CBSE Class 12th

Guess Paper

Time: 3 hrs **M.M**: 100

General Instructions:

(i) *All questions are compulsory.*

(ii) *The question paper consists of 26 questions divided into three sections – A, B & C Section A contains 06 questions of 1 mark each. Section B contains 13 questions of 4 marks each. Section C contains 7 questions of 6 marks each.*

(iii) *Use of calculators is not permitted.*

SECTION – A

Q.1 What is the degree of the differential equation: $y\frac{d^2y}{dx^2}+\left(\frac{dy}{dx}\right)^3=x\left(\frac{d^3y}{dx^3}\right)^2$?

Q.2 Write the differential equation representing the curve $y^2 = 4ax$, where 'a' is an arbitrary constant.

Q.3 If $|\vec{a}|=\sqrt{26}$, $|\vec{b}|=7$ and $|\vec{a}\times\vec{b}|=35$, then find $\vec{a}\cdot\vec{b}$.

Q.4 Find the area of parallelogram, whose diagonals are $\vec{d}_1=5\hat{i}$ and $\vec{d}_2=2\hat{j}$.

Q.5 If $A=\begin{bmatrix}2 & -3 & 5\\ 6 & 0 & 4\\ 1 & 5 & -7\end{bmatrix}$, then find the value of $a_{11}C_{31} + a_{12}C_{32} + a_{13}C_{33}$

Q.6 If $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k}$ and $\vec{c} = 3\hat{i} + \lambda\hat{j} + 5\hat{k}$ are coplanar, then find the value of λ.

SECTION – B

Q.7 If the value of $\sin\left(2\tan^{-1}\frac{1}{3}\right) + \cos\left(\tan^{-1}2\sqrt{2}\right)$.

Q.8 If sin(y) = x sin(a+y), then prove that $\frac{dy}{dx} = \frac{\sin^2(a+y)}{\sin a}$

OR

If $y = x^x$, then prove that $\frac{d^2y}{dx^2} - \frac{1}{y}\left(\frac{dy}{dx}\right)^2 - \frac{y}{x} = 0$.

Q.9 Prove that $\begin{vmatrix} a & b & c \\ a-b & b-c & c-a \\ b+c & c+a & a+b \end{vmatrix} = a^3 + b^3 + c^3 - 3abc$

OR

Prove that $\begin{vmatrix} 1 & x & x^2 \\ x^2 & 1 & x \\ x & x^2 & 1 \end{vmatrix} = (1 - x^3)^2$

Q.10 Out of a group of 8 highly qualified doctors in a hospital, 6 are very kind and cooperative with their patients and so are very popular, while the other two remain reserved. For a health camp, three doctors are selected

at random. Find the probability distribution of the number of very popular doctors. What values are expected from the doctors?

Q.11 Find the vector equation of the plane passing through the points A(2,5,-3), B(-2,-3,5) and C(5,3,-3). Also, find the distance of this plane from origin.

Q.12 Find the equations of the tangent and normal to the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = 2$ at (1,1).

OR

A ladder 5 m long is leaning against a wall. The bottom of the ladder is pulled along the ground away from the wall, at the rate of 2cm/sec. How fast is its height on the wall decreasing when the foot of the ladder is 4 m away from the wall?

Q.13 Evaluate: $\int \frac{\sin x + \cos x}{\cos^2 x + \sin^4 x} dx$

Q.14 Three vectors $\vec{a}, \vec{b}$ and $\vec{c}$ satisfy the condition $\vec{a} + \vec{b} + \vec{c} = 0$. Evaluate the quantity $\mu = \vec{a}.\vec{b} + \vec{b}.\vec{c} + \vec{c}.\vec{a}$, if $|\vec{a}| = 1$, $|\vec{b}| = 4$ and $|\vec{c}| = 2$

Q.15 Evaluate: $\int \frac{\sqrt{x^2+1}\left[\log(x^2+1) - 2\log x\right]}{x^4} dx$

Q.16 Evaluate $\int_0^{\frac{\pi}{2}} \cot^{-1}(1 - x + x^2) dx$

Q.17 Verify Rolle's theorem for the function f(x) = (x – 1) (x – 2)² in [1,2].

OR

If $x = a\left(\cos\theta + \log\tan\frac{\theta}{2}\right)$ and y = a sinθ, then find the value of $\frac{dy}{dx}$ at $x = \frac{\pi}{4}$.

Q.18 A farmer posses 30 acre cultivated land that must be cultivated in two different modes of cultivations organic and inorganic. The yield for organic and inorganic system of cultivations is 11 quintals/acre and 14 quintal/acre respectively. Using matrix method, determine how to divide 30 acre land among two modes of cultivation to obtained yield 390 quintals. (Organic cultivation means growing crop organically without using any chemicals for sustainable agriculture).
Which mode of cultivation you prefer most and why?

Q.19 If $A = \begin{bmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{bmatrix}$, prove that $A^n = \begin{bmatrix} \cos nx & \sin nx \\ -\sin nx & \cos nx \end{bmatrix}$ for all positive integers n.

SECTION – C

Q.20 A company manufactures two types of sweaters, type A and type B. It costs Rs. 360 to make one unit of type A and Rs. 120 to make a unit of type B. The company can make atmost 300 sweaters and can spend atmost Rs. 72000 a day. The number of sweaters of type A cannot exceed the number of type B by more than 100. The company makes a profit of Rs. 200 on each unit of type A but considering the difficulties of a common man the company charges a nominal profit of Rs. 20 on a unit of type B. Using LPP, solve the problem for maximum profit.

Q.21 Find the area of the smaller region bounded by the ellipse $\frac{x^2}{9}+\frac{y^2}{4}=1$ and the line $\frac{x}{3}+\frac{y}{2}=1$.

Q.22 Solve the differential equation: $x\cos\frac{y}{x}(ydx+xdy)=y\sin\frac{y}{x}(xdy-ydx)$

OR

Solve the differential equation: $(1-x)\frac{dy}{dx}+1=e^{x-y}, x\neq -1$.

Q.23 Let AP and BQ be two vertical poles at points A and B respectively. If AP = 16 m, BQ = 22 m and AB = 20 m, then find the distance of point R on AB from A such that $RP^2 + RQ^2$ is minimum.

Q.24 A bag contains 4 balls. Two balls are drawn at random and are found to be white. What is the probability that all balls are white?

OR

Suppose a girl throws a die. If she gets a 5 or 6, she tosses a coin 3 times and notes the number of heads. If she gets a 1, 2, 3 or 4, she tosses a coin twice and notes the number of heads. If she obtained exactly two heads, what is the probability that she threw a 1, 2, 3 or 4 with the die?

Q.25 Find distance of the point (2, 3, 4) from the line $\frac{x+3}{3}=\frac{y-2}{6}=\frac{z}{2}$, measured parallel to the plane 3x + 2y + 2z + 5 = 0

Q.26 Consider f: $R_+ \longrightarrow [-5,\infty)$ given by $f(x) = 9x^2 + 6x - 5$. Show that f is invertible with $f^{-1}(x)=\frac{\sqrt{x+6}-1}{3}$.

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