

[Time: 3 Hours]

(Sem-1 (pBE) (New Sy QJ) Diploma Engg 202-1 (Odd)
(Common Branch) (Theo) /T
Basic Engg. Mathematics Q7400101)

[Rill. Marks: 70]

- All questions are compulsory. (3 marks each)

- Marks are mentioned on the right side of each question.

Q.1 Answer all questions as directed.
(निर्देशानुसार सभी प्रश्नों के उत्तर दें।)

Group (A) (उप-बी)

(100-50)

Marks	CO	BL
2	1	1
2	1	1
2	2	2
2	2	2
2	3	2
2	4	2

a) If the order of matrix BA is $n \times n$ and 5 is px^2 .
(If the order of matrix BA is $n \times n$ and 5 is px^2 .)

b) If $\begin{bmatrix} 3 & 1 \\ 2 & 0 \end{bmatrix} = \begin{bmatrix} 2a & 1 \\ -3 & 1 \end{bmatrix}$, then the value of a is...
(If $\begin{bmatrix} 3 & 1 \\ 2 & 0 \end{bmatrix} = \begin{bmatrix} 2a & 1 \\ -3 & 1 \end{bmatrix}$, then the value of a is...)

c) If $f(x) = x^2 + 1$, then $f'(x) = \dots$
(If $f(x) = x^2 + 1$, then $f'(x) = \dots$)

d) The function $f(x) = |x| + |x-1|$ is continuous for...
(The function $f(x) = |x| + |x-1|$ is continuous for...)

e) If $f(x) = \tan^{-1}x$, then $f'(x) = \dots$
(If $f(x) = \tan^{-1}x$, then $f'(x) = \dots$)

f) If $f(x) = \tan^{-1}x$, then $f'(x) = \dots$
(If $f(x) = \tan^{-1}x$, then $f'(x) = \dots$)

g) The value of $y = x^2 + 2x$ at $x = 1$ is...
(The value of $y = x^2 + 2x$ at $x = 1$ is...)

h) The value of $y = x^2 + 2x$ at $x = 1$ is...
(The value of $y = x^2 + 2x$ at $x = 1$ is...)

i) If the distance between points $(-4, k)$ and $(-4, 8)$ is 8 units. Then the value of k is...
(If the distance between points $(-4, k)$ and $(-4, 8)$ is 8 units. Then the value of k is...)

h) Slope of the line $6x + 2y + 5 = 0$ is...
(Slope of the line $6x + 2y + 5 = 0$ is...)

i) Mean of first 10 natural numbers will be...
(Mean of first 10 natural numbers will be...)

j) Value of $\lim_{x \rightarrow 0} \frac{\sin 5x}{x}$ is...
(Value of $\lim_{x \rightarrow 0} \frac{\sin 5x}{x}$ is...)

Group (B) (उप-बी)

Answer all five questions. (सभी पाँच प्रश्नों के उत्तर दें।)

Q.2 If $\Delta = \begin{vmatrix} 0 & b-a & c-a \\ a-b & 0 & c-b \\ a-c & b-c & 0 \end{vmatrix}$, then show that Δ is equal to zero.

If $\Delta = \begin{vmatrix} 0 & b-a & c-a \\ a-b & 0 & c-b \\ a-c & b-c & 0 \end{vmatrix}$, then show that Δ is equal to zero.

OR (अथवा)

If $A = \begin{bmatrix} 2 & -1 & 3 \\ 4 & 5 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 \\ 4 & -2 \\ 1 & 5 \end{bmatrix}$, then find AB .

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Q.3 Verify the Rolle's theorem for the function $f(x) = \sin 2x$ in the interval $[0, \pi/2]$.

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OR (अथवा)

Find the slope of normal to the curve $y = x^2 - 2x$ at the point $y = 3$.

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Q.4 Find the standard deviations for first 10 natural numbers.

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OR (अथवा)

What is the probability that a randomly chosen two-digit positive integer is a multiple of 3?

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Q.5 Evaluate: $\lim_{x \rightarrow \pi} \frac{1 + \cos x}{\tan^2 x}$

$\lim_{x \rightarrow \pi} \frac{1 + \cos x}{\tan^2 x}$ को हल कीजिए।

OR (अथवा)

For what value of k , given function $f(x) = \begin{cases} \frac{x^2-9}{x-3}, & \text{if } x \neq 3 \\ k, & \text{if } x = 3 \end{cases}$ is continuous at $x = 3$.

k के किस मान के लिए फलन $f(x) = \begin{cases} \frac{x^2-9}{x-3}, & \text{if } x \neq 3 \\ k, & \text{if } x = 3 \end{cases}$ $x = 3$ पर संतत है।

Q.6 Find the equation of the circle which touches the both axes in first quadrant and whose radius is a unit.
ऐसा वृत्त का समीकरण ज्ञात कीजिए जो प्रथम चतुर्थांश में दोनों अक्षों को स्पर्श करता है जिसका त्रिज्या 1 इकाई है।

OR (अथवा)

Find the equation of the straight line passing through the origin and point of intersection of the lines $5x - 6y - 1 = 0$ and $3x + 2y + 5 = 0$.

मूल बिंदु और रेखाओं $5x - 6y - 1 = 0$ और $3x + 2y + 5 = 0$ के प्रतिच्छेदन बिंदु से गुजरने वाली सीधी रेखा का समीकरण ज्ञात कीजिए।

Group (C) (ग्रुप - सी)

Answer all five questions. (सभी पाँच प्रश्नों के उत्तर दें।)

6x5=30

Q.7 Differentiate $\sqrt{\tan x} + (\sin x)^x$ with respect to x .

$\sqrt{\tan x} + (\sin x)^x$ का x के सापेक्ष अवकल ज्ञात कीजिए।

OR (अथवा)

Find the differential coefficient of x^3 from first principle of derivative.

अवकल के प्रथम सिद्धांत से x^3 का अवकल गुणांक ज्ञात कीजिए।

Q.8 Find the value of p for which the vectors $\vec{a} = 2\hat{i} + 7\hat{j} + 9\hat{k}$ and $\vec{b} = \hat{i} + p\hat{j} + 3\hat{k}$ are
(i) Perpendicular (ii) Parallel

p के किस मान के लिए सदिश $\vec{a} = 2\hat{i} + 7\hat{j} + 9\hat{k}$ और $\vec{b} = \hat{i} + p\hat{j} + 3\hat{k}$
(i) लंबवत (ii) सामानांतर होंगे।

OR (अथवा)

Solve the following system of equation by matrix inversion method.

$$x + y - z = 1, 2x - 2y + z = 0, \text{ and } x - 2y + 2z = 4.$$

निम्नलिखित समीकरणों को मैट्रिक्स व्युत्क्रम विधि द्वारा हल करें।

$$x + y - z = 1, 2x - 2y + z = 0, \text{ और } x - 2y + 2z = 4.$$

4	2	3
4	2	3
4	4	3
4	4	3
6	2	3
6	2	3
6	1	3
6	1	3

Q.9 Find the equation of tangent to the curve $y = x + \frac{2}{x}$ at the point (2, 3).

वक्र $y = x + \frac{2}{x}$ के बिंदु (2, 3) पर स्पर्श रेखा का समीकरण ज्ञात कीजिए।

OR (अथवा)

Prove that maximum value of the curve $y = \sin x + \cos x$ is $\sqrt{2}$.

सिद्ध कीजिए कि वक्र $y = \sin x + \cos x$ का उच्चिष्ठ मान $\sqrt{2}$ है।

Q.10 Find the equation of a circle which passes through the points (3,0), (1,-6), (4,-1)

उस वृत्त का समीकरण ज्ञात कीजिए जो बिंदुओं (3,0), (1,-6), (4,-1) से होकर गुजरता है।

OR (अथवा)

Find the equation of parabola with focus (-3,0) and directrix $x-3=0$.

फोकस (-3,0) और डायरेक्ट्रिस $x-3=0$ के साथ परवलय का समीकरण खोजें।

Q.11 A bag contains tickets numbered 1 to 30. Find the probability if one ticket drawn from bag at random will be prime number.

एक बैग में 1 से 30 तक संख्या वाले टिकट हैं। यदि बैग से यादृच्छिक रूप से निकाला गया एक टिकट अभाज्य संख्या होगा तो इसकी प्रायिकता ज्ञात कीजिए।

OR (अथवा)

Find the variance for the following data: 57, 64, 43, 67, 49, 39, 44, 47, 61, 59.

निम्नलिखित डेटा के लिए प्रसरण ज्ञात कीजिए: 57, 64, 43, 67, 49, 39, 44, 47, 61, 59

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6	2	3
6	3	3
6	4	3
6	4	3
6	5	3
6	5	3