Karnataka School Examination and Assessment Board

QUESTION PAPERS

2024-25



SECOND QUARTERLY TEST DECEMBER 2024

CLASS : II PUC **SUBJECT : MATHEMATICS (35)** **Max. Marks : 40**
TIME : 1 Hr. 30 Mins.

PART-A

I Answer the Multiple Choice Questions : **7x1=7**

1) If a line makes angle 90°, 60° and 30° with the positive direction of X, Y and Z axes respectively then its direction cosines are

A) $1, \frac{1}{2}, \frac{\sqrt{3}}{2}$ B) $1, \frac{\sqrt{3}}{2}, \frac{1}{2}$ C) $0, \frac{1}{2}, \frac{\sqrt{3}}{2}$ D) $0, \frac{\sqrt{3}}{2}, \frac{1}{2}$

2) If a line has the direction ratios $2, -1, -2$ then its direction cosines are

A) $\pm\frac{2}{3}, \mp\frac{1}{3}, \mp\frac{2}{3}$ B) $\pm\frac{2}{5}, \mp\frac{1}{5}, \mp\frac{2}{5}$

C) $\pm\frac{2}{\sqrt{5}}, \mp\frac{1}{\sqrt{5}}, \mp\frac{2}{\sqrt{5}}$ D) $-2, 1, 2$

3) **Statement 1 :** If α, β, γ are the direction angles with respect to +ve direction X, Y and Z axes, then $\cos\alpha, \cos\beta, \cos\gamma$ are the direction cosines

Statement 2 : If l, m and n are the direction consines then $l^2 + m^2 + n^2 = 1$

A) Statement 1 is true and Statement 2 is false
B) Both Statements are true
C) Both Statements are false
D) Statement 1 is false and Statement 2 is true

4) $\int e^{2x+3}\,dx$ is

A) $e^{2x+3}+C$ B) $\frac{e^{2x+3}}{2}+C$ C) $2e^{2x+3}+C$ D) $\frac{e^{2x+3}}{3}+C$

5) $\int \sec x(\sec x + \tan x)\,dx =$

A) $\sec x + \tan^2 x + C$ B) $\cot x + \operatorname{cosec}^2 x + C$ C) $\tan x + \sec x + C$ D) $\sec^2 x + \tan x + C$

6) $\int e^x(\sin x + \cos x)\,dx =$

A) $e^x \cos x + C$ B) $e^x \sin x + C$ C) $e^{-x}\tan x + C$ D) $e^{-x}\cot x + C$

7) $\int_0^1 \frac{dx}{1+x^2} =$

A) $\frac{\pi}{6}$ B) $\frac{\pi}{3}$ C) $\frac{\pi}{4}$ D) $\frac{\pi}{2}$

II Fill in the blanks with the answers given in the brackets: **3x1=3**
[1, 4, log x, 0]

8) The order of the differential equation $\frac{d^4y}{dx^4} + \sin(y''') = 0$ is _____.

9) $\int_1^e \frac{1}{x}\,dx =$ _____.

10) $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^7 x\,dx =$ _____.

(P.T.O.)

PART-B

III Answer any THREE questions : **3x2=6**

11) Find the angle between the pair of lines $\vec{r} = 3\hat{i} + \hat{j} - 2\hat{k} + \lambda\left(\hat{i} - \hat{j} - 2\hat{k}\right)$ and

$\vec{r} = 2\hat{i} - \hat{j} - 56\hat{k} + \mu\left(3\hat{i} - 5\hat{j} - 4\hat{k}\right)$

12) Integrate $\dfrac{x^3 \sin\left(\tan^{-1} x^4\right)}{1+x^8}$ with respect to x.

13) Integrate $\dfrac{1}{1+\tan x}$ with respect to x.

14) Evaluate $\displaystyle\int_0^{\frac{\pi}{4}} \frac{\sin^4 x\, dx}{\sin^4 x + \cos^4 x}$

15) Find the general solution of the differential equation $\dfrac{dy}{dx} = \dfrac{1+y^2}{1+x^2}$.

PART-C

IV Answer any THREE questions : **3x3=9**

16) Find the shortest distance between the lines l_1 and l_2 whose vector equations are $\vec{r} = \hat{i} + \hat{j} + \lambda\left(2\hat{i} - \hat{j} + \hat{k}\right)$ and $\vec{r} = 2\hat{i} + \hat{j} - \hat{k} + \mu\left(3\hat{i} - 5\hat{j} + 2\hat{k}\right)$.

17) Find the direction cosines of the sides of the triangle whose vertices are (3, 5, −4) (−1, 1, 2) and (−5, −5, −2).

18) Find $\displaystyle\int \frac{x\, dx}{(x+1)(x+2)}$

19) Evaluate $\displaystyle\int_{-1}^{1} \frac{dx}{x^2 + 2x + 5}$

20) Prove that $\displaystyle\int_0^a f(x)\, dx = \int_0^a f(a-x)\, dx$.

PART-D

V Answer any THREE questions : **3x5=15**

21) Prove that $\displaystyle\int_{-a}^{a} f(x)dx = \begin{cases} 2\int_0^a f(x)dx & \text{if } f(-x) = f(x) \\ 0 & \text{if } f(-x) = -f(x) \end{cases}$

22) Show that $\displaystyle\int_0^{\pi} \frac{x \sin x\, dx}{1+\cos^2 x} = \frac{\pi^2}{4}$

23) Prove that $\displaystyle\int \frac{dx}{x^2 + a^2} = \frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right) + C$ and hence solve $\displaystyle\int \frac{dx}{x^2 - 6x + 13}$.

24) Find the general solution of the differential equation $x\dfrac{dy}{dx} + 2y = x^2\ (x \neq 0)$.

25) Find the particular solution of the differential equation $\dfrac{dy}{dx} + 2y \tan x = \sin x$, $y = 0$ when $x = \dfrac{\pi}{3}$.

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