TARGET : CBSE-2017

PREPARED BY:
ER. VINEET LOOMBA
(IIT ROORKEE)

BATCH : XII
MATHEMATICS

FOR SURE SHOT SUCCESS IN CBSE-2017
(BASED ON LATEST CBSE PATTERN)

Full Syllabus Test-2017

FST # 01

Time: 3 Hrs.   **MM. 100**

General Instructions:

(i) **All** questions are compulsory.

(ii) This question paper contains **29** questions.

(iii) Question **1- 4** in **Section A** are very short-answer type questions carrying **1** mark each.

(iv) Question **5-12** in **Section B** are short-answer type questions carrying **2** marks each.

(v) Question **13-23** in **Section C** are long-answer-I type questions carrying **4** marks each.

(vi) Question **24-29** in **Section D** are long-answer-II type questions carrying **6** marks each.

Questions 1-4 Carrying One Mark Each

1. If $\begin{vmatrix} x & 2 \\ 18 & x \end{vmatrix} = \begin{vmatrix} 6 & 6 \\ 18 & 6 \end{vmatrix}$ then find the value of x.

2. If the binary operation * on the set Z of integers is defined by $a * b = a + b - 5$, then write the identity element for the operation * in Z.

3. If $\vec{a}$ and $\vec{b}$ are two vectors of magnitude 3 and 2/3, respectively such that $\vec{a} \times \vec{b}$ is a unit vector, write the angle between $\vec{a}$ and $\vec{b}$.

4. Prove that the function f: N → N, defined by $f(x) = x^3 + x^2 + 1$ is one –one.

Questions 5-12 Carrying Two Marks Each

5. Find the value of $\cos\left[\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right) + \frac{\pi}{6}\right]$.

6. If A is square matrix of order 3 such that | adj A | = 225, find $\left| A' \right|$

7. Evaluate $\int \frac{1}{sin^2 x cos^2 x} dx$

8. Form the differential equation of the family of curves represented by the equation : $(2x + a)^2 + y^2 = a^2$.

9. If A and B are two independent events, such that P (A) =0.3 , and P (B) =0.6 , find P (not A and B)

10. If $\left| \vec{a} + \vec{b} \right| = 60, \left| \vec{a} - \vec{b} \right| = 40$ and $\left| \vec{b} \right| = 46,$ find $\left| \vec{a} \right|$

11. An edge of a variable cube is increases at the rate of 3cm/sec. How fast the volume of the cube increasing when the edge is 10 cm long.

12. Find $\frac{dy}{dx}$ of $sin^2 y + \cos(xy) = \pi$

Questions 13-23 Carrying Four Marks Each

13. Find the value of k so that the function f is continuous at $x = \dfrac{\pi}{2}$.

$$f(x) = \begin{cases} \dfrac{k \cos x}{\pi - 2x}, & if \ \ x \neq \dfrac{\pi}{2} \\[3mm] 3, & if \ \ x = \dfrac{\pi}{2} \end{cases}$$

OR

Find $\dfrac{dy}{dx}$, when $y = \sin^{-1}\left\{ \dfrac{5x + 12\sqrt{1-x^2}}{13} \right\}$

14. Solve : $x\,dy - y\,dx = \sqrt{x^2 + y^2}\ dx$.

15. Using properties of determinant, prove that:

$$\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc\left(\dfrac{1}{a} + \dfrac{1}{b} + \dfrac{1}{c} + 1 \right).$$

16. Find the intervals in which the function $f(x) = \log(1+x) - \dfrac{2x}{2+x}$ is increasing or decreasing.

OR

An open box, with a square base, is to be made out of a given quantity of metal sheet of area C^2. Show that the maximum volume of the box is $\dfrac{C^3}{6\sqrt{3}}$.

17. Using differentials, find the approximate value of $\sqrt[3]{0.009}$.

18. $\displaystyle \int \dfrac{dx}{\sin(x-a)\sin(x-b)} = \dfrac{1}{\sin(a-b)} \log \left| \dfrac{\sin(x-a)}{\sin(x-b)} \right| + c.$

19. Show that the general solution of the differential equation $\dfrac{dy}{dx} + \dfrac{y^2 + y + 1}{x^2 + x + 1} = 0$, is given by $(x+y+1) = A(1 - x - y - 2xy)$, where A is a parameter.

OR

Show that the given differential equation is homogeneous and solve it $(1 + e^{x/y})\,dx + e^{x/y}\left(1 - \dfrac{x}{y} \right)dy = 0$

20. Find the value of λ for which these three vectors represented by points (-1, 4, -3) ,(3, λ, -5) , (-3, 8, -5) and (-3, 2, 1) are coplanar.

21. Find the shortest distance between the lines $\dfrac{x-4}{3} = \dfrac{1-y}{6} = \dfrac{5-z}{3}$ and $\vec{r} = (4\hat{i} - \hat{j} - 2\hat{k}) + \lambda(\hat{i} - 2\hat{j} - \hat{k}).$

22. Bag I contains 3 Red and 4 Black balls and Bag II contain 4 Red and 5 Black balls. One ball in transferred from Bag I to Bag II and then a ball is drawn from bag II. The ball so drawn is found to be red in colour. Find the probability that the transferred ball is black.

23. A candidate has to reach the examination centre in time. Probability of him going by bus or scooter or by other means of transport are $\dfrac{3}{10}, \dfrac{1}{10}, \dfrac{3}{5}$ respectively. The probability that he will be late is $\dfrac{1}{4}$ and $\dfrac{1}{3}$ respectively, if he travels by bus or scooter. But he reaches in time if he uses any other mode of transport. He reached late at the centre. Find the probability that he traveled by bus.

Questions Carrying Six Marks Each

24. Show that operation * on $Q - \{1\}$, defined by $a * b = a + b - ab$ for all $a, b \in Q - \{1\}$ satisfies (i) the closure property, (ii) the associative property (iii) the commutative property (iv) What is the identity element? (v) For each $a \in Q - \{1\}$, find the inverse of a.

OR

Let N be the set of all natural numbers and R be the relation on $N \times N$ defined by (a, b) R (c, d) iff $ad (b + c) = bc (a + d)$. Examine whether R is an equivalence relation on $N \times N$?

25. Find the inverse of the following matrix using elementary transformation

$$A = \begin{pmatrix} 1 & 2 & -3 \\ 2 & 3 & 2 \\ 3 & -3 & -4 \end{pmatrix}$$ and hence solve the following system of linear equations:

$$x - 2y - 3z = -4$$
$$2x + 3y + 2z = 2$$
$$3x - 3y - 4z = 11.$$

OR

Using elementary row transformation, find the inverse of matrix $\begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$

26. Using integration, find the area of triangle ABC, coordinates of the vertices being A (2, 5), B (4, 7), C (6, 2).

27. Evaluate $\displaystyle\int_{0}^{\frac{\pi}{2}} \dfrac{dx}{5 + 4\sin x}.$

OR

Evaluate $\displaystyle\int_{1}^{2} \left\{ |x + 1| + |x| - |x - 1| \right\} dx.$

28. Find the equation of the plane passing through the intersection of the plane $4x - y + z = 10$ and $x + y - z = 4$ parallel to the line with direction ratio <2, 1, 1>. Find also the perpendicular distance of (1, 1, 1) from the plane.

29. Every gram of wheat provides 0.1 gm of proteins and 0.25 gm of carbohydrates. The corresponding values for rice are 0.05 gm and 0.5 gm respectively. Wheat costs Rs. 4 per kg and rice Rs. 6 per kg. The minimum

daily requirements of proteins and carbohydrates for an average child are 50 gms and 200 gms respectively. In what quantities should wheat and rice be mixed in the daily diet to provide minimum daily requirements of proteins and carbohydrates at minimum cost. Frame an L.P.P. and solve it graphically.