Board Paper of Class 12-Science Term-II 2022 Math Delhi(Set 1)

Total Time: 120

Total Marks: 40.0

Section A

Q.No.1: Find: $\int \frac{dx}{\sqrt{4x-x^2}}$ **Marks:[2.00]**

Q.No.2: Find the general solution of the following differential equation:
$\frac{dy}{dx} = e^{x-y} + x^2 e^{-y}$ **Marks:[2.00]**

Q.No.3: Let X be a random variable which assumes values x_1, x_2, x_3, x_4 such that $2P(X = x_1) = 3P(X = x_2) = P(X = x_3) = 5P(X = x_4)$.
Find the probability distribution of X. **Marks:[2.00]**

Q.No.4: If $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{a} . \vec{b} = 1$ and $\vec{a} \times \vec{b} = \hat{j} - \hat{k}$, then find $\left|\vec{b}\right|$
Marks:[2.00]

Q.No.5: If a line makes an angle α, β, γ with the coordinate axes, then find the value of $\cos 2\alpha + \cos 2\beta + \cos 2\gamma$. **Marks:[2.00]**

Q.No.6: Events A and B are such that
$P(A) = \frac{1}{2}$, $P(B) = \frac{7}{12}$ and $P(\overline{A} \cup \overline{B}) = \frac{1}{4}$

Find whether the events A and B are independent or not.

OR

A box B_1 contains 1 white ball and 3 red balls. Another box B_2 contains 2 white balls and 3 red balls. If one ball is drawn at random from each of the boxes B_1 and B_2, then find the probability that the two balls drawn are of the same colour. **Marks:[2.00]**

Section B

Q.No.7: Evaluate: $\int_0^{\frac{\pi}{4}} \frac{dx}{1+\tan x}$ **Marks:[3.00]**

Q.No.8: If $\vec{a}$ and $\vec{b}$ are two vectors such that $\left|\vec{a}+\vec{b}\right| = \left|\vec{b}\right|$, then prove that $\left(\vec{a}+2\vec{b}\right)$ is perpendicular to $\vec{a}$.

OR

If $\vec{a}$ and $\vec{b}$ are unit vectors and θ is the angle between them, then prove that $\sin\frac{\theta}{2} = \frac{1}{2}\left|\vec{a}-\vec{b}\right|$. **Marks:[3.00]**

Q.No.9: Find the equation of the plane passing through the line of intersection of the planes $\vec{r}.\left(\hat{i}+\hat{j}+\hat{k}\right) = 10$ and $\vec{r}.\left(2\hat{i}+3\hat{j}-\hat{k}\right)+4=0$ and passing through the point (–2, 3, 1). **Marks:[3.00]**

Q.No.10: Find:
$\int e^x.\sin 2x\, dx$

OR

Find:
$\int \frac{2x}{(x^2+1)(x^2+2)}dx$ **Marks:[3.00]**

Section C

Q.No.11: Three persons A, B and C apply for a job of manager in a private company. Chances of their selection are in the ratio 1 : 2 : 4. The probability

that A, B and C can introduce changes to increase the profits of a company are 0.8, 0.5 and 0.3 respectively. If increase in the profit does not take place, find the probability that it is due to the appointment of A. **Marks:[4.00]**

Q.No.12: Find the area bounded by the curves $y = |x - 1|$ and $y = 1$, using integration. **Marks:[4.00]**

Q.No.13: Solve the following differential equation :

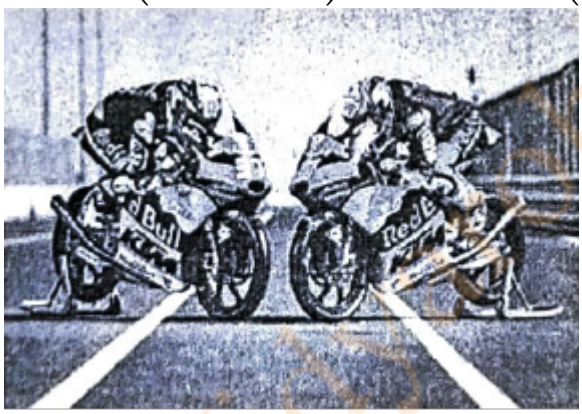
$(y - \sin^2 x)dx + \tan x\, dy = 0$

OR

Find the general solution of the differential equation:

$(x^3 + y^3)dy = x^2 y dx$ **Marks:[4.00]**

Q.No.14: Two motorcycles A and B are running at the speed more than the allowed speed on the roads represented by the lines $\vec{r} = \lambda\left(\hat{i} + 2\hat{j} - \hat{k}\right)$ and $\vec{r} = \left(3\hat{i} + 3\hat{j}\right) + \mu\left(2\hat{i} + \hat{j} + \hat{k}\right)$ respectively.



Based on the above information, answer the following questions:

(a) Find the shortest distance between the given lines.

(b) Find the point at which the motorcycles may collide. **Marks:[4.00]**