ARMY PUBLIC SCHOOL JAMMU CANTT
PRE BOARD EXAMINATION 2011-12

CLASS: XII   **M.M : 100**

SUBJECT: MATHEMATICS   **TIME: 3 h**

GENERAL INSTRUCTION:

(a) *All questions are compulsory.*
(b) *This question paper consists of 29 questions divided into three section A, B, and C. Section A comprises of 10 question of one mark each, section B comprises of 12 questions of four marks each and section C comprises of 7 questions of six marks each.*
(c) *All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.*
(d) *There is no overall choice. However, internal choice has been provided in 04 questions of four marks each and 02 questions of six marks each. You have to attempt only one of the alternatives in all such questions.*
(e) *Use of calculators is not permitted. You may ask for logarithmic tables, if required.*

SET-II

SECTION-A

Q1.   If :R$\to R$ defined as $f(x) = \frac{2x-7}{4}$ is an invertible function , find f^{-1}.

Q2.   If a * b denotes the bigger number between a and b and a.b = (a*b) +3 , find 3.2.

Q3.   If the vectors $2\hat{i} - \hat{j} + \lambda\hat{k}, \hat{i} - \hat{j} + 2\hat{k}$ and $3\hat{i} - 2\hat{j} + \hat{k}$ are coplanar, find the value of λ

Q4.   Find the principal value of $\tan^{-1}(-1) + \cos^{-1}\left[\frac{-1}{\sqrt{2}}\right]$

Q5.   Find the angle between the vectors with direction ratios proportional to 4, –3, 5 and 3, 4, 5.

Q6.   Evaluate: $\int_{-99}^{99} (x^{99} + x^{49} + x^{19})dx$

Q7.   For A $= \begin{bmatrix} 2 & -1 \\ -4 & -2 \end{bmatrix}$, find A(adjA).

Q8.   If $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$ and $\vec{b} = 3\hat{i} + \hat{j} + \hat{k}$, find a unit vector perpendicular to $\vec{a} \ and \ \vec{b}$.

Q9.   Write the co-factor of a_{13} of $\begin{bmatrix} 1 & 2 & 3 \\ -4 & 3 & 6 \\ 2 & -7 & 9 \end{bmatrix}$

Q10.   Find the rate of change of surface area of a sphere when rate of change of its radius is 4cm/s.

SECTION-B

Q11.   A pair of dice is thrown once. What is the probability of getting the sum of numbers a perfect square if it is known that one of the number is 3.

OR

Three cards are drawn from a well shuffled deck of 52 cards without replacement. Find the mean and variance of number of jacks.

Q12.   Solve the given differential equation : $\frac{dy}{dx} + 2y \tan x = \sin x.$

Q13.   Find the equation of normal to the curve y = x^3 + 2x + 6 which is parallel to the line x + 14y + 4 =0.

OR

Find the approximate value of $\sqrt[3]{26.57}$ by using differentials.

Q14.   Solve : $y \left\{ x \cos\frac{y}{x} + y \sin\frac{y}{x} \right\} dx - x \left\{ y \sin\left(\frac{y}{x}\right) - x \cos\left(\frac{y}{x}\right) \right\} dy = 0$

OR

Form the differential equation of family of circles touching both the coordinate axes and having centre in the fourth quadrant.

Q15.   Evaluate: $\int_0^\pi \frac{x \tan x}{\sec x + \tan x} dx$

Q16:   If y = $sin^{-1} \left[\frac{5x + 12\sqrt{1-x^2}}{13} \right]$, find $\frac{dy}{dx}$

Q17: Find the equation of the line passing through the point (–1, 3, –2) and perpendicular to the lines :

$$\frac{x}{1} = \frac{y}{2} = \frac{z}{3}, \quad and \quad \frac{x+2}{-3} = \frac{y-1}{2} = \frac{z+1}{5}.$$

OR

Find the shortest distance between the following lines: $\frac{x-3}{1} = \frac{y-5}{-2} = \frac{z-7}{1}$ and

$$\frac{x+1}{7} = \frac{y+1}{-6} = \frac{z+1}{1}$$

Q18: Evaluate : $\int \frac{\sin^{-1}x}{x^2}\,dx$

Q19: Prove that : $\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix} = 2(a+b+c)^3$

Q20: Show that the relation R defined by (a, b) R (c, d) $\Rightarrow$ a+d = b+c on the Set N $\times$ N is an equivalence relation.

Q21: Prove that $\tan^{-1}\left[\frac{\sqrt{x+1}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}\right] = \frac{\pi}{4} - \frac{1}{2}\cos^{-1}x.$

Q22: Let $\vec{a} = \hat{i} - \hat{j}, \vec{b} = 3\hat{j} - \hat{j} + 3\hat{k}$ and $\vec{c} = 7\hat{i} - \hat{k}$ Find a vector $\vec{d}$ which is perpendicular to both $\vec{a}$ and $\vec{b}$ and $\vec{c}.\vec{d} = 1$.

SECTION–C

Q23: If a young man drives his motorcycle at 25 km/hr he has to spend Rs.2 per km on petrol. If he rides at a faster speed of 40 km/hr the petrol cost increases to Rs.5 per km. He has Rs.100 to spend on petrol & wishes to find what is the max. distance he can travel within an hour. Express as LPP & solve it.

Q24: A man is known to speak truth 4 out of 7 times . He throws a pair of dice and reports the sum of numbers as 9. Find the probability that the sum of numbers was 9.

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Q25: Find the equation of the plane passing through the line of intersection of the planes $\vec{r}.(i+j+k) = 1 \; and \; \vec{r}.(2i+3j-k)+4 = 0$ and parallel to y-axis.

Q26: Evaluate : $\int \dfrac{sin^8 x - cos^8 x}{1 - 2\,sin^2 x\,cos^2 x}\, dx$ OR $\int \dfrac{dx}{\sqrt{sin^3 x\, sin\,(x+a)}}$

Q27: Find the area of the region enclosed between $x^2 + y^2 = 4$ and $(x-2)^2 + y^2 = 4$.

Q28: If $A = \begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} 3 & 1 & -1 \\ 1 & 3 & 1 \\ -1 & 1 & 3 \end{pmatrix}$, find AB.

Use AB to solve the following system of equations: $2x - y + z = -1$, $-x + 2y - z = 4$, $x - y + 2z = -3$.

Q29: If the length of three sides of a trapezium other than base are equal to 10cm, then find the area of the trapezium when it is maximum.

OR

Show that the triangle of maximum area that can be inscribed in a given circle is an equilateral triangle.

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