D.A.V KAPILDEV PUBLIC SCHOOL, KADRU, RANCHI

PRACTICE SET- I [2017-2018]

Maths

TIME :3.00 HRS. **CLASS - XII** **FM =100**

GENERAL INSTRUCTIONS

(i) *All questions are compulsory.* (ii) *This paper contains 29 questions.*
(iii) *Q.No. Q1 to 4 in Section – A are very short answer type questions carrying one mark each.*
(iv) *Q.No. 05to 12 in Section – B are short answer type questions carrying two marks each.*
(v) *Q.No. 13to 23 in Section – C are long answer type I questions carrying four marks each.*
(vi) *Q.No. 24to 29 in Section – D are long answer type II questions carrying six marks each.*

SECTION-A

Q1. If f is an invertible function, find the inverse of $f(x)=\dfrac{3x-2}{5}$. .

Q2 Is * defined on the set A = {1,2,3,4,5} by a*b = LCM(a,b), a binary operation. Give a reason.

Q3. What is the cosine of the angle which the vector $\sqrt{2}\hat{i}+\hat{j}+\hat{k}$ makes with the y-axis ?

Q4. If I is an identity matrix and A is a square matrix of the same order such that $A^2 = A$, then write the value of $(I + A)^2 - 3A$?

SECTION – B

Q5. Evaluate $\cos^{-1}\left(\cos\dfrac{11\pi}{6}\right)$.

Q6. I_2 is multiplicative identity for matrix $A=\begin{bmatrix}1 & 2 & -1\\ 4 & 2 & 6\end{bmatrix}$. State true or false, with a reason.

Q7. In a binomial probability distribution, variance < mean, prove it.

Q8. If $y=\left(\sin\dfrac{x}{2}+\cos\dfrac{x}{2}\right)^2$, find $\dfrac{dy}{dx}$ at $x=\dfrac{\pi}{6}$

Q9. Find the points on the curve $y=\dfrac{1}{x-1}$, where tangent has slope equal to 2.

Q10. Evaluate $\int e^{\sqrt{x}}dx$

Q11. Form the differential equation corresponding to the function y = A sin 3x + B cos 3x, by eliminating A and B.

Q12. If $\vec{a}=\hat{i}+2\hat{j}-\hat{k}$ and $\vec{b}=3\hat{i}+\hat{j}-5\hat{k}$, find a unit vector in the direction of $\vec{a}-\vec{b}$.

SECTION – C

Q13. Verify Mean Value Theorem for the function $f(x) = x^2 + 2x + 3$ in [4, 6].

OR

Let functions f and g be differentiable in [0, 1] such that f(0) = 2, g(0) = 0, f(1) = 6 and g(1) =2. Show that there exists at point $c \in (0, 1)$ such that $f'(c) = 2g'(c)$.

Q14. If y = x + tan x, prove that $\cos^2 x.\dfrac{d^2y}{dx^2}-2y+2x=0$.

Q15. For what value of p, the function $f(x)=\begin{cases}\dfrac{\sqrt{1+px}-\sqrt{1-px}}{x} & ,if\ -1\le x<0\\[2ex] \dfrac{2x+1}{x-2} & ,if\ 0\le x<1\end{cases}$ is continuous at x = 0.

Q16. If $A=\begin{bmatrix}3 & -2\\ 4 & -2\end{bmatrix}$ and $\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$, find k so that $A^2 = kA - 2I$.

Q17. Assuming that the petrol burnt per unit time in driving a motorboat varies as the cube of its velocity. Find the most economical speed of the motorboat when running against the current whose speed is a m/s. Write an importance of economical use of speed and petrol.

Q18. Evaluate $\int\dfrac{\log x}{(x+1)^2}dx$.

Q19. A die is thrown thrice. If getting a four is considered a success, find the probability distribution of number of successes. Also, find the mean and the variance of the distribution.

Q20. Ten cards numbered 1 to 10 are placed in a box, mixed up thoroughly and then one card is drawn randomly. If it is known that number on the drawn card is more than 3, what is the probability that it is an even number?

Q21. Find the equation of the line passing through the point P(4, 6,2) and the point of intersection of the line $\frac{x-1}{3}=\frac{y}{2}=\frac{z+1}{7}$ and the plane $x + y - z = 8$.

Q22. Vectors $\vec{a},\vec{b},\vec{c}$ are of the same magnitude and taken pair wise in order form equal angles. If $\vec{a}=\hat{i}+\hat{j}$ and $\vec{b}=\hat{j}+\hat{k}$ find $\vec{c}$.

Q23. Show that the differential equation $\frac{dy}{dx}=\frac{y^2}{xy-x^2}$ is homogeneous and solve it.

OR

Solve the differential equation, $(2x-5y+3)\,dx+(4x-10y-9)\,dy=0$.

SECTION - D

Q24. Let f: $N\rightarrow R$ be a function, defined as $f(x) = 4x^2 + 12x + 15$. Show that f: $N\rightarrow$range of f is invertible. Also find f^{-1}.

OR

Let * be a binary operation on $Q-\{0\}$ defined by $a*b=\frac{ab}{4}, a,b\in Q-\{0\}$. Find (i) identity element in $Q-\{0\}$ (ii) inverse of an element in $Q-\{0\}$.

Q25. Using properties of determinants, solve for x: $\begin{vmatrix} x-2 & 2x-3 & 3x-4 \\ x-4 & 2x-9 & 3x-16 \\ x-8 & 2x-27 & 3x-64 \end{vmatrix}=0$.

OR

Show that $\begin{vmatrix} a^2+1 & ab & ac \\ ab & b^2+1 & bc \\ ca & cb & c^2+1 \end{vmatrix}=1+a^2+b^2+c^2$

Q26. Find the area of the region inside the circle $x^2 + (y - 1)^2 = 1$ and outside the ellipse

$c^2x^2 + y^2 = c^2$; $[c=\sqrt{2}-1]$

Q27. Evaluate $\int_0^2 (x^2+x+1)\,dx$, as a limit of sum.

Q28. Find the equation of the plane passing through the point P(1, 1, 1) and containing the line $\vec{r}=(-3\hat{i}+\hat{j}+5\hat{k})+\lambda(3\hat{i}-\hat{j}-5\hat{k})$. Also, show that the plane contains the line $\vec{r}=(-\hat{i}+2\hat{j}+5\hat{k})+\mu(\hat{i}-2\hat{j}-5\hat{k})$

Q29. A merchant plans to sell two types of personal computers; a desktop model and a portable model that will cost Rs 25000 and Rs 40000 respectively. He estimates that the total monthly demand of computers will not exceed 250 units. Determine the number of units of each type of computers which the merchant should stock to get maximum profit if he does not want to invest more than Rs 70 lakh and his profit on the desktop model is Rs 4500 and on the portable model is Rs 5000. Make an LPP and solve it graphically.