Preliminary Examination

Subject:**Mathematics** Class:**XII Sc**.
Time: **90 minutes** Max Marks :**40**

INSTRUCTION:
Questions **1-3** are MCQ type and carry **1 mark** each; question **4** is VSA type carry **1 mark**; questions **5 to 8** are Short answer (SA-I) type and carry **2 marks** each; questions **9 to 12** are SA-II type and carry **3 marks** each; questions **13 to 16** are Long Answer (LA) type and carry **4 marks** each.

Questions 1-3 carry 1-mark each. Select and write the correct alternative

1. $\int \frac{3\tan\frac{x}{3}-\tan^3\frac{x}{3}}{1-\tan^2\frac{x}{3}}dx =$…… $+C$
   - $-\log|\cos x| + c$
   - $\log|\tan x| + c$
   - $\log|\cos x| + c$
   - $(\sec x)^2 + c$

2. The order and the degree of the differential equation $\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^{1/3} + x^{1/4} = 0$
i) 2, 3 ii) 2, 4 iii) 3, 3 iv) 2, 6

3. The function $f(x) = x^2 - 2x$ is decreasing in the interval
• $(-\infty, 1)$ • $(-\infty, -1)$ • $(-1,1)$ • $[1, \infty)$

Question number 4 carries 1mark

4. Shown that $f(x) = \log(x + 1)$ is an increasing function for $x > 0$.

Questions 5-8 cary 2-mark each

5. Find
$\int \frac{\log(x+\sqrt{x^2+1})}{\sqrt{x^2+1}}\,dx$

6. Show that $y=cx$ is a solution of the differential equation $xy' = y$

7. Evaluate
$\int_{-1}^{1} \sin^7 x\,dx$

8. Find the points on the curve $y = x^3 - x^2 - x + 3$, where the tangent is parallel to x-axis.

Questions 9-12 cary 3-mark each

9. Evaluate $\int_0^1 x(1-x)^{23}dx$

10. Solve the differential equation
i. $\frac{dy}{dx} = 1 + x + y + xy$

OR

ii. $x\log x\frac{dy}{dx} + y = \frac{2\log x}{x}$

11. Attempt any one of the following

i. Find the angle between the tangents to the curve $\frac{x^2}{9} + \frac{y^2}{4} = 1$ at the points (3, 0) and (0, 2).

OR

ii. A garden is to be laid out in a rectangular area and protected by wire fence. What is the largest possible area of the fenced garden with 40m of wire.

12. In a class 30% of the students appear for the medical entrance, 25% of engineering and 15% for both. One student is selected at random find the probability that

i) He appears for medical, if it is known that he appears for engineering.
ii) He appears for engineering, if it is known that he appears for medical.

Questions 13-16 carry 4-mark each

13. Attempt any one of the following

i. $\int \frac{1}{\csc x \sec x}\, dx$

OR

ii. $\int \frac{1}{\sqrt[4]{(x-1)^3(x+2)^5}}\, dx$

14. Find the area of the region bounded by the parabola $y^2 = 4x$, the lines $x = 1$ and $x = 3$.

15. Solve the following LPP graphically
Minimize $Z = 20x + 10y$
Subject to
$x + 2y \leq 40$
$3x + y \geq 30$
$4x + 3y \geq 60$ and $x, y \geq 0$

16. Bag I contains 3 red and 4 black balls. Bag II contains 5 red and 6 black balls. One of the bags is selected at random and a ball is drawn from it, which is found to be red. Find the probability that the ball drawn is from bag II.

**********THE END**********