A) is followed by a statement of Reason (R).Choose the correct answer out of the following from (Ques. 14-16):-

Q. 14) Assertion (A): the Vector equation of the line with the Cartesian equation:-

$\frac{x-5}{3}=\frac{y+4}{7}=\frac{z-6}{2}$ is

$\vec{r}=(5\hat{\imath}-4\hat{\jmath}+6\hat{k})+\lambda\,(3\hat{\imath}+7\hat{\jmath}+2\hat{k})$

Reason (R): The direction ratios of the line are given by the denominators in the Cartesian form, and the point on the line can be found by equating numerator to zero.

Options: a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)

b) Both Assertion (A) and Reason (R) are true, but Reason R is not the correct explanation of assertion (A)

c) Assertion (A) is true, but Reason (R) is false

d) Both Assertion (A) and Reason R are false.

Q. 15) Assertion (A): The probability of getting an odd number when a dice thrown once is ½

Reason (R): A standard die has six faces, with three of them showing odd numbers (1,3,and 5)

Options:

a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)

b) Both Assertion (A) and Reason (R) are true, but Reason R is not the correct explanation of assertion (A)

c) Assertion (A) is false, but Reason (R) is true

d) Assertion (A) is true, but Reason (R) is false

Q. 16) Assertion (A):

The probability of event B occurring given that event A has occurred, denoted as $P(\frac{B}{A})$, is $\frac{5}{11}$

Reason (R) : The formula for conditional probability is given by $P(\frac{B}{A})$,) = $\frac{P(A \cap B)}{P(A)}$ and with

$P(A) = \frac{6}{11}$, $P(B)=\frac{5}{11}$, and $P(A \cup B)=\frac{7}{11}$, $P(\frac{B}{A})$ is calculated as $\frac{2}{5}$.

Options:

a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)

b) Both Assertion (A) and Reason (R) are true, but Reason R is not the correct explanation of assertion (A)

c) Assertion (A) is false, but Reason (R) is true

d) Both Assertion (A) and Reason (R) are false

SECTION –B

Q.17. Show that the relation R in the set R of real numbers defined as $R=\{a, b) : a \leq b^2\}$ is neither reflexive nor symmetric nor transitive.

Q.18.Construct a 2x2 matrix, $A = [a_{ij}]$, whose elements are given by $a_{ij} = \frac{(i+j)^2}{2}$

Q.19. Find the area of the triangle by using the determinant whose vertices are (3,8), (-4,2) and (5,1)

Q.20. Find the values of K so that the function f is continuous at the indicated point:

$$f(x) = \begin{cases} kx^2 , & \text{if } x \leq 2 \\ 3 , & \text{if } x > 2 \end{cases} \qquad \text{at } x = 2$$

Q.21. Evaluate $\int \frac{1-\cos x}{1+\cos x} dx$

Q.22. Evaluate $\int_0^{\frac{\pi}{2}} \frac{\sin^4 x}{\sin^4 x + \cos^4 x} dx$

Q.23. Using Integration find the area enclosed by the circle $x^2+y^2 = a^2$

Q.24.Solve the differential equation:- $\frac{dy}{dx} + 2y = sinx$

Or

Find the general solution of the differential equation:- $\frac{dy}{dx} = \frac{1-cos}{1+cosx}$

Q.25. Find$\left|\vec{a}x\vec{b}\right|$, if $\vec{a} = (2\hat{\imath}+\hat{\jmath}+3\hat{k})$ and$\vec{b} = 3\hat{\imath}+5\hat{\jmath}-2\hat{k}$

Q.26.Show that the vector $2\hat{\imath}-\hat{\jmath}+\hat{k}$, $\hat{\imath}-3\hat{\jmath}-5\hat{k}$ and $3\hat{\imath}-4\hat{\jmath}-4\hat{k}$form the vertices of a right angled triangle.

Q.27. A game at a local fair involves drawing balls from a box to win prizes. The box contains 10 black balls and 8 red balls. To win the top prizes, a player must draw two red balls consequently, with each ball being replaced back into the box before the next draw. If you were advising a player and their chances of winning the top prizes, how you would calculate the probability that both balls drawn are red.

Q.28.A bag contains 4 red and 4 black balls; another bag contains 2 red and 6 black balls. One of the two bags is selected at random and a ball is drawn from the bag which is found to be red. Find the probability that the ball is drawn from the first bag.

Or

A coin is tossed three times such that

E: head an third toss

F: heads an first two tosses

Find P $(\frac{E}{F})$.

SECTION C.

Q.29. Prove that $\cos^{-1}\frac{12}{13} + \sin^{-1}\frac{3}{5} = \sin^{-1}\frac{56}{65}$

Or

Write in simplest form $\tan^{-1}\left[\frac{cosx - sinx}{cosx + sinx}\right]$

Q.30. Find $\frac{dy}{dx}$ when $xy + y^2 = tanx+y$

Or

Differentiate w.r.t.x $(cosx)^y = (\cos y)^x$

SECTION –D

Q.31. Solve the system of linear equations using matrix method:-

$2x+3y+3z = 5$

$x-2y+z=-4$

$3x-y-2z=3$

Q.32. A square piece of tin of side 18 cm is to be made into a box without top, by cutting of square from each corner and folding up the flaps. What should be the side of the square to be cut off so that the volume of box is maximum?

Or

An apache helicopter of enemy is flying along the curve given by $y=x^2+7$. A soldier placed at(3,7) wants to shoot down the helicopter when it is nearest to him. Find the nearest distance.

Q.33.Find the shortest distance between lines:-

$\vec{r} = \hat{\imath}+2\hat{\jmath}+3\hat{k} + \lambda(\hat{\imath}-3\hat{\jmath}+2\hat{k})$

$\vec{r} = 4\hat{\imath}+5\hat{\jmath}+6\hat{k} + \mu(2\hat{\imath}+3\hat{\jmath}+\hat{k})$

Or

Find the angle between the pair of lines given by :-

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

and $\vec{r} = 5\hat{\imath}-2\hat{\jmath}+\mu(3\hat{\imath}+2\hat{\jmath}+6\hat{k})$

Q.34. Solve the following linear programming problem (LPP) graphically:-

Maximize $Z = 3x+2y$

Subject to constraints:-

$x+2y \leq 10$

$3x + y \leq 15$

$x, y \geq 0$

Distribution of Marks 10+2 Mathematics
(Session 2024-25)

Chapter -1:	Relation and Functions	(1+3=4)
Chapter -2:	Inverse Trigonometric functions	(1+1+4 (c)=6)
Chapter -3:	Matrices	(1+1+3=5)
Chapter -4:	Determinants	(3+5=8)
Chapter -5:	Continuity and Differentiability	(1+3+4 (c) =8)
Chapter -6:	Application of Derivations	(1+1+5 (c) =7)
Chapter -7:	Integrals	(1+3+3=7)
Chapter -8:	Applications of Integrals	(3)
Chapter -9:	Differential Equations	(1+1+3(c)=5)
Chapter -10:	Vector Algebra	(1+3+3=7)
Chapter -11:	Three Dimensional Geometry	(1+1+5 (c)=7)
Chapter -12:	Linear Programming	(5)
Chapter -13:	Probability	(1+1+3+3 (c) =8)

Note:- Assertion Reasons based question will be asked from the chapter 11 and Chapter 13.