Chhatrapati Shahu Ji Maharaj University, Kanpur

Answer Script Details
Barcode 8570081

Roll No. 23081000409
Total Mark 44/75.00

Exam BACHELOR OF SCIENCE_ODD EXAM-DEC-24
Subject B030301T - ALGEBRA AND MATHEMATICAL METHODS

Question wise Mark Summary

Q.No	Mark	Q.No	Mark	Q.No	Mark	Q.No	Mark
1A	NA/6	7B	3/6				
1B	4/6	8A	3/6				
1C	NA/6	8B	4/6				
1D	4/6	9A	NA/6				
1E	3/6	9B	NA/6				
1F	NA/6						
1G	4/6						
1H	NA/6						
1I	NA/6						
2	NA/12						
3A	4/6						
3B	4/6						
4	NA/12						
5A	4/6						
5B	3/6						
6	NA/12						
7A	4/6						

Chhatrapati Shahu Ji Maharaj University
Kanpur, Uttar Pradesh

PART-I

Date of Exam 22-01-2025 Shift: morning Room No.: 21 Year/Sem 3rd Sem

Paper Code: B030301T Subject: maths

Name of Candidate: shivani prajapati

Roll No. 2 3 0 8 1 0 0 0 4 0 9

Shivani — Signature of Candidate

Signature of Invigilator

COE Facsimile

PART-II

MARKS OBTAINED										
Q.	1	2	3	4	5	6	7	8	9	10
(a)										
(b)										
(c)										
(d)										
(e)										
(f)										
(g)										
(h)										
(i)										
(j)										
Total										
Total Marks in Figures									Max. Marks	
Total Marks in Words										

B 0 3 0 3 0 1 T
Paper Code

Signature of Evaluator

PART-III

Course B.Sc.

Session 2024-25 Year/Semester 3rd sem.

Subject Name maths

Medium English ○ Hindi ●

Paper Code: B 0 3 0 3 0 1 T

Exam Date: 2 2 0 1 2 0 2 5

Name of Candidate: SHIVANI PRAJAPATI

Father's Name: SANJAY KUMAR

महाविद्यालय का कोड College Code: A U - 0 3

परीक्षा केन्द्र का कोड Exam Centre Code: A U - 0 3

परीक्षा का प्रकार Type of Exam: Regular ● Ex-Student ○ Private ○ Back Paper Exam ○

ANSWER BOOKLET NO. 8570081

B 0 3 0 3 0 1 T
Paper Code

PART-IV

नामांकन संख्या Enrollment Number: C S J M A 2 3 0 0 0 0 0 3 8 5 2

परीक्षार्थी अनुक्रमांक संख्या Candidate's Roll Number: 2 3 0 8 1 0 0 0 4 0 9

पेपर कोड Paper Code: B 0 3 0 3 0 1 T

Shivani
Signature of Candidate

Signature of Invigilator

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नोट- 1. परीक्षार्थी को निर्देशित किया जाता है कि आवरण पत्रे के पृष्ठ भाग पर अंकित सभी निर्देशों को सावधानी पूर्वक पढ़ें।
2. बॉक्स में भरी जाने वाली प्रविष्टियाँ बायीं तरफ से शुरू की जायें। 3. गोलों को काले या नीले बॉलपेन से भरा जायें।

INSTRUCTION TO THE CANDIDATE FOR FILLING PART-I

1. Read the instructions carefully given on the answer script and admit card.
2. Write Date of Exam, Shift, Paper Code & Name of Subject Correctly.
3. Write Name & Roll No. Correctly.
4. Write Semester & Branch Correctly.

INSTRUCTION TO THE CANDIDATE FOR FILLING PART-III

1. Use blue or black ball point pen for writing alphabets & numerals in ☐ boxes.
2. Carefully study the example before you start marking.
3. As shown in the example below, blacken the circles completely.

4. Make no Stray marks on this sheet.
5. **DO NOT WRITE OR MARK ON THE BAR CODE.**

IN ORDER TO AVOD UFM (UNFAIR MEANS) :

1. The Roll No. and Answer Book no. found elsewhere or any other symbol found in the answer book will be treated as unfair means.
2. Any tempering of Bar Code and Booklet no shall be treated as Unfair Means.
3. Do Not bring the materials like slip of paper/mobile/digital diaries/ study material/ revision notes in examination hall. Possession of the mobiles/ digital diaries/electronic/digital/ watch and any other electronic gadget except memory less scientific calculator shall be considered as UFM case.
4. Do not keep or paste currency note in answer script it shall be consider as UFM.

अनुचित साधन से बचने हेतु :

1. उत्तर पुस्तिका के निर्देशित स्थान को छोड़कर अनुक्रमांक एवं उत्तरपुस्तिका का क्रमांक कहीं और न लिखें तथा कोई भी चिन्ह न बनायें क्योंकि यह अनुचित साधन प्रयोग की परिधि में आता है।
2. उत्तर पुस्तिका के बारकोड अथवा उत्तर पुस्तिका संख्या पर छेद छाड़ करने पर अनुचित साधन प्रयोग माना जावेगा।
3. परीक्षा कक्ष में निम्न वस्तुएं साथ न लायें, जैसे लिखे हुए कागज के टुकड़ें, मोबाईल, डिजिटल डायरी, डिजिटल घड़ी, कॉपी, पुस्तक एवं सभी वस्तुएं जो अनुचित साधन के अन्तर्गत आती है। केवल संबंधित प्रश्नपत्र में ही मेमोरी लेस साइंटिफिक केल्कुलेटर ले जाने की अनुमति होगी।
4. उत्तर पुस्तिकाओं में कचरे न रखें न ही उत्तर पुस्तिका में चिपकायें। ऐसा करना अनुचित साधन प्रयोग की परिधि में आता है।

परीक्षार्थियों के लिए निर्देश

1. प्रवेश पत्र एवं उत्तर पुस्तिका पर दिये गये निर्देशों को ध्यान से पढ़ें।
2. उत्तर पृष्ठ के दूसरी तरफ कुछ न लिखें।
3. उत्तर पुस्तिका के पृष्ठों पर दोनों तरफ लिखें।
4. प्रश्न पत्र पर अपने अनुक्रमांक के अतिरिक्त कुछ न लिखें।
5. प्रश्न पत्र कोड एवं प्रश्न पत्र ID सावधानी पूर्वक लिखें।
6. अपनी स्थिति स्पष्ट लिखें।
7. उत्तर पुस्तिका के पृष्ठों की संख्या देखें। अगर उत्तर पुस्तिका में पृष्ठ (1-24) से कम है या फटे हुए है, तो परीक्षा शुरू होने के पूर्व दूसरी उत्तर पुस्तिका ले लें।
8. प्रश्नपत्र को देख, यदि प्रश्नपत्र के विषय कोड, विषय का नाम तथा प्रश्न में कोई त्रुटि है तो उसके परीक्षा प्रारंभ होने के 30 मिनट के अन्दर कक्ष निरीक्षक को तत्काल सूचित करें, उसके बाद विश्वविद्यालय द्वारा कोई सुधार नहीं की जावेगी।
9. प्रश्नों के उत्तर लिखने के लिये पेंसिल का प्रयोग न करें।
10. दी कोरी या अतिरिक्त ग्राफ नहीं दिया जावेगा।

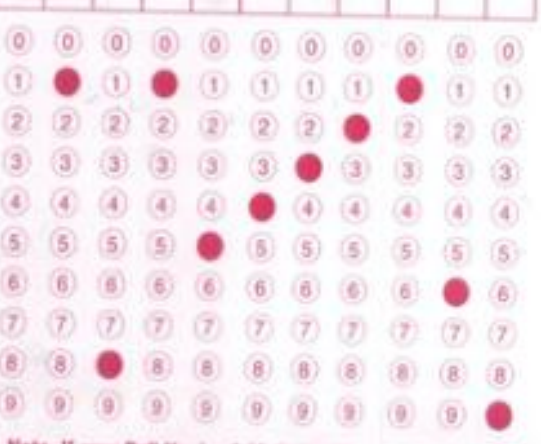
INSTRUCTION TO THE CANDIDATE

1. Read the instructions carefully given on the Question Paper, Admit Card & Answer Script.
2. Do not write anything on back side of the cover page.
3. Write on both sides of pages of answer book.
4. Do not write anything on question paper except Roll Number.
5. Write Paper Code & Question Paper Id carefully.
6. CHECK the number of pages (1-24) or any other kind of damage in your answer script, if found than change the answer script immediately before the commencement of examination.
7. CHECK the Question Paper for any kind of discrepancy e.g. Subject Code, Su Name, and Question of the Question Paper during first THIRTY MINUTES of t commencement of the exam, so that it can be corrected in TIME. After that no corrections shall be entertained by the university.
8. Do not use pencil for answering the question.
9. Write status correctly e.g. those appearing in carry over papers should fill in stat as Carry Over. Those appearing as Ex- Students should fill in status as ex.
10. No supplementary answer book & graph paper will be provided.

INSTRUCTION TO THE CANDIDATE FOR FILLING PART-IV

1. Use blue or black ball point pen for writing alphabets & numerals in ☐ Boxes.
2. Use blue or black ball point pen for filling the circles.

	1	8	1	5	4	3	2	1	6	9



Note- If your Roll No. is of 10 digits. Please leave first three columns .

Paper Code

B 0 3 0 3 0 1 T

1

Section- B

Part- A

Question- 3. (a)

Given that:- $x = r \sin\theta \cos\phi$

$y = r \sin\theta \sin\phi$

$z = r \cos\theta$

To find:- $\frac{\partial(x, y, z)}{\partial(r, \theta, \phi)}$

Solution:-

$$\frac{\partial(x, y, z)}{\partial(r, \theta, \phi)} = \begin{vmatrix} \frac{\partial x}{\partial r} & \frac{\partial x}{\partial \theta} & \frac{\partial x}{\partial \phi} \\ \frac{\partial y}{\partial r} & \frac{\partial y}{\partial \theta} & \frac{\partial y}{\partial \phi} \\ \frac{\partial z}{\partial r} & \frac{\partial z}{\partial \theta} & \frac{\partial z}{\partial \phi} \end{vmatrix}$$

Partial diff. w.r.to r.

$\frac{\partial x}{\partial r} = \sin\theta\cos\phi$ $\quad \frac{\partial y}{\partial r} = \sin\theta\sin\phi$ $\quad \frac{\partial z}{\partial r} = \cos\theta$

partial diff. w.r.to θ.

$\frac{\partial x}{\partial \theta} = r\cos\theta\cos\phi$ $\quad \frac{\partial y}{\partial \theta} = r\cos\theta\sin\phi$ $\quad \frac{\partial z}{\partial \theta} = -r\sin\theta$

partial diff. w.r.to ϕ

$\frac{\partial x}{\partial \phi} = -r\sin\theta\sin\phi \quad \frac{\partial y}{\partial \phi} = r\sin\theta\cos\phi \quad \frac{\partial z}{\partial \phi} = 0$

then

$$\begin{vmatrix} \frac{\partial x}{\partial r} & \frac{\partial x}{\partial \theta} & \frac{\partial x}{\partial \phi} \\ \frac{\partial y}{\partial r} & \frac{\partial y}{\partial \theta} & \frac{\partial y}{\partial \phi} \\ \frac{\partial z}{\partial r} & \frac{\partial z}{\partial \theta} & \frac{\partial z}{\partial \phi} \end{vmatrix} = \begin{vmatrix} r\sin\theta\cos\phi & r\cos\theta\cos\phi & -r\sin\theta\sin\phi \\ \sin\theta\sin\phi & r\cos\theta\sin\phi & r\sin\theta\cos\phi \\ \cos\theta & -r\sin\theta & 0 \end{vmatrix}$$

$\Rightarrow \sin\theta\cos\phi(0 + r^2\sin\theta\cos\theta\cos\phi) - r\cos\theta\cos\phi(-r\sin\theta\cos\theta\cos\phi) - r\sin\theta\sin\phi(-r\sin^2\theta\sin\phi - r\cos^2\theta\sin\phi)$

$\Rightarrow r^2\sin^3\theta\cos^2\phi + r^2\sin\theta\cos^2\theta\cos^2\phi + r^2\sin\theta\sin\phi\sin\phi(\sin^2\theta + \cos^2\theta)$

$\Rightarrow r^2\sin^3\theta\cos^2\phi + r^2\sin\theta\cos^2\theta\cos^2\phi + r^2\sin\theta\sin^2\phi$

$\Rightarrow r^2\sin\theta\cos^2\phi(\sin^2\theta + \cos^2\theta) + r^2\sin\theta\sin^2\phi$

$\Rightarrow r^2\sin\theta\cos^2\phi + r^2\sin\theta\sin^2\phi$

$\Rightarrow r^2\sin\theta(\sin^2\phi + \cos^2\phi)$

$\Rightarrow r^2\sin\theta$

$r^2 \sin\theta$ is the required answer

$$\frac{\partial(x, y, z)}{\partial(u, v, w)} = r^2 \sin\theta$$

Question-3 (b)

Given that:- $y_1 = \frac{x_2 x_3}{x_1}$

$$y_2 = \frac{x_3 x_1}{x_2}$$

$$y_3 = \frac{x_1 x_2}{x_3}$$

Prove that:- $J(y_1, y_2, y_3) = 4$.

Solution:-

$$J(y_1, y_2, y_3) = \frac{\partial(y_1, y_2, y_3)}{\partial(x_1, x_2, x_3)}$$

$$\frac{\partial(y_1, y_2, y_3)}{\partial(x_1, x_2, x_3)} = \begin{vmatrix} \frac{\partial y_1}{\partial x_1} & \frac{\partial y_1}{\partial x_2} & \frac{\partial y_1}{\partial x_3} \\ \frac{\partial y_2}{\partial x_1} & \frac{\partial y_2}{\partial x_2} & \frac{\partial y_2}{\partial x_3} \\ \frac{\partial y_3}{\partial x_1} & \frac{\partial y_3}{\partial x_2} & \frac{\partial y_3}{\partial x_3} \end{vmatrix}$$

Partial diff. w.r. to x_1.

$$\frac{\partial y_1}{\partial x_1} = \frac{-x_2 x_3}{x_1^2} \qquad \frac{\partial y_2}{\partial x_1} = \frac{x_3}{x_2} \qquad \frac{\partial y_3}{\partial x_1} = \frac{x_2}{x_3}$$

P.T.O.

partial diff. w.r.t to x_2.

$$\frac{\partial y_1}{\partial x_2} = \frac{x_3}{x_1} \qquad \frac{\partial y_2}{\partial x_2} = \frac{-x_1 x_3}{x_2^2} \qquad \frac{\partial y_3}{\partial x_2} = \frac{x_1}{x_3}$$

partial diff. w.r.t to x_3.

$$\frac{\partial y_1}{\partial x_3} = \frac{x_2}{x_1} \qquad \frac{\partial y_2}{\partial x_3} = \frac{x_1}{x_2} \qquad \frac{\partial y_3}{\partial x_3} = \frac{-x_1 x_2}{x_3^2}$$

$$\frac{\partial(y_1, y_2, y_3)}{\partial(x_1, x_2, x_3)} = \begin{vmatrix} \frac{-x_2 x_3}{x_1^2} & \frac{x_3}{x_1} & \frac{x_2}{x_1} \\ \frac{x_3}{x_2} & \frac{-x_1 x_3}{x_2^2} & \frac{x_1}{x_2} \\ \frac{x_2}{x_3} & \frac{x_1}{x_3} & \frac{-x_1 x_2}{x_3^2} \end{vmatrix}$$

$$\Rightarrow \frac{1}{x_1^2 x_2^2 x_3^2} \begin{vmatrix} -x_2 x_3 & x_3 x_1 & x_2 x_1 \\ x_3 x_2 & -x_1 x_3 & x_1 x_2 \\ x_2 x_3 & x_1 x_3 & -x_1 x_2 \end{vmatrix}$$

$$\Rightarrow \frac{x_3^2 x_2^2 x_1^2}{x_1^2 x_2^2 x_3^2} \begin{vmatrix} -1 & 1 & 1 \\ 1 & -1 & 1 \\ 1 & 1 & -1 \end{vmatrix}$$

$$= -1(1-1) - 1(-1-1) + 1(1+1)$$

$$= 0 + 2 + 2 = 4$$

Paper Code

8	0	3	0	3	0	1	T

5

$J(4_1, 4_2, 4_3) = 9$

Part - B.

Question-5(a)

Given that:- $F(t) = \frac{\sinh t}{t}$

To Find:- Laplace transform

Solution:-

$$L\left\{\frac{F(t)}{t}\right\} = L\left\{\frac{\sinh t}{t}\right\}$$

From Comparing

$F(t) = \sinh t$

From Laplace transform

$$L\{F(t)\} = L\{\sinh t\}$$

$$L\{F(t)\} = f(p) = \frac{1}{p^2-1}$$

$$f(p) = \frac{1}{p^2-1}$$

p is replaced by x

$$f(x) = \frac{1}{x^2-1}$$

P.T.O.

integrating in both sides.

$$\int F(x)\,dx = \int_p^\infty \frac{1}{x^2-1}\,dx$$

$$\int F(x)\,dx = \left[\frac{1}{2}\log\left|\frac{x-1}{x+1}\right|\right]_p^\infty = \frac{1}{2}\log\left(\frac{p+1}{p-1}\right)$$

$$\frac{f(p)}{p} = L\left\{\int_0^t F(u)\,du\right\}$$

$$\boxed{L\left\{\frac{F(t)}{t}\right\} = \frac{1}{2p}\log\left(\frac{p+1}{p-1}\right)}$$

Question-5 (b)

Given that: $y'' - 6y' + 9y = t^2 e^{3t}$

$y(0) = 2 \quad y'(0) = 6.$

$$\left[p^2\bar{y} - py(0) - y'(0)\right] - 6\left[p\bar{y} - y(0)\right] + 9\bar{y} = \frac{2}{(p-3)^3}$$

$$p^2\bar{y} - 2p - 6 - 6p\bar{y} + 12 + 9\bar{y} = \frac{2}{(p-3)^3}$$

$$(p^2 - 6p + 9)\bar{y} - 2p + 6 = \frac{2}{(p-3)^3}$$

$$(P-2)\bar{Y} = \frac{2}{(P-3)^3} + 2P - 6$$

$$\bar{Y} = \frac{2}{(P-3)^5} + \frac{2P}{(P-3)^2} - \frac{6}{(P-3)^2}$$

Taking laplace inverse transform

$$y = 2L^{-1}\left\{\frac{1}{(P-3)^5}\right\} + 2L^{-1}\left\{\frac{P}{(P-3)^2}\right\} - 6L^{-1}\left\{\frac{1}{(P-3)^2}\right\}$$

$$y = 2 \times e^{3t} \cdot \frac{t^4}{4!} + 2L^{-1}\left\{\frac{P+3}{1}\right\} e^{3t} - 6e^{3t} \cdot t$$

$$y = 2 \times \frac{t^4 e^{3t}}{4 \times 3 \times 2} + 2L^{-1}\left\{\frac{1}{P} + \frac{3}{P^2}\right\} e^{3t} - 6te^{3t}$$

$$y = \frac{t^4 e^{3t}}{12} + 2L^{-1}\{(1+3t)e^{3t}\} - 6te^{3t}$$

$$y = \frac{t^4 e^{3t}}{12} + 2e^{3t} + 6te^{3t} - 6te^{3t}$$

$$\boxed{y = \frac{t^4 e^{3t}}{12} + 2e^{3t}}$$

P.T.O

Section-C

Part-A

Question-7(a)

x	y
0	3
1	8
2	12
3	18
4	29

Let $X = x - 2$

$Y = y - 12$

X	Y	XY	X^2
-2	-9	18	4
-1	-4	4	1
0	0	0	0
1	6	6	1
2	12	24	4
0	5	52	10

For a straight line-

$$y = a + bx.$$

$$\Sigma y = na + b\Sigma x$$

$$\Sigma xy = a\Sigma x + b\Sigma x^2$$

Paper Code

B	0	3	0	3	0	1	T

9

For X and Y.

$\Sigma y = na + b\Sigma x$

$\Sigma xy = a\Sigma x + b\Sigma x^2$

$\bar{y} = 5a + 0$

$\boxed{a = 1.9}$

$52 = 0 + 10b.$

$\boxed{b = 5.2}$

Put the value of a and b in the given equation-

$(y - 12) = 1.9 + 5.2(x - 2)$

$y = 12 + 1.9 + 5.2x - 10.4$

$y = 13.9 + 5.2x - 10.4$

$y = 5.2x + 3.5$

$\boxed{y = 3.5 + 5.2x}$

Question-7 (b)

X	Y.	R_1	R_2	$d_i = R_1 - R_2$	d_i^2
10	40	5	5	0	0
12	41	4	4	0	0
15	48	2	3	-1	1
14	60	3	1	2	4
19	50	1	2	-1	1

P.T.O.

$$\rho = 1 - \frac{6\sum d_i^2}{n(n^2-1)}$$

$\sum d_i^2 = 6$

$n = 5$

$$\rho = 1 - \frac{6 \times 6}{5(25-1)}$$

$$\rho = 1 - \frac{\cancel{6}^{3} \times 6}{5 \times \cancel{24}_{2}}$$

$$\rho = 1 - \frac{3}{10}$$

$$\rho = 1 - 0.3$$

$$\boxed{\rho = 0.7}$$

Coefficient of rank correlation $\rho = 0.7$

Part - B

Question - 8 (a)

Given that:- $np = 4$

$npq = 3$.

To Find:- Binomial distribution $= (q+p)^n$.

Solve:- $np = 4$

$npq = 3$

$(np)q = 3$

$qq = 3$

$\boxed{q = \frac{3}{4}}$

$p + q = 1$

$p + \frac{3}{4} = 1$

$p = 1 - \frac{3}{4} = \frac{1}{4}$ $\boxed{p = \frac{1}{4}}$

$np = 4$

$n \times \frac{1}{4} = 4$

$n = 16$

Binomial distribution-

$(q+p)^n = \left(\frac{3}{4} + \frac{1}{4}\right)^{16}$

Question - 01

Given that:- $np = 2$.

$npq = 1$

To Find:- the probability that X takes a value greater than 1.

Solution:- $(np)q = 1$

$2 \cdot q = \frac{1}{2}$ $\because np = 2$

$q = \frac{1}{2}$

$p + q = 1$

$p = \frac{1}{2}$

P.T.O.

$np = 2.$

$$\boxed{p = \frac{1}{2}}$$

$n = 2 \times 2$

$$\boxed{n = 4}$$

$$\boxed{q = \frac{1}{2}}$$

$$P(X > 1) = \sum_{n=2}^{4} {}^4C_n \left(\frac{1}{2}\right)^n \left(\frac{1}{2}\right)^{4-n}$$

$$\Rightarrow {}^4C_1 \left(\frac{1}{2}\right)^1 \left(\frac{1}{2}\right)^{4-1} + {}^4C_2 \left(\frac{1}{2}\right)^2 \left(\frac{1}{2}\right)^{4-2} +$$

$${}^4C_3 \left(\frac{1}{2}\right)^3 \left(\frac{1}{2}\right)^{4-3} + {}^4C_4 \left(\frac{1}{2}\right)^4 \left(\frac{1}{2}\right)^{4-4}$$

$$\Rightarrow \frac{4!}{2! \times 2!} \left(\frac{1}{2}\right)^2 \left(\frac{1}{2}\right)^2 + \frac{4!}{3! \times 1!} \times \left(\frac{1}{2}\right)^3 \left(\frac{1}{2}\right)$$

$$+ \frac{4!}{4! \times 0!} \left(\frac{1}{2}\right)^4$$

$$\Rightarrow \frac{4 \times 3 \times 2!}{2! \times 2} \left(\frac{1}{2}\right)^2 \left(\frac{1}{2}\right)^2 + \frac{4 \times 3!}{3! \times 1!} \left(\frac{1}{2}\right)^3 \left(\frac{1}{2}\right)$$

$$+ \frac{4!}{4! \times 1} \left(\frac{1}{2}\right)$$

Paper Code

B	0	5	0	3	0	1	T

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$\left(\frac{1}{2}\right)^4 \left[\frac{x^2 x^3}{x} + \frac{9}{1} + 1\right)$.

$\left(\frac{1}{2}\right)^4 \left[6+9+1\right) = 11 \times \frac{1}{16} = \frac{11}{16}$

Ans = $\frac{11}{16}$

P.T.O

Section-A

Question-1 (8)

N is the set of all natural number.
R be a relation defined on it such that

$R = \{(x,y) : x \in N, y \in N, (x-y) \text{ is divisible by } 5\}$

$xRy \Rightarrow (x-y) = 5k.$

We show that R is an equivalence relation.

(i) Reflexive relation:-

Let $x \in N$. then
$xRx \Rightarrow (x-x)$ is a divisible by 5.

$xRx \Rightarrow 0$ is divisible by 5.

Hence R is reflexive relation.

(ii). Symmetric relation:-

Let $x, y \in N$.

$xRy \Rightarrow (x-y)$ is divisible by 5.
$\Rightarrow -(-x+y)$ is divisible by 5.
$\Rightarrow (y-x)$ is divisible by 5.
$\Rightarrow yRx$

$xRy \Rightarrow yRx \quad \forall\ x, y \in N$

(iii) Transitive relation:-

Let $x, y, z \in N$.

xRy and $yRz \Rightarrow (x-y)$ is divisible by $5 + (y-z)$ is divisible by 5

$\Rightarrow (x+y+y-z)$ is divisible by 5

$\Rightarrow (x-z) = (k_1+k_2)5$

$\Rightarrow xRz$

xRy and $yRz \Rightarrow xRz$

Hence R is transitive relation

Since R is reflexive, Symmetric and transitive relation therefor R is an equivalence relation on $A \subseteq N$.

Question-1 (D).

Given that:- $F = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 4 & 1 & 2 \end{pmatrix}$

$G_1 = \begin{pmatrix} 3 & 4 & 1 & 2 \\ 1 & 2 & 3 & 4 \end{pmatrix}$.

set $A = \{1, 2, 3, 4\}$

To show:- They are inverse of each other

Solution:- if they are inverse of each other then the product of two permutation is Identity

$$f \cdot g = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 4 & 1 & 2 \end{pmatrix} \begin{pmatrix} 3 & 4 & 1 & 2 \\ 1 & 2 & 3 & 4 \end{pmatrix}$$

$$f \cdot g = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 1 & 2 & 3 & 4 \end{pmatrix}$$

$f \cdot g = I$

where $I = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 1 & 2 & 3 & 4 \end{pmatrix}$.

I is Identity permutation.

$\boxed{f \cdot g = I.}$

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B 0 3 0 3 0 1 T

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Question-1 (G1)

Given that:-

$$u = \sin^{-1}\left(\frac{x}{y}\right) + \tan^{-1}\left(\frac{y}{x}\right)$$

Show that:- $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 0$

Solution:-

partial diff. w.r. to x.

$$\frac{\partial u}{\partial x} = \frac{1}{\sqrt{1-\left(\frac{x}{y}\right)^2}} \cdot \frac{1}{y} + \frac{1}{1+\frac{y^2}{x^2}} \times \frac{-y}{x^2}$$

$$\frac{\partial u}{\partial x} = \frac{y}{\sqrt{y^2-x^2}} - \frac{y}{x^2+y^2}$$

partial diff w.r. to y.

$$\frac{\partial u}{\partial y} = \frac{1}{\sqrt{1-\left(\frac{x}{y}\right)^2}} \times \frac{-x}{y^2} + \frac{1}{1+\frac{y^2}{x^2}} \times \frac{1}{x}$$

$$\frac{\partial u}{\partial y} = \frac{-x}{y\sqrt{y^2-x^2}} + \frac{x}{x^2+y^2}$$

$$x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{x}{\sqrt{y^2-x^2}} - \frac{yx}{x^2+y^2} - \frac{x}{\sqrt{y^2-x^2}} + \frac{xy}{x^2+y^2}$$

$$\boxed{x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 0}$$

P.T.O

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Question- 1 (I).

Let

A: A student will get 1st division

B: A student will get IInd division

C: A student will get IIIrd division

$P(A) = 0.25$ $P(\bar{A}) = 0.75$

$P(B) = 0.90$ $P(\bar{B}) = 0.60$

$P(C) = 0.85$ $P(\bar{C}) = 0.65$

The probability that the students will get at least a second division

$\Rightarrow P(\bar{A})P(\bar{B}) + P(B)P(\bar{C}) + P(A)P$

$\Rightarrow P(A)P(\bar{B})P(C) + P(A)P(B)P(\bar{C}) + P(\bar{A})P(B)P(C) + P(A)P(B)P(C)$

$\Rightarrow \frac{25}{100} \times \frac{60}{100} \times \cdots + \frac{25}{100} \times \frac{90}{100} \times \frac{65}{100} + \frac{75}{100} \times \frac{90}{100} \times \frac{85}{100} + \frac{25}{100} \times \frac{90}{100} \times \frac{85}{100}$

$\Rightarrow \frac{25[1900 + 2600) + 90 \times 85 \times 100}{1000 \times 1000}$

$\Rightarrow \quad \frac{25 \times 9500 + 1900 \times 100}{100 \times 100 \times 100}$

$\Rightarrow \quad \frac{25 \times 95 + 1900}{100 \times$ X

$\Rightarrow$

Question - E (1)

Homomorphism:-

Let (G, o) and (G', o') be any two groups and $f: G \to G'$ is a mapping then f is called homomorphism if -

$$f(a o b) = f(\checkmark (b)$$

Let us consider-

$$f(x) = e^x$$

$$f: R \to R^+$$

we show that f is homomorphism

(i) f is one-one.

Let $x_1, x_2 \in R$. ✓

$f(x_1) = f(x_2)$

$e^{x_1} = e^{x_2}$

$\boxed{x_1 = x_2}$

(ii) f is onto -

Let $y \in R^+$

then $f(x) = y$

$e^x = y$.

$\boxed{x = \log y}$

Hence f is onto.

(iii) f is homomorphism.

$f(x+y) = e^{x+y} =$

$f(x+y) = f(x) \cdot f(y)$.

Hence f is homomorphism.

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