

HALF SYLLABUS TEST – 01

For September Exams.

By **OP Gupta**

M.9650350480, 9718240480

Time Allowed : 120 Minutes

Max. Marks : 60

SECTION – A (Carries 1 mark each)

Q01. Write $|A^{-1}|$ for $A = \begin{pmatrix} 2 & 5 \\ 1 & 3 \end{pmatrix}$.

Q02. For what value of x , the matrix given as $\begin{bmatrix} 5-x & x+1 \\ 2 & 4 \end{bmatrix}$ is singular?

Q03. Evaluate: $\int \frac{1}{\sqrt{(1-x^2)(16-\sin^{-1}x)}} dx$.

Q04. The amount of pollution content added in air in a city due to x -diesel vehicles is given by $P(x) = 0.005x^3 + 0.02x^2 + 30x$. Find the marginal increase in pollution content when 3 diesel vehicles are added and write which value is indicated in the above question

Q05. If $\begin{vmatrix} x+1 & x-1 \\ x-3 & x+2 \end{vmatrix} = \begin{vmatrix} 4 & -1 \\ 1 & 3 \end{vmatrix}$, then determine the value of x .

Q06. Evaluate: $\int_{-\pi/6}^{\pi/6} \frac{\sin^5 x \cos^3 x}{x^4} dx$.

Q07. Evaluate: $\tan^{-1}(1) + \cos^{-1}\left(-\frac{1}{2}\right)$.

Q08. Find the value of c of Rolle's Theorem for the function $f(x) = x^{4/3}$ on $-1 \leq x \leq 1$.

SECTION – B (Carries 4 marks each)

Q09. Evaluate: $\int \frac{\sin(x-a)}{\sin(x+a)} dx$.

OR Evaluate: $\int \frac{2x}{(x^2+1)(x^2+2)(x^2+3)} dx$.

Q10. If $y = \log[x + \sqrt{x^2 + a^2}]$, then show that:

$$(x^2 + a^2) \frac{d^2y}{dx^2} + x \frac{dy}{dx} = 0.$$

Q11. Using the properties of determinants, prove that:

$$\begin{vmatrix} -a^2 & ab & ac \\ ba & -b^2 & bc \\ ca & cb & -c^2 \end{vmatrix} = 4a^2b^2c^2.$$

Q12. If $x \in (\pi/2, \pi)$, then simplify the following:

$$\cot^{-1} \left[\frac{\sqrt{1+\sin x} + \sqrt{1-\sin x}}{\sqrt{1+\sin x} - \sqrt{1-\sin x}} \right].$$

Q13. Evaluate: $\int \frac{2-3\cos x}{3-2\cos x} dx$.

Q14. Given that $\cos y = x \cos(a+y)$ then,

prove that: $\frac{dy}{dx} = \frac{\cos^2(a+y)}{\sin a}$.

OR

If $(\sin y)^x = (\sin x)^y$ then, find $\frac{dy}{dx}$.

Q15. Find the equation of the normal at a point on the curve $x^2 = 4y$ which passes through the point $(1,2)$. Also find the equation of the corresponding tangent.

SECTION – C (Carries 6 marks each)

Q16. A window is in the form of a rectangle surmounted by a semi-circular opening. It is given that the total perimeter of the window is 10m. Find the dimensions of the window to admit maximum light through the whole opening.

OR

Show that the semi-vertical angle of a right circular cone of given surface area and maximum volume is $\sin^{-1}\left(\frac{1}{3}\right)$.

Q17. Let $A = \begin{pmatrix} -1 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{pmatrix}$. Find A^{-1} by using

the elementary transformations.

Q18. Evaluate $\int_0^2 (3x^2 + 2) dx$ as the limit of a sum.

OR

Evaluate: $\int_0^{\pi/4} [\sqrt{\tan x} + \sqrt{\cot x}] dx$.

Q19. Show that the function $f(x) = |x - 3|$, $x \in \mathbb{R}$ is continuous but not differentiable at $x = 3$.

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ANSWERS of HST XII – 01 [2014 - 15]

Q01. $|A^{-1}| = \frac{1}{|A|} = 1$

Q02. $x = 3$

Q03. $-2\sqrt{16 - \sin^{-1} x} + C$

Q04. 30.255

Q05. 2

Q06. 0

Q07. $\frac{11\pi}{12}$

Q08. $c = 0$

Q09. $x \cos 2a - \sin 2a \log |\sin(x+a)| + C$ OR $\frac{1}{2} \log |x^2 + 1| + \frac{1}{2} \log |x^2 + 3| - \log |x^2 + 2| + C$

Q12. $\frac{\pi - x}{2}$

Q13. $\frac{3}{2}x - \sqrt{5} \tan^{-1} \left(\sqrt{5} \tan \frac{x}{2} \right) + C$

Q14. OR $\frac{y \cot x - \log \sin y}{x \cot y - \log \sin x}$

Q15. $x + y = 3, y - x = 1$

Q16. $l: \frac{20}{\pi+4} \text{ m}, b: \frac{10}{\pi+4} \text{ m}$

Q17. $\begin{pmatrix} 1 & -1 & 1 \\ 7 & 7 & -5 \\ -4 & -4 & 3 \end{pmatrix}$

Q18. 12 OR $\frac{\pi}{\sqrt{2}}$

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