Chhatrapati Shahu Ji Maharaj
University, Kanpur

Answer Script Details
Barcode 11950974

Roll No. 23071002365
Total Mark 51/75.00

Exam BCA-V_ODD_EXAM_NOV_2025
Subject BCA5004 - NUMERICAL METHODS

Question wise Mark Summary

Q.No	Mark	Q.No	Mark	Q.No	Mark	Q.No	Mark
1A	3/5						
1B	4/5						
1C	4/5						
1D	3/5						
1E	3/5						
1F	3/5						
1G	3/5						
1H	3/5						
1I	3/5						
2	11/15						
3	0/15						
4	0/15						
5	0/15						
6	11/15						
7	0/15						
8	0/15						
9	0/15						

Chhatrapati Shahu Ji Maharaj University
Kanpur, Uttar Pradesh

PART-II

Date of Exam 19-11-25 Shift Evening Room No. G-22
Paper Code BCA S004 Subject Numerical Methods Year/Sem. V
Name of Candidate Khyati Trivedi
Roll No. 2307100236 5

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

BCA S004
Paper Code

Signature of Evaluator

Signature of Candidate — Signature of Invigilator — COE Facsimile

Course Bachelor of Computer Applicatio
Session 2025-2026 Year/Semester V
Subject Numerical Methods

Paper Code: B C A 5 0 0 4
Exam Date: 1 9 1 1 2 0 2 5
Name of Candidate: KHYATI TRIVEDI
Father's Name: SHAILENDRA KUNAR TRIVEDI

महाविद्यालय का कोड College Code: K N I 6 2
परीक्षा केन्द्र का कोड Exam Centre Code: K N I 6 2

परीक्षा का प्रकार Type of Exam
नियमित Regular ● पूर्व परीक्षी Ex. Student ○
प्राइवेट Private ○ बैक पेपर परीक्षा Back paper Exam ○

ANSWER BOOKLET NO.
11950974

BCA S004
Paper Code

नामांकन संख्या Enrollment Number: C S J M A 2 3 0 0 0 1 2 9 5 1 7

परीक्षार्थी अनुक्रमांक संख्या Candidate's Roll Number: 2 3 0 7 1 0 0 2 3 6 5

पेपर कोड Paper Code: B 5 0 0 4

Signature of Candidate
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COE Facsimile

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

INSTRUCTIONS 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.

INSTRUCTIONS 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.

Correct method	Incorrect method
① ● ③ ④	✓ ✗ ◉ ⓪

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

परीक्षार्थी के लिए निर्देश

1. प्रवेश पत्र एवं उत्तर पुस्तिका पर दिये गये निर्देशों को ध्यान से पढ़ें।
2. कवर 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 कोड 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 शुरू होने के 30 मिनट के अन्दर कक्ष निरीक्षक को तत्काल सूचित करें, उसके बाद विश्वविद्यालय द्वारा कोई कार्यवाही नहीं की जायेगी।
9. प्रश्नों के उत्तर लिखने के लिये पेंसिल का प्रयोग न करें।
10. B कोपी या अतिरिक्त ग्राफ नहीं दिया जायेगा।

IN ORDER TO AVOID 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 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.

INSTRUCTIONS 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 (1-32) 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. Subject Name and Question of the Question Paper during first THIRTY MINUTES of the commencement of the exam, so that it can be corrected in TIME. After that no corrections shall be entertained by the university.
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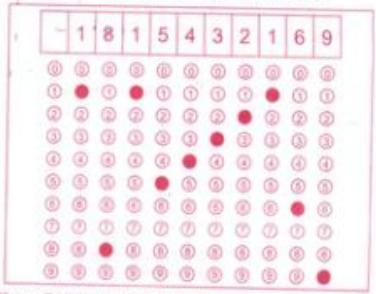
10. No supplementary answer book & graph paper will be provided.

अनुचित साधन से बचने हेतु:

1. उत्तर पुस्तिका के निर्दिष्ट 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 छेड़ करने पर अनुचित साधन प्रयोग माना जावेगा।
3. परीक्षा कक्ष में निम्न वस्तुएं साथ न लायें, जैसे लिखे हुए कागज के टुकड़े, मोबाईल, डिजिटल डायरी, कोपी, पुस्तक यह सभी वस्तुएं जो अनुचित साधन के अन्तर्गत आती है। केवल संबंधित प्रश्नपत्र में ही मेमोरी लेस साइंटफिक केल्कुलेटर ले जाने की अनुमन्यता होगी।
4. उत्तर पुस्तिकाओं में रबड़ें न रखें न ही उत्तर पुस्तिका में चिपकायें। ऐसा करना अनुचित साधन प्रयोग की परिधि में आता है।

INSTRUCTIONS TO THE CANDIDATE FOR FILLING PART-IV

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



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

Paper Code

01

Section-A

Answer - a).

Relation b/w forward Diff. operator & backward Dif operator.

Forward diff operator.

$$\Delta f(x) = f(x+h) - f(x)$$

Backward Diff. operator.

$$\nabla f(x) = f(x) - f(x-h)$$

If we do $\Delta - \nabla$

which means:

~~$\Delta f(x) - \nabla f(x)$~~

$\Delta f(x+h) - f(x) - f(x)$

$\Delta \nabla \quad \Delta(\nabla f(x))$

$\Delta(f(x) - f(x-h)) - f(x)$

$f(x+h) - f(x) + f(x-h)$.

$\Delta f(x) - \Delta f(x-h)$

$f(x+h) - f(x) - f(x-h+h) + f(x-h)$

$\nabla = \Delta - \nabla + I$

$= f(x) + f(x+h) - f(x) \cdot f(x+h) - f(x) - f(x)$

Prove $E \cong 1 + \Delta$

$(1+\Delta)(1-\nabla) = 1$

$1 - \nabla + \Delta - \Delta\nabla$

$(1+\nabla)(\Delta - 1)$

$\Delta + \nabla\Delta - 1 - \nabla$

Hence proved

Answer-b)

$3x^2 + 5x + 7$.

Let the function be $f(x)$ whose first diff is given.

We need to convert this function into factorial form using —

1	3	5	$7_x^{(0)}$
	0	3	
2	3	$8_x^{(1)}$	
	0		
	$\frac{3}{x}^{(2)}$		

Paper Code

03

Therefore the the coefficients are.

$$[3]^2 + [8]^1 + [7]^0$$

For identifying the formula we do integration of this factorial form.

$$= \int [3x]^2 + [8x]' + [7(x)]^0 \, dx.$$

$$= \frac{3x^{(3)}}{3} + \frac{8x^{(2)}}{2} + 7x + C$$

↳ Integrating constant.

now putting actual $(x-1)(x-2)\ldots$ intervals in the factorial form.

$$3(x-1)(x-2) + 8(x-1) + 7x$$

$$3(x^2 - 2x - x + 2) + 8x - 8 + 7x$$

$$3x^2 - 9x + 6 + 8x - 8 + 7x.$$

$$f(x) = 3x^2 + 6x - 2$$

$$\boxed{f(x) = 3x^2 + 6x - 2}$$

Paper Code

Answer-6.

x	f(x)	Δ	Δ^2	Δ^3	Δ^4
0	1	1			
1	2	a-2	a-3	9-3a	15-6a
2	? a	8-a	6-2a	3a-6	b-30+5a
3	8	8	a	b-24-a	
4	16	b-16	b-24	104-3b	
5	? b	64-b	80-2b		
6	64				

x	f(x)	Δ	Δ^2	Δ^3	Δ^4	Δ^5
0	1					
1	2	1	a-3	13-3a	6a-23	b-3a+9
2	a	a-2	10-2a	3a-10		
3	8	8-a	a		b-4a-14	142-5b+3a
4	16	8	b-24	b-24-a	128-4b-a	
5	?	b-16	b-2			
6	64	64-b	80-2b	104-3b		

Since we are given only 5 value
∴ all the upper order derivatives will be 0

$\Delta^5 = 0$

∴

$b - 10a + 9 = 0$ — (i)

$142 - 5b + 3a = 0$ — (ii)

Solving (i)

$b = 10a - 9$ → (iii)

Putting in (ii)

Paper Code

05

$142 - 5(10a - 9) + 3a = 0$

$142 - 50a + 45 + 3a = 0$

$187 = 47a$

$3.978 = a$

putting in (iii).

$b = 10 \times 3.978 - 9$

$b = 30.787$

$a = 3.97$ and $b = 30.78$ Ans.

Answer - d

x	f(x)
0	2
1	5
2	7
5	8

Lagrange's formula

$$f(a) = \frac{(x-x_1)(x-x_2)(x-x_3)}{(x_0-x_1)(x_0-x_2)(x_0-x_3)} \times y_0 + \frac{(x-x_0)(x-x_2)(x-x_3)}{(x_1-x_0)(x_1-x_2)(x_1-x_3)} \times y_1$$

$$+ \frac{(x-x_0)(x-x_1)(x-x_3)}{(x_2-x_0)(x_2-x_1)(x_2-x_3)} \times y_2 + \frac{(x-x_0)(x-x_1)(x-x_2)}{(x_3-x_0)(x_3-x_1)(x_3-x_2)} \times y_3$$

$$f(4) = \frac{(4-0)(4-2)(4-5)}{(0-1)(0-2)(0-5)} \times 2 + \frac{(4-0)(4-2)(4-5)}{(1-0)(1-2)(1-5)} \times 5 +$$

$$\frac{(4-0)(4-1)(4-5)}{(2-0)(2-1)(2-5)} \times 7 + \frac{(4-0)(4-1)(4-2)}{(5-0)(5-1)(5-2)} \times 8$$

$= \left(\frac{-6}{-10}\right)x^2 + \frac{(-8)^2}{4} \times 5 + \frac{(-12)^2}{(-4)} \times 7 + \frac{24}{60} \times 8$

$= 9 - 10 + 14 + 32.$

$= [37.2]$

Answer-e).

x	$f(x)$	Δ	Δ^2	Δ^3	Δ^4	Δ^5
1.5	3.375					
2.0	7.000	3.625	1.000			
2.5	13.625	6.625		0.75	0	0
3.0	24.000	10.375	3.75	0.75	0	
3.5	38.875	14.875	4.5	0.75		
4.0	59.000	20.125	5.25			

Here $x = 1.5$

$a = 1.5$

and $h = 0.5$.

$\therefore u = \frac{x-a}{h} = \frac{1.5-1.5}{0.5} = 0$

$$\frac{d}{dx}f(1.5) = \frac{1}{h}\left[\Delta f(x) + \frac{2u-1}{2!}\Delta^2 f(x) + \frac{3u^2-6u+2}{3!}\Delta^3 f(x)\right]$$

$$= \frac{1}{0.5}\left[3.625 + \frac{2\times 0 - 1}{2} \times 1 + \frac{3\times 0 - 6\times 0 + 2}{6} \times 0.75\right].$$

$$= \frac{1}{0.5}\left[3.625 + \left[\frac{-1}{2}\right]\times 1 + \frac{2}{6} \times 0.75\right]$$

$= \frac{1}{0.5}[2.375]$

$= 4.75$

Therefore $\frac{d}{dx}f(1.5) = 4.75$ Accordig to the newton forward Difference formula.

Answer - f.

Year	Population	Δ	Δ^2	Δ^3
2010	45			
		10		
2012	55		3	
		13		1
2014	68		2	
		15		
2016	83			

For 2017.

$a = 2016.$

$h = 2.$

$x = 2017.$

now

$$u = \frac{x-a}{h} = \frac{2017-2016}{2} = \frac{1}{2} = 0.5$$

Applying Newtons backward

$$f(x) = f(a+nh) + u\Delta f(a+nh) + \frac{u(u+1)}{2!}\Delta^2 f(a+nh) + \frac{u(u+1)(u+2)}{3!}\Delta^3 f(a+nh)$$

$$= 83 + 0.5 \times 15 + \frac{0.5(0.5-1) \times 2}{2} + \frac{(0.5)(0.5-1)(0.5-2)}{6} \times (-1)$$

$$= 83 + 7.5 + (-0.25) + \frac{(-0.25) \times (-1.8) \times (-1)}{6}$$

$$= 90.175$$

The population in 2017 will be nes
$90.175 \cong 90$ Thousands.

Answer-g

(Gauss Elimination Method.)

This method is use to solve system of linear equations when 2 or more equations are given.
now we have to form augmented Matrix with it.

Step-1 Form Augmented Matrix

$$a_{11}x + a_{12}y + a_{13}z = A$$
$$a_{21}x + a_{22}y + a_{23}z = B$$
$$a_{31} + a_{32} + a_{33}z = C$$

$$\left[\begin{array}{ccc:c} a_{11} & a_{12} & a_{13} & A \\ a_{21} & a_{22} & a_{23} & B \\ a_{31} & a_{32} & a_{33} & C \end{array}\right]$$

Step-2
Now the value with highest value in first column shifted at the first row.

Step-3. Now the highest value in first column is at the first row now with elementary equation we try to make that a unit digit of 1 by the operation.

$$R_1 = \frac{R_1}{a_{11}}$$

So first element becomes 1.

Step-4
Now our task is to make all the elements in that pivot element row as 0 for this we can use multiple methods of elementary operations on rows.

$$\begin{bmatrix} 1 & a_{12} & a_{13} & : A \\ 0 & a_{22} & a_{23} & : B \\ 0 & a_{32} & a_{33} & : C \end{bmatrix}$$

Step-5.
Now choose the element in next row & next column as the pivot element & place the ligest value element of that column in that row by shifting complete rows.

Remember not to disturb the above configuration.

Step-3. Repeat Step 3 & 4 & then we get the new & matrix configuration that can be used to get values of x & y & z by backward Substitution by

$$\left.\begin{aligned} a_1x + b_1y + c_1z &= A \\ b_2y + c_2z &= B \\ c_3z &= C. \end{aligned}\right\} \text{Substitute.}$$

Answer-h)

$$\int_{-3}^{3} x^4 dx.$$

By Simpson's $\frac{1}{3}$ rule.

x	$f(x)$
-3	81
-2	16
-1	1
0	0
1	1
2	16
3	81

Here $h = 1$.

Simpson's $\frac{1}{3}$ rule $= \frac{1}{3}h\left[(y_0+y_6) + 4(x_1+x_3+x_5) + 2(x_2+x_4)\right]$

$= \frac{1}{3} \times 1 \left[(81 + 81) + 4(16 + 0 + 16) + 2(1 + 1) \right]$

$= \frac{1}{3} (162 + 128 + 4)$

$= 98.$

$\int_{-3}^{3} x^4 \, dx$ by Simpson $\frac{1}{3}$ rule $= 98.$

By Trapezoidal Rule.

Trapezoid $= \frac{1}{2} \times [(y_0 + y_6) + 2(y_1 + y_2 + y_3 + y_4 + y_5)$

$= \frac{1}{2} [(81 + 81) + 2(16 + 1 + 1 + 16 + 0)$

$= \frac{1}{2} (162 + 68)$

$= 115.$

$\therefore$ the trapezoidal Rule value is $\int_{-3}^{3} = 115.$

Answer - 7)

Bisection Method Steps.

- Step-1 First step is to find the interval

for the roots using the Intermediate value theorem (IVT)
by putting $x = 0, 1, 2 \dots$
till we get
$$f(a) \cdot f(b) < 0$$

Step-2. When we get ... consider that as the interval for roots

[a, b]

now root will ... be b/w a and b.

Step-3.
For approximating keep on finding the mid value by formula for each interval $x_n = \frac{a+b}{2}$

and then check
If $f(x_n) > 0$
change b to x_n. $[a, x_n]$
If $f(x_n) < 0$
change a to x_n $[x_n, b]$

- Step-4.

  Repeat the step until you find approximated value.

- example

- $f(x)$ $x^3 - 2 = 0$.

  $f(0) = -2$

  $f(1) = -1$] The root is $[1, 2]$.

  $f(2) = 0$]

  $\frac{1+2}{2} = \frac{3}{2}$ 1.5

  $f(1.5) < 0$.

  $\therefore [1.5, 2]$ ∴ till approximate reached.

Section- B

Answer- 2.

(Regular Falsi Method)

- This method is also used for identifying the roots of a function.

- The roots for a function can be identified with the following steps.—

Steps for Regular Falsi —

• Step-1.
Using the IVT theorem find the interval for the roots which means when $[f(a) \cdot f(b) < 0]$ then this interval will have the root of that functions.

• Step-2.

now we begin the approximation of roots by identifying a optimal value for x_n the interval that could be the actual root by the formula—

$$x_n = \frac{a f(b) - b f(a)}{f(b) - f(a)}$$

• Step-3.

Now we find $f(x_n)$ and then identify

$f(x_n) < 0$
then replace a with x_n $[x_n, b]$
$f(x_n) > 0$
then replace b with x_n $[a, x_n]$

• Step 4.

Repeat these steps until the approximation is reached.

(Advantages)

1. This method is used because it is more accurate than Bisection method because roots identification is a unique formula.
2. There is less slope of error.
3. It is faster than Newton Raphson as there is no need for derivative of function.

Q- $x^3 - 9x + 1 = 0$. [CO4]

$f(2) = 2^3 - 9 \times 2 + 1 = -9$

$f(3) = 3^3 - 9 \times 3 + 1 = 1$

Therefore root lies in $[2, 3]$

$$x_n = \frac{a f(b) - b f(a)}{f(b) - f(a)}$$

1st approximation

$$x_1 = \frac{2 \times (1) - (3) \times (-9)}{1 - (-9)}$$

$$= \frac{2 + 27}{1 + 9} = \frac{29}{10}$$

$x_1 = 2.900$

now $f(2.900) = -0.711$

so $[2.9, 3]$

$$x_2 = \frac{2.90 \times 1 - 3 \times (-0.711)}{1 - (-0.711)}$$

$$= \frac{5.033}{1.711}$$

$$\boxed{x_2 = 2.941}$$

$f(2.941) = -0.021$

$\therefore$ $[2.941, 3]$.

IIIrd Approximation.

$$x_3 = \frac{2.941 \times 1 - 3 \times (-0.021)}{1 - (-0.021)}$$

$$= \frac{3.004}{1.021}$$

$$\boxed{x_3 = 2.942}$$

Till 3rd approximation we know that the root is $\boxed{2.94}$ Answer.

Section-C

Que-6.

$$\frac{dy}{dx} = \frac{y-x}{y+x}.$$

$y = 1$

$y_x = 0$.

$f(1) = ?$

Here the question is asked to identify the value at $x=1$ in five steps so we can identify h by using.

$$h = \frac{\text{upper limit} - \text{lower value}}{\text{parts}}$$

$$= \frac{1-0}{5} = 0.2.$$

For Euler's method the formula is given as

$$y_{n+1} = y_n + h(f(x_n, y_n))$$

~~1st Step~~

$$y_1 = y_0 + h \times (f(x_0, y_0).$$

$$= 1 + 0.2\left[\frac{1-0}{1+0}\right]$$

$$= 1 + 0.2$$

$$y_1 = 1.200$$

IInd Step.

now $x_{n+1} = x_n + h = 0 + 0.2 = 0.2$

$$y_2 = y_1 + h \times f(x_1, y_1)$$

$$y_2 = 1.2 + 0.2 \times \left[\frac{1.2}{1.} \quad \frac{0.2}{+0.2}\right]$$

$= 1.2 + 0.2 \times \frac{1}{1.4}$

$= 1.3428$

$[y_2 = 1.34]$

now $x_3 = 0.2 + h$

$= 0.2 + 0.2$

$= 0.4$

III rd Step

$y_3 = y_2 + h f(x_2, y_2)$

$= 1.34 + 0.2 \left[\frac{1.34 - 0.4}{1.34 + 0.4}\right]$

$= 1.34 + 0.2 \times 0.54$

$[y_3 = 1.45]$

IV th Step

now $x_4 = 0.4 + 0.2$

$= 0.6.$

$y_4 = y_3 + h f(x_3, y_3).$

$= 1.45 + 0.2 \left[\frac{1.45 - 0.6}{1.45 + 0.6}\right]$

$= 1.45 + 0.2 \times 0.4$

$= 1.45 + 0.08$

$y_4 = 1.53$

Sol^n.

now $x_5 = 0.6 + 0.2$
$= 0.8$.

$y_5 = y_4 + h f(x_4, y_4)$.
$= 1.53 + 0.2 \left[\frac{1.53 - 0.8}{1.53 + 0.8}\right]$
$= 1.53 + 0.2 \left(\frac{0.73}{2.33}\right)$

$y_5 = 1.594$

now $x_6 = 0.8 + 0.2$
$= 1$

now we will find the $f(1)$

$x_6 = x_5 + h f(x_5, y_5)$
$= 1.59 + 0.2 \left[\frac{1.59 - 1}{1.59 + 1}\right]$
$= 1.59 + 0.2 \left(\frac{0.59}{2.59}\right)$
$= 1.59 + 0.04$

$f(1) = 1.635$ Ans.

Do not write anything in this portion

Do Not Write anything in this Portion

Paper Code

20

Do Not Write anything in this Portion

X

Paper Code

22

Do Not Write anything in this Portion

X

Paper Code

23

Do Not Write anything in this Portion

Paper Code

24

Do Not Write anything in this Portion

8 - a - a + 2

6 - 2a + 2

6 - 2a

6 - 2a - a + 3

9 - 3a

9 - 6 + 2a

3a - 6

b - 24 - a

8a - 2b - b + 24

9 - 3a - 3a + 6

15 - 6a

b - 24 - a - 3a + 6

b - 30 - 4a

104 - 3b - b + 24

8 - a - a + 2

1

8 - 8 + a

80 - 2b - b + 24

b - 16 - 8

104 - 3b

b - 24

3a - 10 - 13 + 3a

64 - b - b + 16

6a - 23

80 - 2b

b - 24 - a - 3a + 10

10 - 2a - a + 3

b - 4a - 14

13 - 3a

a - 10 + 2a

104 - 3b - b + 24 + a

3a - 10

128 - 4b - a

a - 10 + 2a

3a - 10

128 - 4b

b - 24 - a

b - 4a - 14 - 6a + 23

b - 10a + 9