

SET-B

Roll No. [REDACTED]

Total No. of Printed Pages—20

607 R/E
(Regular/Ex-Regular)

M

(Science/Arts)

[As per 2018 and 2019 Syllabi]

(For Students registered in 2016 and 2017)

2019 (A)

SCIENCE/ARTS

MATHEMATICS

Full Marks : 100

Time : 3 hours

The figures in the right-hand margin indicate marks

ଦକ୍ଷିଣ ପାର୍ଶ୍ଵରେ ଥିବା ସଂଖ୍ୟା ପ୍ରଶ୍ନର ମୂଲ୍ୟାଙ୍କ ସୂଚାଭଳ୍ଷି

Answer the questions of all the Groups as directed

*ପ୍ରତ୍ୟେକ ପ୍ରଶ୍ନରେ ଦିଆଯାଇଥିବା ନିର୍ଦ୍ଦେଶ ଅନୁଯାୟୀ ସମସ୍ତ ପ୍ରଶ୍ନର
ଉତ୍ତର ଦିଅ*

*Electronic gadgets are not allowed in the
Examination Hall*

ପରୀକ୍ଷା ହଜାରେ ଇଲେକ୍ଟ୍ରୋନିକ ଯୁକ୍ତର ବ୍ୟବହାର ନିଷେଧ ଆଚେ

(2)

GROUP—A

କ—ବିଭାଗ

(Marks : 10)

(ନମ୍ବର : 10)

1. Answer all questions :

$1 \times 10 = 10$

ସମସ୍ତ ପ୍ରଶ୍ନର ଉତ୍ତର ଦିଆ :

(a) If

$$\begin{vmatrix} 1+x & x & x^2 \\ x & 1+x & x^2 \\ x^2 & x & 1+x \end{vmatrix} = a + bx + cx^2 + dx^3 + ex^4 + fx^5$$

then write the value of a .

ଯଦି

$$\begin{vmatrix} 1+x & x & x^2 \\ x & 1+x & x^2 \\ x^2 & x & 1+x \end{vmatrix} = a + bx + cx^2 + dx^3 + ex^4 + fx^5$$

ଡେବେ a ର ମାନ ଲେଖ ।

(b) Let A and B be two mutually exclusive events such that $P(A) = \frac{1}{2}$ and $P(B) = \frac{1}{3}$.

Write the value of $P(A \cap B)$.

(3)

যদি A ও B দুটি পরস্পর বহিভূত ঘটণা
 $P(A) = \frac{1}{2}$ ও $P(B) = \frac{1}{3}$ হুক্তি, তেবে
 $P(A \cap B)$ র মূল্য লেখ।

(c) If $f'(2^+) = 0$ and $f'(2^-) = 0$, then is $f(x)$ continuous at $x = 2$?

যদি $f'(2^+) = 0$ ও $f'(2^-) = 0$, তেবে $f(x)$,
 $x = 2$ ৰ নিৰবন্ধন কি?

(d) If $\phi(x) = f(x) + f(1-x)$, $f''(x) = 0$ for
 $0 \leq x \leq 1$, then is $x = \frac{1}{2}$ a point of maxima
 or minima of $\phi(x)$?

$0 \leq x \leq 1$ অন্তরালৰে যদি

$\phi(x) = f(x) + f(1-x)$, $f''(x) = 0$, তেবে
 $x = \frac{1}{2}$, $\phi(x)$ র গোটি৏ লঘিষ্ঠ না বৰিষ্ঠ বিহু?

(e) If f is an odd function, then write the
 value of

$$\int_{-a}^a \frac{f(\sin x)}{f(\cos x) + f(\sin^2 x)} dx$$

যদি f এক অযুগ্ম ফাংশন, তেবে

$$\int_{-a}^a \frac{f(\sin x)}{f(\cos x) + f(\sin^2 x)} dx$$
 র মূল্য লেখ।

(4)

- (f) Write the order of the differential equation whose solution is given by

$$y = (c_1 + c_2) \cos(x + c_3) + c_4 e^{x+c_5}$$

where c_1, c_2, c_3, c_4 and c_5 are arbitrary constants.

$y = (c_1 + c_2) \cos(x + c_3) + c_4 e^{x+c_5}$, ଯେଉ
ଅବକଳ ସମୀକରଣର ସମାଧାନ, ତାହାର ଅର୍ଦ୍ଧର ଲେଖ,
 c_1, c_2, c_3, c_4 ଓ c_5 ଯାହୁଡ଼ିକ ଧୂବକ ଅଟନ୍ତି ।

- (g) If $\vec{a} = \vec{b} + \vec{c}$, then write the value of $\vec{a} \cdot (\vec{b} \times \vec{c})$.

ଯଦି $\vec{a} = \vec{b} + \vec{c}$, ତେବେ $\vec{a} \cdot (\vec{b} \times \vec{c})$ ର ମୂଲ୍ୟ ଲେଖ ।

- (h) Write the value of k such that the line
- $$\frac{x-4}{1} = \frac{y-2}{1} = \frac{z-k}{2}$$
- lies on the plane

$$2x - 4y + z = 7.$$

k ର ମୂଲ୍ୟ ଲେଖ ଯେପରିକି $\frac{x-4}{1} = \frac{y-2}{1} = \frac{z-k}{2}$

ରେଖାଟି $2x - 4y + z = 7$ ସମତଳ ଉପରେ ଅବସ୍ଥିତ ହେବ ।

2. Ans

ସେଇ

(a)

(5)

- (i) If R is a relation on A such that $R = R^{-1}$, then write the type of the relation R .

যদি R , A উপরিষ্ঠ এক সম্বন্ধ হুও এবং $R = R^{-1}$,
তেবে R সম্বন্ধৰ প্ৰকাৰ লেখ।

- (j) Write the value of $\cos^{-1} \cos(3\pi / 2)$.

$\cos^{-1} \cos(3\pi / 2)$ র মান লেখ।

GROUP—B

শ্রেণী—বিভাগ

(Marks : 60)

(নম্বৰ : 60)

2. Answer any three questions :

$4 \times 3 = 12$

যেকোণসৰি তিনোটি প্ৰশ্নৰ উত্তৰ দিঅ :

- (a) Two types of food X and Y are mixed to prepare a mixture in such a way that the mixture contains at least 10 units of vitamin A, 12 units of vitamin B and 8 units of vitamin C.

$\frac{z-k}{2}$
অবস্থিত

(6)

These vitamins are available in 1 kg of food as per the table given below :

Food	Vitamin		
	A	B	C
X	1	2	3
Y	2	2	1

1 kg of food X costs ₹ 16 and 1 kg of food Y costs ₹ 20. Formulate the LPP so as to determine the least cost of the mixture containing the required amount of vitamins.

ଦୁଇ ପ୍ରକାରର ଖାଦ୍ୟ X ଓ Y ମିଶାଇ ଏକ ମିଶ୍ରଣ ତିଆରି କରାଯାଏ ଯେପରିକି ମିଶ୍ରଣରେ ସର୍ବନିମ୍ନ ଭିଟାମିନ୍ Aର 10 ମୁନିଟ୍, ଭିଟାମିନ୍ Bର 12 ମୁନିଟ୍ ଓ ଭିଟାମିନ୍ Cର 8 ମୁନିଟ୍ ରହିବ। ଏହି ଭିଟାମିନ୍ଗୁଡ଼ିକ ଖାଦ୍ୟର ଏକ କେଜିରେ ନିମ୍ନ ପ୍ରଦତ୍ତ ଚେବୁଳ ଅନୁଯାୟୀ ମିଲିଥାଏ :

ଭିଟାମିନ୍

ଖାଦ୍ୟ	A	B	C
X	1	2	3
Y	2	2	1

X ଖାଦ୍ୟର 1 କି. ଗ୍ରା.ର ମୂଲ୍ୟ ₹ 16 ଓ Y ଖାଦ୍ୟର 1 କି. ଗ୍ରା.ର ମୂଲ୍ୟ ₹ 20. ଆବଶ୍ୟକ ପରିମାଣର ଭିଟାମିନ୍ ଥାଇ ମିଶ୍ରଣର ଲଘିଷ୍ଟ ପରିବ୍ୟୟ ନିର୍ଣ୍ଣୟ କରୁଥିବା ରେଖିକ ପ୍ରୋଗାମିଙ୍କ ସମସ୍ୟା ସ୍ଫୁରଣ କର ।

- (b) Construct the multiplication table X_7 on the set $\{1, 2, 3, 4, 5, 6\}$. Also find the inverse element of 4 if it exists.

X_7 ର $\{1, 2, 3, 4, 5, 6\}$ ଉପରିସ ଗୁଣନ ଟେବୁଲ ଗଠନ କର। ଯଦି 4ର ବିଲୋମ ଥାଏ, ତାହା ମଧ୍ୟ ନିର୍ଣ୍ଣୟ କର।

- (c) Let R be a relation on the set \mathbb{R} of real numbers such that aRb iff $a-b$ is an integer. Test whether R is an equivalence relation. If so, find the equivalence class of 1 and $\frac{1}{2}$.

R , ବାସ୍ତବ ସଂଖ୍ୟାର ସେଇ \mathbb{R} ଉପରିସ ଏକ ସମ୍ବନ୍ଧ ଯେପରିକି aRb ଯଦି ଓ କେବଳ ଯଦି $a-b$ ଏକ ପୂର୍ଣ୍ଣ ସଂଖ୍ୟା ଅଟେ। R , ଏକ ସମତୁଳ୍ୟ ସମ୍ବନ୍ଧ କି ନୁହେଁ ପରୀକ୍ଷା କର। ଯଦି ହୁଏ, ତାହାହେଲେ 1 ଓ $\frac{1}{2}$ ସମତୁଳ୍ୟ ବର୍ଗ ନିର୍ମାପଣ କର।

- (d) Solve :

ସମାଧାନ କର :

$$2\tan^{-1}(\cos x) = \tan^{-1}(2\operatorname{cosec} x)$$

(e) Prove that

প্রমাণ কর যে

$$\cos^{-1}\left(\frac{b+a \cos x}{a+b \cos x}\right)=2 \tan^{-1}\left(\sqrt{\frac{a-b}{a+b}} \tan \frac{x}{2}\right)$$

3. Answer any three questions : 4×3=12

যেকোণসি তিনোটি প্রশ্নের উত্তর দিঅ :

(a) If $A = \begin{bmatrix} 1 & 2 & 0 \\ 0 & 1 & 3 \\ -2 & 5 & 3 \end{bmatrix}$, then verify that $A+A'$ is symmetric and $A-A'$ is skew-symmetric.

যদি $A = \begin{bmatrix} 1 & 2 & 0 \\ 0 & 1 & 3 \\ -2 & 5 & 3 \end{bmatrix}$, তেবে যাঞ্চ কর যে,

$A+A'$ সমমিত ও $A-A'$ বিষম সমমিত।

(b) If

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 2 & 1 \end{bmatrix}$$

then show that $A^3 - 23A - 40I = 0$.

(9)

ସବି

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 2 & 1 \end{bmatrix}$$

ତେବେ ଦର୍ଶାଅ ଯେ $A^3 - 23A - 40I = 0$.

(c) Solve :

ସମାଧାନ କର :

$$\begin{vmatrix} x+1 & \omega & \omega^2 \\ \omega & x+\omega^2 & 1 \\ \omega^2 & 1 & x+\omega \end{vmatrix} = 0$$

(d) A person takes 4 tests in succession. The probability of his passing the first test is p , that of his passing each succeeding test is p or $\frac{p}{2}$, depending on his passing or failing the preceding test. Find the probability of his passing just 3 tests.

ଜଣେ ବ୍ୟକ୍ତି ଗୋଟିଏ ପରେ ଗୋଟିଏ 4ଟି ପରୀକ୍ଷା ଦିଅଛି। ପ୍ରଥମ ପରୀକ୍ଷା ପାସ କରିବାର ସମ୍ଭାବ୍ୟତା p ଅଟେ, ତା' ପରର ପ୍ରତ୍ୟେକ ପରୀକ୍ଷା ପାସ କରିବାର ସମ୍ଭାବ୍ୟତା ପୂର୍ବ ପରୀକ୍ଷାର ପାସ କିମ୍ବା ଫେଲୁ ଉପରେ ନିର୍ଭର କରି p କିମ୍ବା $\frac{p}{2}$ ହୁଏ। ମାତ୍ର 3ଟି ପରୀକ୍ଷା ପାସ କରିବାର ସମ୍ଭାବ୍ୟତା ନିର୍ଣ୍ଣୟ କର।

- (e) Find the probability distribution of number of heads in 3 tosses of a fair coin.

ନିରପେକ୍ଷ ମୁଦ୍ରାର 3ଟି ଚପ୍ରେ, ମୁଣ୍ଡ ସଂଖ୍ୟାର ସମ୍ବାଦ୍ୟତା ଆବଶ୍ୟନ ନିର୍ଣ୍ଣୟ କର ।

4. Answer any three questions :

$4 \times 3 = 12$

ଯେକୌଣସି ତିନୋଟି ପ୍ରଶ୍ନର ଭାବର ଦିଆ :

- (a) Find the intervals in which the function $y = \frac{\ln x}{x}$ is increasing and decreasing.

ଅନ୍ତରାଳଗୁଡ଼ିକ ନିର୍ଣ୍ଣୟ କର ଯେଉଁଠାରେ $y = \frac{\ln x}{x}$

ଫଳନଟି ବର୍ଣ୍ଣନା ଓ କ୍ଷୟକ୍ଷୟ ।

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- (b) If $y = e^{xe^{xe^x}}$, then find $\frac{dy}{dx}$.

ଯଦି $y = e^{xe^{xe^x}}$, ତେବେ ନିର୍ଣ୍ଣୟ କର $\frac{dy}{dx}$.

- (c) Find $\frac{d^2y}{dx^2}$, if $x = a\cos\theta$ and $y = b\sin\theta$.

ନିର୍ଣ୍ଣୟ କର $\frac{d^2y}{dx^2}$, ଯଦି $x = a\cos\theta$ ଓ $y = b\sin\theta$.

(Continue)

- (d) Verify Lagrange's mean value theorem for $f(x) = x^3 - 2x^2 - x + 3$ on $[1, 2]$.

$f(x) = x^3 - 2x^2 - x + 3$ ଫଳନ ନେଇ ଲାଗ୍ରାଞ୍ଜୀ ମାଧ୍ୟମାନ ଉପପାଦ୍ୟ $[1, 2]$ ଅତରାଳରେ ଯାଅଁ କର ।

- (e) Find the point on the curve $x^2 + y^2 - 4xy + 2 = 0$, where the normal to the curve is parallel to the x -axis.

$x^2 + y^2 - 4xy + 2 = 0$ ବକ୍ର ଉପରିୟ ବିନ୍ଦୁଟି ନିର୍ଣ୍ଣୟ କର ଯେଉଁଠାରେ ବକ୍ର ପ୍ରତି ଲମ୍ବ x -ଅକ୍ଷ ସହିତ ସମାନ୍ତର ହେବ ।

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5. Answer any three questions : $4 \times 3 = 12$

ଯେକୌଣସି ତିନୋଟି ପ୍ରଶ୍ନର ଉଭର ଦିଆ :

- (a) Solve :

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ସମାଧାନ କର :

$$(x^2 + 7x + 12)dy + (y^2 - 6y + 5)dx = 0$$

- (b) Evaluate :

ମୂଲ୍ୟାଙ୍କନ କର :

$$\int \frac{2x+1}{\sqrt{x^2 + 10x + 29}} dx$$

(c) Evaluate :

ମୂଳ୍ୟାଙ୍କନ କର :

$$\int_0^{\pi/2} \frac{\cos x \, dx}{(2 - \sin x)(3 + \sin x)}$$

(d) Find the area of the region bounded by the curve $y = 6x - x^2$ and the x -axis.

$y = 6x - x^2$ ବକ୍ର ଓ x -ଅକ୍ଷ ଦ୍ୱାରା ଆବଶ୍ୟକ କେତ୍ରର କ୍ଷେତ୍ରଫଳ ନିର୍ଣ୍ଣୟ କର।

(e) Find the differential equation of the curve $y = ae^{3x} + be^{5x}$.

$y = ae^{3x} + be^{5x}$ ବକ୍ରର ଅବକଳ ସମୀକରଣଟି ନିର୍ଣ୍ଣୟ କର। suman study academy

6. Answer any three questions :

4×3=12

ଯେକୌଣସି ତିନୋଟି ପ୍ରଶ୍ନର ଉଭର ଦିଆ :

(a) Find the point where the line
 $\frac{x-2}{1} = \frac{y}{-1} = \frac{z-1}{2}$ meets the plane
 $2x + y + z = 2$.

$$\frac{x-2}{1} = \frac{y}{-1} = \frac{z-1}{2} \quad \text{ରେଖାଟି} \quad 2x + y + z = 2$$

ସମତଳ ସହିତ ମିଳିତ ହେଉଥିବା ବିନ୍ଦୁଟି ନିର୍ଣ୍ଣୟ କର।

- (b) Find a unit vector perpendicular to each of the vectors $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$, where $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k}$.

যদি $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ ও $\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k}$ হু�, $\vec{a} + \vec{b}$ ও $\vec{a} - \vec{b}$ প্রত্যেক প্রতিলম্ব একক দিশাঙ্ক নির্ণয় কর।

- (c) Show that $(\vec{a} \times \vec{b})^2 = a^2 b^2 - (\vec{a} \cdot \vec{b})^2$.

দর্শাই যে $(\vec{a} \times \vec{b})^2 = a^2 b^2 - (\vec{a} \cdot \vec{b})^2$.

- (d) Find the vector equation of a plane which is at a distance of 3 units from the origin, $2\hat{i} + 3\hat{j} - 6\hat{k}$ being a normal to the plane. Also get its Cartesian equation.

মূলবিদ্যুৎ রেখা থেকে দূরত্বে অবস্থিত ও $2\hat{i} + 3\hat{j} - 6\hat{k}$ দিশাঙ্ক লম্ব থুবা সমতলর দিশাঙ্ক সমাকরণ নির্ণয় কর। সমতলর ডেকার্টেন্স সমাকরণ মধ্যে নির্ণয় কর।

- (e) If

$$\langle l_1, m_1, n_1 \rangle \text{ and } \langle l_2, m_2, n_2 \rangle$$

are direction cosines of two mutually perpendicular lines, then show that the direction cosines of the line perpendicular to both of them are

$$\langle m_1 n_2 - m_2 n_1, n_1 l_2 - n_2 l_1, l_1 m_2 - l_2 m_1 \rangle$$

যদি

$$\langle l_1, m_1, n_1 \rangle \text{ ও } \langle l_2, m_2, n_2 \rangle$$

হুলচি পরম্পর প্রতি লম্ব রেখামানকর দিশায়
কোজ্যা হু�, তেবে দর্শাই যে, উভয় প্রতি লম্ব
রেখার কোজ্যা।

$$\langle m_1n_2 - m_2n_1, n_1l_2 - n_2l_1, l_1m_2 - l_2m_1 \rangle$$

হেব।

GROUP—C

গ—বিভাগ

(Marks : 30)

(নম্বর : 30)

7. Answer any one question :

যেকোণী গোটিএ প্রশ্নৰ উভৰ দিঅ :

(a) Solve :

সমাধান কৰ :

$$y^2 + x^2 \frac{dy}{dx} = xy \frac{dy}{dx}$$

- (b) Determine the area common to the parabola $y^2 = x$ and the circle $x^2 + y^2 = 2x$.

$y^2 = x$ ପାରାବୋଲା ଓ $x^2 + y^2 = 2x$ ବୁଢ଼ର ସାଧାରଣ କ୍ଷେତ୍ରଫଳ ନିର୍ଣ୍ଣୟ କର।

- (c) Evaluate :

ମୂଲ୍ୟାଙ୍କନ କର :

$$\int \frac{dx}{2\cos^2 x + 3\cos x}$$

8. Answer any one question : 6

ଯେକୌଣସି ଗୋଟିଏ ପ୍ରଶ୍ନର ଉଭର ଦିଆ :

- (a) Show by vector method that the four points $(6, 2, -1)$, $(2, -1, 3)$, $(-1, 2, -4)$ and $(-12, -1, -3)$ are coplanar.

ଦିଶାଙ୍କ ପ୍ରଶାଳୀରେ ଦର୍ଶାଅ ଯେ $(6, 2, -1)$, $(2, -1, 3)$, $(-1, 2, -4)$ ଓ $(-12, -1, -3)$ ବିନ୍ଦୁ ଚାରେଟି ସମତଳୀୟ ।

- (b) Find the distance of the point $(1, -1, -10)$ from the line $\frac{x-4}{1} = \frac{y+3}{-4} = \frac{z+1}{7}$ measured parallel to the line $\frac{x+2}{2} = \frac{y-3}{-3} = \frac{z-4}{8}$.

$$(1, -1, -10) \quad \text{ବିନ୍ଦୁର} \quad \frac{x-4}{1} = \frac{y+3}{-4} = \frac{z+1}{7}$$

$$\text{ରେଖାଠାରୁ} \quad \frac{x+2}{2} = \frac{y-3}{-3} = \frac{z-4}{8} \quad \text{ରେଖା}$$

ସମାନ୍ତରରେ ମପାଯାଇଥିବା ଦୂରତ୍ତ ନିର୍ଣ୍ଣୟ କର।

9. Answer any one question :

ଯେକୌଣସି ଗୋଟିଏ ପ୍ରଶ୍ନର ଉଭର ଦିଆ :

(a) Solve the following LPP graphically :

$$\text{Maximize } Z = 10x_1 + 12x_2 + 8x_3$$

subject to

$$x_1 + 2x_2 \leq 30$$

$$5x_1 - 7x_3 \geq 12$$

$$x_1 + x_2 + x_3 = 20$$

$$x_1, x_2, x_3 \geq 0$$

ଲେଖଚିତ୍ରର ସାହାଯ୍ୟରେ ନିମ୍ନ ପ୍ରଦତ୍ତ ଲିଙ୍ଗର ସମାଧାନ
କର :

ଗରିଷ୍ଠମାନ ନିର୍ଣ୍ଣୟ କର $Z = 10x_1 + 12x_2 + 8x_3$

ଯେପରିକି

$$x_1 + 2x_2 \leq 30$$

$$5x_1 - 7x_3 \geq 12$$

$$x_1 + x_2 + x_3 = 20$$

$$x_1, x_2, x_3 \geq 0$$

(17)

(b) If

$$\sin^{-1}\left(\frac{x}{a}\right) + \sin^{-1}\left(\frac{y}{b}\right) = \sin^{-1}\left(\frac{c^2}{ab}\right)$$

then prove that

$$b^2x^2 + 2xy\sqrt{a^2b^2 - c^4} + a^2y^2 = c^4$$

6

যদি

$$\sin^{-1}\left(\frac{x}{a}\right) + \sin^{-1}\left(\frac{y}{b}\right) = \sin^{-1}\left(\frac{c^2}{ab}\right)$$

তেবে প্রমাণ কর যে

$$b^2x^2 + 2xy\sqrt{a^2b^2 - c^4} + a^2y^2 = c^4$$

(c) Prove that $f : X \rightarrow Y$ is injective iff for all subsets A, B of X , $f(A \cap B) = f(A) \cap f(B)$.

প্রমাণ কর যে $f : X \rightarrow Y$ একেক ফলন যদি ও
কেবল যদি X র সমষ্টি A, B এবং পাই
 $f(A \cap B) = f(A) \cap f(B)$.

10. Answer any one question :

6

3
যেকোণস্বি গোটিএ প্রশ্নৰ উত্তৰ দিঅ :

(a) Out of the adult population in a village, 50% are farmers, 30% do business and 20% are service holders. It is known that 10% of farmers, 20% of businessmen and 50% of service holders are above

poverty line. What is the probability that a villager chosen from the adult population of the village, selected at random, is above poverty line?

ଗୋଟିଏ ଗ୍ରାମର ବୟକ୍ତି ଜନସଂଖ୍ୟାର 50% କୃଷକ
ଅଟେ, 30% ବ୍ୟବସାୟ କରନ୍ତି ଓ 20% ଚାକିରି
କରନ୍ତି । ଏହା ବିଦିତ ଯେ କୃଷକମାନଙ୍କ ମଧ୍ୟରୁ 10%,
ବ୍ୟବସାୟୀମାନଙ୍କ ମଧ୍ୟରୁ 20% ଓ ଚାକିରିଆମାନଙ୍କ
ମଧ୍ୟରୁ 50% ଦାରିଦ୍ର୍ୟ ରେଖାର ଉପରେ । ଯଦି ବୟକ୍ତି
ଗ୍ରାମବାସୀଙ୍କ ମଧ୍ୟରୁ ଜଣକୁ ମନଙ୍ଗଳା ବଛାଗଲା, ତାହାର
ଦାରିଦ୍ର୍ୟ ରେଖା ଉପରେ ରହିବାର ସମ୍ଭାବ୍ୟତା କେତେ ?

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- (b) Examining consistency and solvability,
solve the following equations by matrix
method :

$$x - 2y = 3$$

$$3x + 4y - z = -2$$

$$5x - 3z = -1$$

ସଂଗତି ଓ ସମାଧେନ୍ୟତା ପରୀକ୍ଷା କରି, ନିମ୍ନଲିଖିତ
ସମୀକରଣଗୁଡ଼ିକର ମ୍ୟାଟ୍ରିକ୍ସ ପ୍ରଶାଳୀରେ ସମାଧାନ କର :

$$x - 2y = 3$$

$$3x + 4y - z = -2$$

$$5x - 3z = -1$$

(19)

- (c) Find the inverse of the following matrix using elementary transformation :

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 4 \\ 1 & 0 & 2 \end{bmatrix}$$

ପ୍ରାରମ୍ଭିକ ରୂପାତରଣ କରି ନିମ୍ନଲିଖିତ ମ୍ୟାଟ୍ରିବ୍ସର ବିଲୋମ ନିର୍ଣ୍ଣୟ କର :

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 4 \\ 1 & 0 & 2 \end{bmatrix}$$

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1. Answer any one question :

6

ଯେକୌଣସି ଗୋଟିଏ ପ୍ରଶ୍ନର ଉତ୍ତର ଦିଅ :

- (a) If $e^{y/x} = \frac{x}{a+bx}$, then show that

$$x^3 \frac{d}{dx} \left(\frac{dy}{dx} \right) = \left(x \frac{dy}{dx} - y \right)^2$$

ଯଦି $e^{y/x} = \frac{x}{a+bx}$, ତେବେ ଦର୍ଶାଅ ଯେ

$$x^3 \frac{d}{dx} \left(\frac{dy}{dx} \right) = \left(x \frac{dy}{dx} - y \right)^2$$

(Turn Over)

(20)

- (b) Show that the shortest distance of the point $(0, 8a)$ from the curve $ax^2 = y^3$ is $2a\sqrt{11}$.

ଦର୍ଶାଅ ଯେ $(0, 8a)$ ବିନ୍ଦୁର $ax^2 = y^3$ ବକ୍ତ୍ର ଠାରୁ
ନୃତ୍ୟନତମ ଦୂରତା $2a\sqrt{11}$.

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★ ★ ★