8. Convert the decimal number 2567_{10} to octal form.
(Ans: 5007_8) 2 [Q.N. 16(b), Set 'C' 2071]

9. Find a root of an equation $x^3 + x - 4 = 0$ in the interval [1, 4] within an accuracy of 10^{-1}.
[Ans: 1.375] [Q.N. 19, Set 'C' 2071]

10. Find a root of the equation $x^3 - x - 4 = 0$ between 1 and 2 to three places of decimal by Newton-Raphson method.
[Ans: 1.796] [Q.N. 19(OR), Set 'C' 2071]

11. Convert the hexadecimal number $AB5_{16}$ to the decimal number.
[Ans: 2741_{10}] 2 [Q.N. 16(b), Set 'D' 2071]

12. Using the bisection method, find a root of the equation:
$f(x) = 2x^3 - 5x + 2 = 0$, between 1 and 2 with error less than 10^{-2}.
[Ans: 1.31641] 6 [Q.N. 19, Set 'D' 2071]

13. Derive the formula for Newton-Raphson method. Using Newton Raphson method, find a positive root of $x^3 + 3x - 5 = 0$ lying between 1 and 2 correct to three places of decimals. [Q.N. 19(OR), Set 'D' 2071]
[Ans: 1.154]

14. Using Newton–Raphson method, find the positive root of
$x^3 - 18 = 0$ in (2, 3) [Q.N. 19(OR), 2070 'D']
(Ans: 2.62)

15. Convert the decimal number 3058 to hexadecimal form. 2 [Q.N. 16(b), 2070 'D']
(Ans: $BF2_{16}$)

16. Applying the method of successive bisection, find the root of the equation $x^3 - 4x + 1 = 0$ lying between 1 and 2 correct to 2 places of decimals.
(Ans: 1.86) 6 [Q.N. 19, 2070 'D']

17. Solve $2x^2 - 3x - 1 = 0$ using Newton–Raphson method taking $x_0 = 1$ with error less than 10^{-4}. 6[Q.N. 19(OR), 2070 'C']
[Ans: 1.780776406]

18. Convert the decimal numeral 1503 to hexadecimal form. 2 [Q.N. 16(b), 2070 'C']
[Ans: $5DF_{16}$]

19. Find the root of the equation $x^3 - 2x - 5 = 0$ lying between 2 and 3 correct to three places of decimals by successive bisection method.
[Ans: 2.094] 6 [Q.N. 19, 2070 'C']

20. Convert decimal number 687 into binary system. 2 [Q.N. 16(b), Supp. 2069]
[Ans: 1010101111_2]

21. Show that the equation $f(x) = x^3 - x - 4 = 0$ has only one positive root and find the positive root correct to 3 decimal places using bisection method
(Ans: 1.796) 6 [Q.N. 19, Supp. 2069]

22. Convert the octal numeral 3733_8 into decimal form.
(Ans: 2011_8) [Q.N. 16(b), Set 'A' 2069]

23. Using method of bisecion, find the root of the equation $x^3 - x - 4 = 0$ lying between 1 and 2 correct to 3 places of decimals. [Q.N. 19, Set 'A' 2069]
(Ans: 1.796)

24. Using Newton–Raphson's method, find the square root of 153 correct to 3 places of decimals. [Q.N. 19(OR), Set 'A' 2069]
(Ans: 12.369)

25. Using Newton Raphson's method find the positive root of the equation $f(x) = x^3 - 2x - 5 = 0$ lying between 2 and 3 correct to 3 places of decimals.
(Ans: 2.094) [Q.N. 19(OR), Set 'B' 2069]

26. Convert the hexadecimal numeral 2E4B into decimal form.
(Ans: 11851_{10}) [Q.N. 16(b), Set 'B' 2069]

27. Show that the equation $f(x) = x^3 - x - 4$ has one positive root and using the method of bisection, find the positive root correct to 3 places of decimals.
(Ans: 1.796) [Q.N. 19, Set 'B' 2069]

28. Using Newton–Raphson method, find the positive root of $x^3 + 3x - 5 = 0$ lying between 1 and 2 correct to 3 places of decimals. [Q.N. 19(OR), Supp. 2069]
(Ans: 1.154)

Unit 18: Computational Method (Continued)

1. Write the conditions for the system of equations $a_{11}x + a_{12}y = b_1$, $a_{21}x + a_{22}y = b_2$, to be ill conditioned.
(Ans: $a_{11}a_{22} - a_{21}a_{12} = 0$) 2[Q.N.16(c), 2072'C']

2. Using Gauss Seidel method, solve the equations
$3x + 2y = -9$, $2x - 3y = -6$. 4[Q.N.17(a), 2072'C']
(Ans: – 3, 0)

3. Solve by Gauss elimination method:
$x + 3y - 2z = 5$, $3x + 5y + 6z = 7$, $2x + 4y + 3z = 8$ [Q.N.17(b)(Or), 2072'C']
(Ans: – 15, 8, 2)

4. Test whether the system of equations
$12x + 3y - 5z = 1$, $x + 5y + 3z = 28$ and $3x + 7y + 13z = 1$
is diagonally consistent? 2 [Q.N.16(c), 2072'D']
(Ans: diagonally consistent)

5. Using Gauss Seidel method, solve:
$3x + 4y + 8z = 7$, $x + 20y + z = -18$, $25x + y - 5z = 19$ 4[Q.N.17(a), 2072'D']
(Ans: 1, – 1, 1)

6. Use Gauss elimination method to solve:
$4x - y + z = 8$, $2x = 5y + 2z = 3$, $x + 2y + 4z = 11$ [Q.N.17(b)(Or), 2072'D']
(Ans: 1, – 1, 3)

7. Using Gauss-elimination method, Solve the following system of equations.
$2x_2 + 3x_3 = 7$, $3x_1 - 2x_2 + 2x_3 = 1$, $2x_1 + 3x_2 - 3x_3 = 5$. 4[Q.N.17(a), 2072'E']
(Ans: 1, 2, 1)

8. Solve the following equation using matrix inversion method:
$3x + y + z = 15$, $x + y + z = 3$, $y - z = -1$ [Q.N.17(a)(Or), 2072'E']
(Ans: 6, – 2, – 1)

9. Using Gauss-elimination method, solve the following system of equation:
$x + 3y - z = -2$, $3x + 2y - z = 3$, $-6x - 4y - 2z = 18$.
(Ans: x = 1, y = – 3, z = – 6) 4 [Q.N. 17(a), Set 'C' 2071]

10. Using inverse matrix method, solve the following system of equations:
$3x + y + z = 15$, $x + y + z = 3$, $y - z = -1$.
(Ans: x = 6, y = – 2, z = – 1) 4 [Q.N. 17(a) (Or), Set 'C' 2071]

11. Solve the following system of equations using inverse matrix method:
$x_1 - 2x_2 - x_3 = 1$, $x_1 - x_2 + 2x_3 = 9$, $2x_1 - 3x_2 - x_3 = 4$
[Ans: $x_1 = 2$, $x_2 = -1$, $x_3 = 3$] 4 [Q.N. 17(a) (Or), Set 'D' 2071]

12. Using Gauss-elimination method, solve the following system of equations:
$x - 2y + 3z = 2, \quad 2x - 3y + z = 1, \quad 3x - y + 2z = 9.$
[Ans: x = 3, y = 2, z = 1] **4 [Q.N. 17(a), Set 'D' 2071]**

13. Using Simpson's $\frac{1}{3}$ rule, evaluate:
$$\int_0^1 \sqrt{1+2x^2}\, dx, \; h = 0.25.$$ **4 [Q.N. 17(b), Set 'C' 2071]**
[Ans: 1.2712]

14. Solve, using Gauss elimination method, the following equations.
$x + 3y - 2z = 5, 3x + 5y + 6z = 7, 2x + 4y + 3z = 8$ **4 [Q.N. 17(a), 2070 'C']**
[Ans: –15, 8, 2]

15. Solve the following equation using Gauss Seidel method:
$3x_1 + x_2 = 5, x_1 + 2x_2 = 5.$ **[Q.N. 17(a) (Or), 2070 'C']**
[Ans: 1, 2]

16. Solve the following system of equations by Gauss Seidel method
$3x + y - z = 2, 2x - 5y + z = 20, x - 3y - 8z = 3$ **[Q.N. 17(a) (Or), 2070 'D']**
(Ans: 2, – 3 , 1)

17. Solve the following system of equations by Gaussian elimination method.
$x + 3y - 2z = 5, 3x + 5y + 6z = 7, 2x + 4y + 3z = 8$ **4 [Q.N. 17(a), 2070 'D']**
(Ans: – 15, 8, 2)

18. Examine whether the following system of equations
$x_1 + 2x_2 + 5x_3 = 1$
$2x_1 - 3x_2 + 5x_2 = 2,$
$5x_1 + 3x_2 + 6x_3 = 3$; is diagonally dominant? **2 [Q.N. 16(c), Supp. 2069]**
[Ans: not dominant]

19. Solve by Gauss elimination method, the system of equations
$3x + 2y - z = 1, x - y + 2z = -1, -x + \frac{1}{2} y - z = 0.$ **4[Q.N. 17(a), Supp. 2069]**
[Ans: 1, –2, –2]

20. Solve by Gauss–Seidel method:
$3x_1 + x_2 = 5$
$x_1 - 3x_2 = 5$ **[Q.N. 17(a) (Or), Supp. 2069]**
[Ans: 2, –1]

21. Examine whether the following system of equations are ill conditioned.
$2x_1 + x_2 = 25$
$2.001x_1 + x_2 = 25.01$ **[Q.N. 16(c), Set 'A' 2069]**
(Ans: ill - conditioned)

22. Using Gauss elimination method, solve the following system of equations:
$x - 2y + 3z = 2, \quad 2x - 3y + z = 1, \quad 3x - y + 2z = 9$
(Ans: 3, 2, 1) **[Q.N. 17(a), Set 'A' 2069]**

23. Solve the following equations using Guess-Seidel method:
$2x_1 - x_2 = 8$
$3x_1 + 7x_2 = -5$ **[Q.N. 17(a) (Or), Set 'A' 2069]**
(Ans: 3, – 2)

24. Using Gauss elimination method, solve the following system of equations:
$x_1 - 2x_2 + 3x_3 = 10$,
$2x_1 + 3x_2 - 2x_3 = 1$,
and $-x_1 - 2x_2 + 4x_3 = 13$.
(Ans: 1, 3, 5) [Q.N. 17(a) Set 'B' 2069]

25. Solve the following equations using Guess-Seidel method:
$3x_1 + x_2 = 5$
$x_1 - 3x_2 = 5$ [Q.N. 17(a) (Or), Set 'B' 2069]
(Ans: 1, 2)

Unit 19: Numerical Integration

1. Using Simpson's $\frac{1}{3}$ rule, calculate $\int_1^5 x^4\,dx$ with n = 4. 4[Q.N.17(b), 2072'C']
(Ans: 625.33)

2. State and prove Trapezoidal rule of numerical approximation. 6[Q.N.19(Or), 2072'C']

3. Approximate the value using trapezoidal rule for $\int_{-1}^{1} e^x\,dx$, n = 2. 6[Q.N.19, 2072'D']
$\left(\text{Ans: } \frac{(e+1)^2}{2e}\right)$

4. Evaluate $\int_0^1 \sqrt{1+x^3}\,dx$ using Simpson's $\frac{1}{3}$ rule with n = 4. [Q.N.19(Or), 2072'D']
(Ans: 1.111)

5. Find the approximate value of $\int_0^{0.2} \sqrt{1-2x^2}\,dx$, n = 2, using Simpson's $\frac{1}{3}$ rule.
(Ans: 0.197298809) 2 [Q.N.16(c), 2072'E']

6. Evaluate using composite trapezoidial rule, the integral $\int_0^{\pi} \sin x\,dx$, n = 4.
(Ans: 1.896) [Q.N.17(b), 2072'E']

7. Using the trapezoidal rule, evaluate: $\int_0^1 \frac{dx}{1+x^2}$, n = 2.
(Ans: 0.775) 2 [Q.N. 16(c), Set 'C' 2071]

8. Using the trapezoidal rule, evaluate: $\int_0^2 (2x^2 - 1)dx$, n = 4.
[Ans: 3.5] 2 [Q.N. 16(c), Set 'D' 2071]

9. Estimate the following integral using Simpson's $\frac{1}{3}$ rule,

$$\int_0^{\pi} \sin x dx, n = 6$$ 4[Q.N. 17(b), Set 'D' 2071]

10. Using trapezoidal rule, evaluate $\int_0^{\frac{\pi}{2}} \sqrt{\sin x}\, dx, n = 2.$

[Ans: 1.052] 2 [Q.N. 16(c), 2070 'C']

11. Using Simpsons's $\frac{1}{3}$ rule, evaluate $\int_0^1 \frac{dx}{1+x^2}, n = 4.$

[Ans: 1, 0.785] 4 [Q.N. 17(b), 2070 'C']

12. Using trapezoidal rule, evaluate $\int_0^3 (3x^2 - 4x)dx, n = 3.$

(Ans: 10.5) 2 [Q.N. 16(c), 2070 'D']

13. Using Simpons's $\frac{1}{3}$ rule, evaluate $\int_0^1 \frac{dx}{1+x}, n = 4.$ 4 [Q.N. 17(b), 2070 'D']

(Ans: 0.693255)

14. Evaluate using Simpson's rule $\int_0^1 \frac{dx}{1+x}$. Estimate the error in using the approximation for n = 4. 4 [Q.N. 17(b), Supp. 2069]

[Ans: 0.693255, error $\leq$ 0.00052]

15. Estimate the following integral using Trape-Zoidal rule. [Q.N. 17(b), Set 'A' 2069]

$$\int_0^1 \frac{dx}{1+x}, n = 4$$

Estimate the error with respect to the actual value.

(Ans: 0.69702, 0.00388)

16. Given $I = \int_0^4 x^3 dx, n = 4$

Estimate the value of I using Trapezoidal rule.

(Ans: 68) [Q.N. 16(c), Set 'B' 2069]

17. Evaluate the following integral using Simpson's rule. 4 [Q.N. 17(b), Set 'B' 2069]

$$\int_0^{\pi} \sin x\, dx, n=6$$

(Ans: 2.0008)

5. COMPULSORY ENGLISH–II

Course Content

The contents of this paper can be divided into two components:

1. Core English 2. Extensive Reading and Writing

The text for language skills has the following units.

• experience • appearance • relating past events • attitudes and reactions
• duration • reporting • deduction and explanation • advantages and disadvantages ◂ clarifying
• wishes and regrets • events and sequence
• comparison • processes • prediction • news

The texts for extensive reading are as follows:

Poems 1. William Stafford, *"Travelling through the Dark"*
2. W. B. Yeats, *" The Lamentation of the Old Pensioner"*
3. William Shakespeare, *"Full Fathom Five Thy Father Lies"*
4. Ray Young Bear, *"Grandmother"*
5. Hopkins, *"God's Grandeur"*

Essays 6. *Moti Nissani,* "Two Longterm Problem"
7. Marsha Traugot, *"The Children Who Wait"*
8. Martin Luther king, *"I have a Dream"*
9. Ilene Kantrov, *"Women's Business"*
10. Lilla, M and Barry, C. Bishop, *"Hurried Trip to Avoid a Bad Star"*
11. Germaine Greer, *"A Child is Born"*

Stories 12. *Poe,* "The Tell- Tale Heart"
13. Dylan Thomas, *"A Story"*
14. James Joyce, *"The Boarding House"*
15. G. Garcia Marquez, *"The Last Voyage of the Ghost Ship"*
16. Chekhov, *"About Love"*
17. Brothers Grimm, *"Hansel and Gretel" and its variations*

Play 1. W. B. Yeats, *"Purgatory"*

Model Question 2056

Time: 3 hrs. Full Marks: 100
Pass Marks: 35

Answer all the questions.

1. Read the following passage and answer the questions given below. 3×5=15

If there were no mountains or oceans, and if the winds circled the earth with perfect regularity then the amount of heat and the length of the farmer's growing season would progress uniformly from north to south. Instead, there are all kinds of unexpected differences in climate, as temperature maps of the United states show. For instance, all along the western coast, the temperature changes little between winter and summer. In some places, the average difference between July and January is as little as 10 degrees centigrade. The climate along the northern part of this coasts is similar to that of England. But in the north central part of the country, summer and winter are worlds apart. There the average difference between July and January is 36 degrees centigrade and more violent extremes are common. The coldest days of a typical January may be 40 degrees centigrade, and the hottest July day may be 45 degrees. This is the sort of climate that is also found in central Asia, far from the moderating influence of the oceans. In the eastern part of the United States, the difference between summer and winter is also very distinct, but not nearly so extreme. Near the southwestern corner of the country, the climate is mild and spring like in winter, but in summer the temperature may reach equatorial intensity. In Alaska, almost continuous daylight in summer makes the short growing season an intense one. The variations in temperature within the United States have had a marked effect on the country's economy and living standards. **[Unseen Passage]**

4. MATHEMATICS–II

Exam Questions

Group 'A'

Unit 1: Permutation and Combination

1.1 Permutation

1: How many different numbers of five digits can be formed with the digits 0, 1, 2, 3, 4?
(Ans: 96) [2] [Q.N.1(a), 2073 'C']

2. In how many ways can the letters of the word 'COMPUTER" be arranged so that (i) all the vowels are always together (ii) the vowels may occupy only odd positions.
(Ans: (i) 4320 (ii) 2880) 4[Q.N.5(a), 2073 'D']

3. How many numbers between 3000 and 4000 can be formed with the digits 2, 3, 4, 5, 6, 7? 2[Q.N.1(a), Supp. 2072]
(Ans: 60)

4. Prove that $P(n,r) = \frac{n!}{(n-r)!}$ where the symbols have their usual meanings.
4[Q.N.5(a), Supp. 2072]

5. Prove that $c(n, r) + c(n, r-1) = c(n+1, r)$. Where $c(n, r)$ is the combination of n things taken r at a time. [Q.N.5(b)(Or), Supp. 2072]

1.2 Combination

1. From 10 persons in how many ways can a selection of 4 be made when two particular persons are always excluded ? 2[Q.N.1(a), 2073 'D']
(Ans: 70)

Unit 2: Binomial Theorem

2.1 Binomial Theorem

1. Find the middle term in the expansion of $\left(x - \frac{1}{3x^2}\right)^{12}$. [2] [Q.N.1(b), 2073 'C']

$\left(\textbf{Ans: } \frac{12!}{(6!)^2\,(3x)^6}\right)$

2. If $(1+x)^a = c_0 + c_x x^a$, prove that: $c_0 c_n + c_1 c_{n-1} + \ldots\ldots\ldots + c_n c_0 = \frac{2n!}{n!\,n!}$ 6[Q.N.9, 2073 'D']

3. Find the middle term in the expansion of $\left(x + \frac{1}{2x}\right)^{18}$. 2[Q.N.1(b), Supp. 2072]

$\left(\textbf{Ans: } \frac{18!}{2^9(9!)^2}\right)$

2.2 Exponential and Logarithmic Series

1. Prove that: $\dfrac{\frac{1}{2!} + \frac{1}{4!} + \frac{1}{6!} + \ldots}{\frac{1}{1!} + \frac{1}{3!} + \frac{1}{5!} + \ldots} = \frac{e-1}{e+1}$. [6] [Q.N.9, 2073 'C']

2. Show that $\frac{2}{1!} + \frac{4}{3!} + \frac{6}{5!} + \ldots\ldots\ldots 10 \infty = e$. 2[Q.N.1(b), 2073 'D']

3. Show that : $\sum_{n=1}^{\infty} \frac{n^2}{(n+1)^2} = e - 1$ 6[Q.N.9, Supp. 2072]

Unit 3: Elementary Group Theory

3.1 Binary Operation and Algebraic Structure

1. Find inverses of the elements of $G = \{-1, 1\}$ under multiplication, if exist.
   (Ans: (–1, 1)) [2] [Q.N.1(c), 2073 'C']
2. Let $G = \{0, 1, 2\}$. From a composition table for G under addition modulo 3. Find the inverse element of 2. 2[Q.N.1(c), 2073 'D']
   (Ans: 2)
3. Let $G = \{0, 1, 2\}$. From a composition table for G under multiplication modulo 3. Find the inverse element of 2. 2[Q.N.1(c), Supp. 2072]
   (Ans: 2)

3.2 Group

1. Define Abelian group. Prove that a group G is Abelian if and only if $(aob)^{-1} = a^{-1} \text{ o } b^{-1}$ for all $a, b \in G$. [4] [Q.N.5(b), 2073 'C']
2. Show that the set of all positive rational numbers under the composition defined by $a{*}b = \frac{ab}{5}$ forms a group. [4] [Q.N.5(b) OR, 2073 'C']
3. Given the algebraic structure (G, *) with $G = \{1, w, w^2\}$ where w represents the cube roots of unity and * stand for the binary operation of ordinary multiplication of complex numbers, show that (G, *) is a group. 4[Q.N.5(b), 2073 'D']
4. If $a, b \in (G, o)$, prove that $(a \circ b)^{-1} \text{ o } a^{-1}$. [Q.N.5(b)or, 2073 'D']
5. Given that the algebraic structures (G, *) with $G = \{1, w, w^2\}$ where w represents an imaginary cube root of unity and * stands for the binary operation of multiplication, show that (G, *) is a group. 4[Q.N.5(b), Supp. 2072]

Unit 4: Conic Section

4.1 Parabola

1. If a tangent to the parabola $y^2 = 12x$ makes an angle 45° with the straight line $x - 2y + 3 = 0$, find the equation of the tangent. [4] [Q.N.6(a), 2073 'C']
   (Ans: $3x - y + 1 = 0, x + 3y + 27 = 0$)
2. Find the equation of the tangent to the parabola $y^2 = 4ax$ at the point (x_1, y_1). 4
   (Ans: $yy_1 = 2a(x + x_1)$) [Q.N.6(a), 2073 'D']
3. Define conic section. Find the equation of the parabola in its standard form.
   4 [Q.N.6(a), Supp. 2072]

4.2 Ellipse

1. Find the equation of the ellipse whose major axis is twice its minor axis and passes through the point (0, 1). [4] [Q.N.6(a) OR, 2073 'C']
   (Ans: $x^2 + 4y^2 = 4$)
2. Find the centre, eccentricity and foci of the ellipse $9x^2 + 5y^2 - 30y = 0$
   $\left(\textbf{Ans: } (0, 3), \frac{2}{3}, (0, 3 \pm 2)\right)$ [Q.N.6(a)or, 2073 'D']
3. Find the eccentricity and the coordinates of the foci of the ellipse $\frac{x^2}{9} + \frac{y^2}{16} = 1$.
   $\left(\textbf{Ans: } \frac{\sqrt{7}}{4}; (0, \pm\sqrt{7})\right)$ 2[Q.N.2(a), Supp. 2072]

4.3 Hyperbola

1. Find the foci and vertices of the hyperbola $9x^2 - 16y^2 = 144$. [2] [Q.N.2(a), 2073 'C']
(Ans: [(± 4, 0), (± 5, 0)])

2. Find the equation of a hyperbola with a focus at (–7, 0) and eccentricity $\frac{7}{4}$. 2
$\left(\text{Ans: } \frac{x^2}{16} - \frac{62}{33} = 1\right)$ [Q.N.2(a), 2073 'D']

3. Find the eccentricity, coordinates of the vertices and the foci of the hyperbola $5x^2 - 20y^2 - 20x = 0$. [Q.N.6(a)(Or), Supp. 2072]
$\left(\text{Ans: } \frac{\sqrt{5}}{2}, (2 \pm 2, 0)\ (2 \pm \sqrt{5}, 0)\right)$

Unit 5: Co-ordinates in Space

5.1 Coordinates in Space

1. If O is the origin, P(2, 3, 4) and Q(1, – 2, 1) be any two points, show that OP is perpendicular to OQ. [2] [Q.N.2(b), 2073 'C']
2. If α, β and γ are the direction angles of a line, prove that: $\cos 2\alpha + \cos 2\beta + \cos 2\gamma + 1 = 0$. 2 [Q.N.2(b), 2073 'D']
3. Find the direction cosines of a line passing through the points P(2, 3, 4) and Q(1, 4, 6).
$\left(\text{Ans: } -\frac{1}{\sqrt{6}}, \frac{1}{\sqrt{6}}, \frac{2}{\sqrt{6}}\right)$ 2[Q.N.2(b), Supp. 2072]

5.2 Plane

1. Find the equation of the plane through the point (2, – 3, 1) and perpendicular to the line joining the two points (3, 4, – 1) and (2, – 1, 5). [4] [Q.N.6(b), 2073 'C']
(Ans: $x + 5y - 6z + 19 = 0$)
2. Find the equation of the plane passing through the points (1, 1, 0), (–2, 2, –1) and (1, 2, 1). 4[Q.N.6(b), 2073 'D']
(Ans: $2x + 3y - 3z - 5 = 0$)
3. Find the equation of the plane through the points (2, 2, 1) and (9, 3, 6) and normal to the plane $2x + 6y + 6z = 9$. 4[Q.N.6(b), Supp. 2072]
(Ans: $3x + 4y - 5z = 9$)

Unit 6: Vectors and its Applications

6.1 Elements of Vectors

1. If $\vec{a} = 2\vec{i} - 3\vec{j} + 4\vec{k}$ and $\vec{b} = -\vec{i} + 2\vec{j} - 2\vec{k}$, find a unit vector along the direction of $2\vec{a} + 3\vec{b}$. [2] [Q.N.2(c), 2073 'C']
$\left(\text{Ans: } \frac{1}{\sqrt{5}}\vec{i} + \frac{2}{\sqrt{5}}\vec{j}\right)$
2. ABCD is a parallelogram. G is the point of intersection of its diagonals and if O is any point show that : $\vec{OA} + \vec{OB} + \vec{OC} + \vec{OD} = 4\vec{OG}$ 2 [Q.N.2(c), 2073 'D']
3. If $3\vec{i} + \vec{j} - \vec{k}$ and $\lambda\vec{i} - 4\vec{j} + 4\vec{k}$ are collinear vectors, find the value of λ.
(Ans: – 12) 2[Q.N.2(c), Supp. 2072]

6.2 Product of Vectors

1. Show that vector product $\vec{a} \times \vec{b}$ is perpendicular to both vectors $\vec{a}$ and $\vec{b}$. [2] [Q.N.3(c), 2073 'C']
2. Define scalar product of two vectors. Prove vectorically that cos (A – B) = cos A cos B + sin A sin B. [6] [Q.N.10, 2073 'C']
3. If $\vec{a} + \vec{b} + \vec{c} = 0$, prove that $\vec{a} \times \vec{b} \times \vec{c} = \vec{c} \times \vec{a}$. 2[Q.N.3(c), 2073 'D']
4. Define scalar product of two vectors. Give the geometrical interpretation of the scalar product of two vectors. Prove vectorically that $b^2 = c^2 + a^2 - 2ca \cos B$. 6[Q.N.10,2073'D']
5. If $|\vec{a} + \vec{b}| = |\vec{a} - \vec{b}|$ prove that $\vec{a}$ is perpendicular to $\vec{b}$. 2[Q.N.3(c), Supp. 2072]
6. Define vector product of two vectors. Using vector method prove that sin(A – B) = sinAcosB – cosAsinB. 6[Q.N.10, Supp. 2072]

Unit 7: Derivative and its Application

7.1 Continuity and differentiability

No Questions has been asked in this year.

7.2 Differential Coefficients by definition (by first principle)

1. Find from first principles the derivative of log (sec x). [6] [Q.N.11, 2073'C']
   (Ans: tanx)
2. Find from first principles, the derivative of Sin(logx). [Q.N.11(or), 2073 'D']
   $\left(\text{Ans: } \frac{1}{x}\cos(\log x)\right)$
3. Find, from first principles, the derivative of log(tanx). [Q.N.11(Or), Supp. 2072]
   $\left(\text{Ans: } \frac{1}{\sin x . \cos x}\right)$

7.3 Derivative of hyperbolic function

No Questions has been asked in this year.

7.4 Tangent and Normal

No Questions has been asked in this year.

7.5 L Hospital's rule, Roll's Theorem & Mean Value Theorem

1. Using L Hospital's rule, evaluate: $\lim_{x \to 0} \frac{x - \sin x \cos x}{x^3}$ [2] [Q.N.3(a), 2073 'C']
   $\left(\text{Ans: } \frac{2}{3}\right)$
2. State Rolle's theorem. Using Rolle's theorem find a point on the curve f(x) = cos 2x where the tangent is parallel to x-axis on $[-\pi, \pi]$. [6] [Q.N.11 OR, 2073 'C']
   $\left(\text{Ans: } \frac{-\pi}{2}, 0, \frac{\pi}{2}\right)$
3. Using L Hospital's rule, evaluate : $\lim_{x \to 0} \frac{x - \sin x \cos x}{x^3}$ 2[Q.N.3(a), 2073 'D']
   $\left(\text{Ans: } \frac{2}{3}\right)$

4. State Mean Value Theorem. Interpret it geometrically. Verify Lagrange's mean value theorem for the function $f(x) = x(x-1)^2$ in $[0, 2)$. 6[Q.N.11, 2073 'D']

$\left(\text{Ans: } c = \frac{4}{3}\right)$

5. Using L' Hospital's rule, evaluate

$\lim_{x \to 0} \frac{xe^x - \log(1+x)}{x^2}$. 2[Q.N.3(a), Supp. 2072]

$\left(\text{Ans: } \frac{3}{2}\right)$

6. State Rolle's theorem. Interpret its geometrically. Verify Rolle's theorem for the function $f(x) = \sin x$, $x \in [0, \pi]$. Also find a point in the curve represented by given function where the tangent is parallel to x-axis. 6[Q.N.11, Supp. 2072]

Unit 8: Antiderivatives

1. Evaluate: $\int \frac{dx}{x + \sqrt{x^2-1}}$. [2] [Q.N.3(b), 2073 'C']

$\left(\text{Ans: } \frac{x^2}{2} - \frac{x\sqrt{x^2-1}}{2} + \frac{1}{2}\log\left(x + \sqrt{x^2-1}\right) + c\right)$

2. Evaluate: $\int \frac{dx}{1 - 2\cos x}$. [4] [Q.N.7(a), 2073 'C']

$\left(\text{Ans: } \frac{1}{\sqrt{3}} \log \frac{\sqrt{3}\tan\frac{x}{2} - 1}{\sqrt{3}\tan\frac{x}{2} + 1} + c\right)$

3. Evaluate: $\int \frac{x^3 dx}{2x^4 - 3x^2 - 5}$. [4] [Q.N.7(a) OR, 2073 'C']

$\left(\text{Ans: } \frac{1}{14}\log(x^2+1) = \frac{5}{28}\log(2x^2-5) + c\right)$

4. Evaluate : $\int \frac{dx}{x + \sqrt{x^2-1}}$ 2[Q.N.3(b), 2073 'D']

$\left(\text{Ans: } \frac{x^2}{2} - \frac{x\sqrt{x^2-1}}{2} + \frac{1}{2}\log\left(x + \sqrt{x^2-1}\right) + c\right)$

5. Evaluate: $\int \frac{dx}{1 + \sin x + \cos x}$. 4[Q.N.7(a), 2073 'D']

$\left(\text{Ans: } \log\left(1 + \tan\frac{x}{2}\right) + c\right)$

6. Evaluate : $\int \sqrt{2ax - x^2}\, dx$ 2[Q.N.3(b), Supp. 2072]

$\left(\text{Ans: } \sin^{-1}\frac{x-a}{a} + C\right)$

7. Evaluate : $\int \frac{dx}{3\sin x + 4\cos x}$ 4[Q.N.7(a), Supp. 2072]

$\left(\text{Ans: } \frac{1}{5}\log \frac{\frac{1}{2} - \tan\frac{x}{2}}{2 + \tan\frac{x}{2}} + c\right)$

Unit 9: Differential Equations and their Applications

1. Solve: $\frac{dx}{1+x^2}+\frac{dy}{1+y^2}=0$ [2] [Q.N.4(a), 2073 'C']

   $\left(\textbf{Ans: } \frac{x+y}{1-xy}=c\right)$

2. Solve: $x\frac{dy}{dx}+2y=x^2\log x.$ [4] [Q.N.7(b), 2073 'C']

   $\left(y=\frac{1}{4}x^2\log x-\frac{x^2}{16}+\frac{c}{x^2}\right)$

3. Solve: $ydx - xdy = xy\,dy.$ 2[Q.N.4(a), 2073 'D']

   $\left(\textbf{Ans: } \log\frac{x}{y}=y+c\right)$

4. Solve: $\frac{dy}{dx}-2xy=x.$ 4[Q.N.7(b), 2073 'D']

   $\left(\textbf{Ans: } y=-\frac{1}{2}+ce^{x^2}\right)$

5. Solve: $x^2\frac{dy}{dx}+y^2=xy$ [Q.N.7(b)or, 2073 'D']

   (Ans: $x = y(\log x + c)$)

6. Solve : $\frac{dy}{dx}+4x=2e^{2x}.$ 2[Q.N.4(a), Supp. 2072]

   (Ans: $y = e^{2x} - 2x^2 + c$)

7. Solve : $(x+1)\frac{dy}{dx}+2y=\frac{e^x}{x+1}.$ 4[Q.N.7(b), Supp. 2072]

   (Ans: $(x+1)^2y + e^x + c$)

8. Solve : $\frac{dy}{dx}=\frac{y}{x}-\sin^2\frac{y}{x}.$ 4[Q.N.7(b)(Or), Supp. 2072]

   $\left(\textbf{Ans: } \cot\left(\frac{y}{x}\right)=\log x+c\right)$

Unit 10: Dispersion, Correlation and Regression

10.1 Measures of dispersions

1. A frequency distribution gives the following results. C.V. = 5%, Mean = 40 and Mode = 39. Calculate Karl Pearson's coefficient of skewness of the distribution.
   (Ans: 0.5) [2] [Q.N.4(b), 2073 'C']
2. If $\Sigma f(x) = 110$, $\Sigma fx^2 = 1650$, $N = 10$ and $M_0 = 12.45$, find Karl Person's coefficient of skewness. 4[Q.N.8(a), 2073 'D']
   (Ans: – 0.22)
3. Calculate the coefficient of skewness based on mean, mode and the standard deviation from the following data: 4[Q.N.8(a), Supp. 2072]
   (Ans: 0.18)

Wages (in Rs)	100	110	120	130	140
No of persons	2	6	10	8	4

10.2 Correlation

1. Calculate Karl Pearson's coefficient of correlation from the following data using product moment formula. [4] [Q.N.8(a), 2073 'C']
(Ans: 0.99)

X	12	9	8	10	11
Y	12	8	6	9	10

2. If $\Sigma(x - \overline{x})^2 = 40$, $\Sigma(y - \overline{y})^2 = 63$ and $\Sigma(x - \overline{x})(y - \overline{y}) = 35$, find the correlation coefficient between the two variables x and y. 2[Q.N.4(b), 2073 'D']
(Ans: 0.697)

3. If $n = 10$, $\Sigma x = 18$, $\Sigma y = 25$, $\Sigma x^2 = 90$, $\Sigma y^2 = 120$ and $\Sigma xy = 65$, find the correlation coefficient between two variables. 2[Q.N.4(b), Supp. 2072]
(Ans: 0.35)

10.3 Regression

No Questions has been asked in this year.

Unit 11: Probability

11.1 Probability

1. The chance that A can solve the problem is $\frac{2}{3}$ and the chance that B can solve the problem is $\frac{1}{3}$. Find the probability that the problem is solved by A and B.
$\left(\text{Ans: } \frac{2}{9}\right)$ [2] [Q.N.4(c), 2073 'C']

2. A class consists of 60 boys and 40 girls. If two students are chosen at random, what is the probability that (i) both are boys (ii) one boy and one girl. 4
$\left(\text{Ans: (i) } \frac{59}{165} \text{ (ii) } \frac{16}{33}\right)$ [Q.N.8(b), 2073 'D']

3. An urn contains 4 white and 8 red balls. If two balls are drawn at random, find the probability of getting one of each colour. 2[Q.N.4(c), Supp. 2072]
$\left(\text{Ans: } \frac{16}{33}\right)$

11.2 Binomial Distribution

1. There are ten electric bulbs in the stock of a shop out of which four are defectives. In how many ways can a selection of 6 bulbs be made so that 4 of them may be good bulbs? [4] [Q.N.5(a), 2073 'C']
$\left(\text{Ans: } \frac{972}{15625}\right)$

2. If 4 dice are rolled simultaneously, what is the probability of getting (i) exactly 3 sixes (ii) exactly 2 sixes? [4] [Q.N.8(b), 2073 'C']
$\left(\text{Ans: (i) } \frac{5}{324} \text{ (ii) } \frac{25}{216}\right)$

3. A dice is rolled 4 times. Getting an even number is considered as a success. Find the probability of getting two successes. 2[Q.N.4(c), 2073 'D']

$\left(\text{Ans: } \frac{3}{8}\right)$

4. A certain manufacturing process produce electrical fuses of which 15% are defective. Find the probability that in a sample of 10 fuses selected at random there will be i) no defective ii) not more than one defective.

(Ans: (i) 0.1969 (ii) 0.5443) 4[Q.N.8(b), Supp. 2072]

Group 'B'

Unit 12: Statics

1. If the resultant of two equal forces is equal to the given force, find angle between the forces. [2] [Q.N.12(a), 2073 'C']

(Ans: 120°)

2. State and prove triangle of forces. [4] [Q.N.13(a), 2073 'C']

3. Two forces P and 2P acting at a point have a resultant $\sqrt{3}$ p. Find the angle between the two forces. 2[Q.N.12(a), 2073 'D']

(Ans: 120°)

4. A body of weight 100 kg is suspended by two things 7 m and 24 m in length; their other ends being fastened to the extremeties of a rod of length 25m. If the rod is so held that the body hangs immediately below its middle point, find the tensions of the strings. 4[Q.N.13(a), 2073 'D']

(Ans: 28 kg, 96 kg)

5. Find the resultant of two forces P and Q acting at a point when the angle between them is α. [Q.N.13(a)or, 2073 'D']

$\left(\text{Ans: } \sqrt{P^2 + Q^2 + 2PQ\cos\alpha},\ \theta = \tan{-1}\left(\frac{Q\sin\alpha}{P + Q\cos\alpha}\right)\right)$

6. Forces of 2, $\sqrt{3}$, 5, $\sqrt{3}$, 2N respectively act at one of the angular points of a regular hexagon towards the five other points. Find the magnitude and the direction of the resultant. 4[Q.N.13(a), Supp. 2072]

(Ans: 10N, along the diagonal making 60° with a side)

7. State and prove Lame's theorem. [Q.N.13(a)(Or), Supp. 2072]

8. Two forces P and 2P acting at a point have the resultant $\sqrt{3}$P, find the angle between the two given forces. 2[Q.N.12(a), Supp. 2072]

(Ans: 120°)

Unit 13: Statics (Continued)

13.1 Like and unlike parallel forces

1. Define like and unlike parallel forces. A man carries a bundle at the end of a stick which is placed over his shoulder; if the distance between his hand and shoulder be changed how does the pressure on his shoulder change? [6] [Q.N. 15, 2073 'C']

2. Two like parallel forces P and Q act at points 18 m apart, if the resultant force be 9N and acts at a distance 6 m from P, find Q. 2[Q.N.12(b), 2073 'D']

(Ans: 3N)

3. Two like parallel forces P and Q act at points 18m apart, if the resultant force be 9N and acts at a point 6m from P, find Q. 2[Q.N.12(c), Supp. 2072]

(Ans: 3N)

13.2 Moment of a Force

1. ABCD is a square. Forces 1, 2, 3, 4 and $2\sqrt{2}$ Newton's act at a point in directions AB, BC, CD, DA and AC respectively. Find the resultant. [4] [Q.N.13(a) OR, 2073 'C']
   (Ans: A couple of moment 5a N, a = side of the square)
2. Forces equal to P, 2P, 3P and 4P act along the sides of a square ABCD taken in order. Find the magnitude, direction and the line of action of the resultant. 6[Q.N.15, 2073 'D']
   (Ans: $2\sqrt{2}$P, 45° with CD, meeting CD produced at E such that DE = $\frac{3a}{2}$, a = side of the square)
3. Define moment of a force about a point. What does it represent geometrically? Prove that the algebraic sum of the moments of two intersecting forces about any point in their plane is equal to the moment of their resultant about the same points. 6[Q.N.15, Supp. 2072]

13.3 Couple

No Questions has been asked in this year.

Unit 14: Dynamics

14.1 Motion with Uniform Acceleration

1. An aeroplane land on the runway with a velocity of 108 km/hr. If then its velocity slows down at the rate of 25 m/s^2, find the distance covered by the aeroplane before coming to rest. 2[Q.N.12(c), 2073 'D']
   (Ans: 18 m)
2. A cyclist travelling with a velocity of 72km/hr accelerates at the rate of 4m/s^2 until it describes a distance of 48m. Find the time taken. 2[Q.N.12(b), Supp. 2072]
   (Ans: 2s)

14.2 Motion Under Gravity

1. A body falls from rest from the top of a tower and during the last second it falls $\frac{16^{th}}{25}$ of the whole height. Find the height of the tower. (g = 10 ms^{-2})
   (Ans: 31.5 m) [4] [Q.N.13(b), 2073 'C']
2. A balloon is rising with a acceleration f. Prove that the fraction of the weight of the balloon which must be emptied out of the balloon in order to double the acceleration is $\frac{f}{g+2f}$. 4[Q.N.13(b), Supp. 2072]

14.3 Motion Down a Smooth Inclined Plane

1. A particle slides down a smooth inclined plane 10 m long and acquires a velocity of $10\sqrt{2}$ms^{-1}. Find the inclination of the plane. (g = 10 ms^{-2})
   (Ans: 90°) [2] [Q.N.12(b), 2073 'C']

Unit 15: Dynamics (Continued)

15.1 Newton's Laws of Motion

1. State Newton's Laws of Motion. A bullet of mass 10g is fired from a gun of mass 3kg with a velocity 300 kmh^{-1}. Find the velocity of recoil of the gun. [6] **[Q.N. 14, 2073 'C']**
   (Ans: 1 kmh^{-1})
2. A mass of 5 kg falls 3 m from rest and is then brought to rest by penetrating 30 cm into some sand. Find the average thrust of the sand on it. 4
   (Ans: 539N upward) **[Q.N.13(b), 2073 'D']**

15.2 Projectiles

1. If R be the horizontal range of a projectile and h is greatest height, prove that its velocity is $\sqrt{2g\left(h+\frac{R^2}{16h}\right)}$. **[6] [Q.N. 14 OR, 2073 'C']**
2. A projectile thrown from a point in horizontal plane comes back to the plane in 4 secs at a distance of 60 m from the point of projection. Find the velocity of the projection. ($g = 10$ m/s^2) **6 [Q.N.14, 2073 'D']**
   (Ans: 25 m/sec)
3. From a point on the ground at a distance x from the foot of a vertical wall, a ball is thrown at an angle of 45° which just clears the top of the wall and afterwards strikes the ground at a distance y on the other side. Prove that the height of the wall is $\frac{xy}{x+y}$.
   6[Q.N.14, Supp. 2072]

15.3 Work, Energy and Power

1. How large a force is required to cover a distance of 80 m if the total work done is 800J? **[2] [Q.N.12(c), 2073 'C']**
   (Ans: 10N)
2. 800 kg of air, moving at 20 m/s, imping on the vanes of a windmill every second. At what rate in kilowatt is the energy arriving at the windmill? What is the maximum mass of water that could be pumped each second through a vertical height of 2.5 m? ($g = 10$ m/s^2) **[Q.N.14(or), 2073 'D']**
   (Ans: 160 kw, 6400 kgs^{-1})
3. Define kinetic and potential energies of a body. Prove that the sum of the kinetic and the potential energies of a freely falling body remains constant throughout the motion.
   [Q.N.14(Or), Supp. 2072]

Group 'C'

Unit 16: Linear Programming

1. Find the vertices of the feasible region under the constraints
   $3x + 2y \le 48,\ x + y \le 20;\ x, y \ge 0.$ **[2] [Q.N.16(a), 2073 'C']**
   (Ans: (0, 0), (12, 0), (8, 12), (0, 20))
2. Maximize $z = 5x_1 + 7x_2$ subject to $2x_1 + 3x_2 \le 13,\ 3x_1 + 2x_2 \le 12;\ x_1, x_2 \ge 0$ by Simplex method. **[6] [Q.N. 18, 2073 'C']**
   (Ans: Max Z = 31, at $x_1 = 2$, $x_2 = 3$)
3. Find the feasible region determined by the inequalities
   $2x + y \le 8,\ x + 2y \le 10,\ x, y \ge 0.$ **2[Q.N.16(a), 2073 'D']**
   (Ans: (0, 0), (4, 0),(2, 4), (0, 5))

4. Using the simplex method, 6[Q.N.18, 2073 'D']
maximize $z = 15x_1 + 10x_2$
subject to $2x_1 + x_2 \leq 10$
$x_1 + 3x_2 \leq 10$
$x_1, x_2 \geq 0$.
(Ans: Max z = 80, at $x_1 = 4$, $x_2 = 2$)

5. Find the vertices of the feasible region determined by the following inequalities: $2x + y \leq 8$, $x + 2y \leq 10$ and $x, y \geq 0$. 2[Q.N.16(a), Supp. 2072]
(Ans: (0, 0), (4, 0), (2, 4), (0, 5))

6. Using Simplex method,
maximize $z = 5x + 3y$ subject to
$2x + y \leq 40$
$x + 2y \leq 50$
$x, y \geq 0$ 6[Q.N.18, Supp. 2072]
(Ans: Max Z = 110 at (10, 20))

Unit 17: Computational Method

1. Convert the octal number 143_8 into hexadecimal form. [2] [Q.N.16(b), 2073 'C']
(Ans: 63_{16})

2. Apply successive bisection method to find the root of the equation $x^3 - 4x + 1 = 0$ lying between 1 and 2 correct to two places of decimal. [4] [Q.N.17(a), 2073 'C']
(Ans: 1.86)

3. Find a root of the equation $x^3 - x - 4 = 0$ between 1 and 2 to three places of decimal by Newton Raphson's method. [4] [Q.N.17(a) OR, 2073 'C']
(Ans: 1.796)

4. Convert the decimal numberal 3058 to hexadecimal form. 2[Q.N.16(b), 2073 'D']
(Ans: $BF2_{16}$)

5. Show that the equation $f(x) = x^3 - 3x - 8 = 0$ has only one positive root. Using bisection method, find a root in (2, 3) correct to 3 places of decimals.6[Q.N.19,2073'D']
(Ans: 2.492)

6. Using Newton Raphson method, find a root of the equation $f(x) = x^3 - x - 4 = 0$ in (1, 2) correct to 3 places of decimals. [Q.N.19(or) 2073 'D']
(Ans: 1.796)

7. Convert the decimal number 1503 into hexadecimal form.
(Ans: $5DF_{16}$) 2[Q.N.16(b), Supp. 2072]

8. Using the method of bisection, find the root of the equation $x^3 - 2x - 5 \cdot 0$ lying between 2 & 3 correct to 3 places of decimals. 6[Q.N.19, Supp. 2072]
(Ans: 2.094)

9. Using Newton Raphson's method, find the root of the equation $f(x) = x^2 - x - 4 = 0$ in (1, 2) correct to 3 places of decimals. 6[Q.N.19(Or), Supp. 2072]
(Ans: 1.796)

Unit 18: Computational Method (Continued)

1. Define well-conditioned and ill-conditioned of a system of equations.
[2] [Q.N.16(c), 2073 'C']

2. Solve by Gauss elimination method:
$3x_1 + x_2 + x_3 = 5$, $x_1 - 4x_2 + x_3 = -2$, $x_1 + x_2 - 3x_3 = -1$. [4] [Q.N.17(b), 2073 'C']
(Ans: 1, 1, 1)

3. Using Gauss-elimination method, solve the following system of equations:
$2x - 3y + 3z = 27$, $4x + 7 - 2z = 0$, $-6x - 4y + 2z = 0$. 4[Q.N.17(a), 2073 'D']
(Ans: 3, – 2, 5)

4. Using Gauss-Seidel method, solve the following system of equations:
$4x_1 + x_2 + x_3 = 7$, $2x_1 - 5x_2 + 2x_3 = 1$, $x_1 - x_2 + 3x_3 = 6$. [Q.N.17(a)or, 2073 'D']
(Ans: 1, 1, 2)

5. Examine whether the following equations are diagonally dominant:
$8x_1 - 2x_2 + 3x_3 = -1$
$-3x_1 + 9x_2 - x_3 = 2$
$2x_1 - x_2 - 7x_3 = 3$ 2[Q.N.16(c), Supp. 2072]
(Ans: diagonally dominant)

6. Solve the following system of equations using Gauss elimination method:
$x + 3y - 2z = 5$
$3x + 5y + 6z = 7$
$2x + 4y + 3z = 8$ 4[Q.N.17(a), Supp. 2072]
(Ans: – 15, 8, 2)

7. Solve the following equation using Gauss-Seidel method:
$3x_1 + x_2 = 5$
$x_1 - 3x_2 = 5$ [Q.N.17(a)(Or), Supp. 2072]
(Ans: 2, – 1)

Unit 19: Numerical Integration

1. Define Trapezoidal rule. Evaluate using Trapezoidal rule $\int_0^1 \frac{dx}{1+x}$ for n = 4.
(Ans: 0.697025) [6] [Q.N. 19, 2073 'C']

2. Using Simpson's rule, evaluate $\int_0^2 \frac{dx}{1+x^4}$ for n = 4, correct to 3 places of decimal.
[6] [Q.N. 19 OR, 2073 'C']
(Ans: 1.081)

3. Using Simpson's $\frac{1}{3}$ rule, evaluate $\int_0^{0.2} \sqrt[3]{1-2x^2}\, dx$, n = 2.
2[Q.N.16(c), 2073 'D']
(Ans: 0.198191413)

4. Using the trapezoidal rule, compute $\int_0^2 (2x^2 - 1)\, dx$ with 4 intervals. Find the absolute error of approximation from its actual value. 4[Q.N.17(b), 2073 'D']
(Ans: 3.5, 0.17)

5. Evaluate the following integral using Simpson's rule:
$\int_1^0 \frac{dx}{1+x^2}$, n = 4 4[Q.N.17(b), Supp. 2072]
(Ans: 0.785)