

O-6305

M. A./M. Sc. (Final)

Term End Examination, Jan.-Dec., 2020

MATHEMATICS

Paper First

(Operations Research)

Time : Three Hours]

[Maximum Marks : 70

[Minimum Pass Marks : 14

Instructions for Candidate :

Section-A : Question Nos. **01** to **08** are very short answer type questions. Attempt all questions. Each question carries 01 mark. Answer each of these questions in **1** or **2** words/1 sentence.

Section-B : Question Nos. **09** to **14** are half short answer type questions. Attempt any *four* questions. Each question carries $2\frac{1}{2}$ marks. Answer each of these questions in about **75** words or half page.

Section-C : Question Nos. **15** to **18** are short answer type questions. Attempt any *three* questions. Each question carries 05 marks. Answer each of these questions in about **150** words or one page.

Section-D : Question Nos. **19** to **22** are half long answer type questions. Attempt any *two* questions. Each question carries 10 marks. Answer each of these questions in about **300** words or two pages.

Section-E : Question Nos. **23** and **24** are long answer type questions. Attempt any *one* question. Each question carries 17 marks. Answer each of these questions in about **600—750** words or 04—05 pages.

Section—A

- In rolling a fair die, what is the probability of obtaining an even number ?
 - $\frac{1}{3}$
 - $\frac{1}{2}$
 - $\frac{1}{6}$
 - None of these
- The value of the money decreases with a constant ratio when is known as its
- A feasible solution to an L. P. P. is said to be optimum solution if
- A set S is said to be an open set if
- The set of constraints (linear equations) is said to be inconsistent if
- Define Feasible Solution (FS).

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7. If an F. S. involves exactly $(m + n - 1)$ independent individual positive allocations, then it is known as
8. Define "Loop (or Cycle)."

Section—B

9. From a bag containing 10 black and 5 white balls, a ball is drawn at random. What is the probability that it is white ?
10. Define "Generating Functions."
11. Calculate the probability of staff resignation in each year from the following survival table :

Year	No. of original staff is service at the end of the year
0	1000
1	940
2	820
3	580
4	400
5	280
6	190
7	130
8	70
9	30
10	0

P. T. O.

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12. Is $x_1 = 1, x_2 = \frac{1}{2}, x_3 = x_4 = x_5 = 0$ a basic solution of the following system ?

$$x_1 + 2x_2 + x_3 + x_4 = 2$$

$$x_1 + 2x_2 + \frac{1}{2}x_3 + x_5 = 2$$

13. Define the following :

- (a) Path
(b) Loop
(c) Tree

14. Distinguish between PERT and CPM.

Section—C

15. Discuss scientific method in OR.
16. Consider the inventory system with the following data in usual notations :

$$r = 100 \text{ units/year, } I = 0.30,$$

$$P = ₹ 0.50 \text{ per unit,}$$

$$C_3 = ₹ 10.00, L = 2 \text{ yrs. (lead time)}$$

Determine the following :

- (i) Optimal order quantity
(ii) Minimum average cost

17. If you wish to have a return of 10% per annum on your investment, which of the following plans would you prefer ?

	Plan A (₹)	Plan (B)
Ist cost	2,00,000	2,50,000
Scrap value after 15 years	1,50,000	1,80,000
Excess of annual revenue over annual disbursement	25,000	30,000

18. Write the “Degeneracy in Transportation Problems” in short.

Section—D

19. What is Monte-Carlo simulation in short.
20. Find the optimal order quantity (q) for a product for which the price breaks are as follow :

q	Unit Cost (₹)
$0 \leq q < 50$	10
$50 \leq q < 100$	9
$100 \leq q$	8

The monthly demand for the product is 200 units the cost of storage is 25% of the unit cost and ordering cost is ₹ 20 per order.

21. Discuss Chame’s perturbation method for resolving degeneracy.

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22. What is Network ? Write the general procedure for construction of a Network Diagram.

Section—E

23. Prove that the following sets are convex. Which are convex polyhedron sets ?
(i) The interior and the edges of a triangle
(ii) The interior of a circle
(iii) The interior of a rectangle
25. Solve the following transportation problem :

		To			
		1	2	3	Supply
From	1	2	7	4	5
	2	3	3	1	8
	3	5	4	7	7
	4	1	6	2	14
Demand		7	9	18	34

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Term End Examination, Jan.-Dec., 2020

MATHEMATICS

Paper Second

(Complex Analysis)

Time : Three Hours]

[Maximum Marks : 70

[Minimum Pass Marks : 14

Instructions for Candidate :

Section-A : Question Nos. 01 to 08 are very short answer type questions. Attempt all questions. Each question carries 01 mark. Answer each of these questions in 1 or 2 words/1 sentence.

Section-B : Question Nos. 09 to 14 are half short answer type questions. Attempt any *four* questions. Each question carries $2\frac{1}{2}$ marks. Answer each of these questions in about 75 words or half page.

Section-C : Question Nos. 15 to 18 are short answer type questions. Attempt any *three* questions. Each question carries 05 marks. Answer each of these questions in about 150 words or one page.

Section-D : Question Nos. 19 to 22 are half long answer type questions. Attempt any *two* questions. Each question carries 10 marks. Answer each of these questions in about 300 words or two pages.

Section-E : Question Nos. 23 and 24 are long answer type questions. Attempt any *one* question. Each question carries 17 marks. Answer each of these questions in about 600—750 words or 04—05 pages.

Section—A

1. The equation of the circle whose centre is at the origin and radius R is
2. If $z = x + iy$, then $\bar{z}z = \dots\dots\dots$
3. The function :

$$f(z) = \frac{1}{z(z-3)}$$

is not analytic at $z = \dots\dots\dots$

4. For the function $f(z) = z^2$, the value of derivative at $z = 4$ is
5. If $f(z)$ is analytic in a simply connected domain D, then for every closed path C in D, $\int_C f(z) dz = \dots\dots\dots$
6. If C is circle $|z - a| = r$, then $\int_C \frac{dz}{z - a} = \dots\dots\dots$
7. $f(z) = \frac{z-2}{z^2} \sin \frac{1}{z-1}$ has a pole at
8. For the function $f(z) = e^z$; $z = \infty$ is

P. T. O.

Section—B

9. Find the moduli and arguments of the complex number $\frac{1-i}{1+i}$.
10. Find the equation of any straight line passing through the point z_1 and making an angle α with the real axis.
11. Check whether the function $f(z) = \bar{z}$ is analytic or not ?
12. State Liouville's theorem for entire function.
13. Show that the limit point of a sequence of poles of a function $f(z)$ is a non-isolated essential singularity.
14. Find the poles of the function :

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

Section—C

15. Show that the modulus of the sum of two complex numbers can never exceed the sum of their moduli.
16. Show that the function :

$$e^x(\cos y + i \sin y)$$

is holomorphic and find its derivative.

17. Evaluate :

$$\int_{(0,1)}^{(3,10)} \{(3x+y) dx + (2y-x) dy\}$$

along the line joining (0, 1) and (3, 10).

18. Show that the function $e^{-\frac{1}{z^2}}$ has no singularities.

Section—D

19. A relation R on the set of complex numbers is defined by $z_1 R z_2$ if and only if $\frac{z_1 - z_2}{z_1 + z_2}$ is real. Show that R is an equivalence relation.
20. Prove that the function $|z|^2$ is continuous everywhere but nowhere differentiable except at origin.
21. Let $f(z)$ be analytic function within and on the boundary C of a simply connected region D and let z_0 be any point within C. Then show that :

$$f'(z_0) = \frac{1}{2\pi i} \int_C \frac{f(z)}{(z - z_0)^2} dz$$

22. State and prove Fundamental Theorem of Algebra.

Section—E

23. Evaluate :

$$\int_C \frac{z-3}{z^2+2z+5} dz$$

where C is the circle :

(i) $|z| = 1$

(ii) $|z + 1 - i| = 2$

24. State and prove maximum modulus principle.

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Term End Examination, Jan.-Dec., 2020

MATHEMATICS

Paper Third

(Mathematical Statistics)

Time : Three Hours]

[Maximum Marks : 70

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Instructions for Candidate :

Section-A : Question Nos. **01** to **08** are very short answer type questions. Attempt all questions. Each question carries 01 mark. Answer each of these questions in **1** or **2** words/**1** sentence.

Section-B : Question Nos. **09** to **14** are half short answer type questions. Attempt any *four* questions. Each question carries $2\frac{1}{2}$ marks. Answer each of these questions in about **75** words or half page.

Section-C : Question Nos. **15** to **18** are short answer type questions. Attempt any *three* questions. Each question carries 05 marks. Answer each of these questions in about **150** words or one page.

P. T. O.

Section-D : Question Nos. **19** to **22** are half long answer type questions. Attempt any *two* questions. Each question carries 10 marks. Answer each of these questions in about **300** words or two pages.

Section-E : Question Nos. **23** and **24** are long answer type questions. Attempt any *one* question. Each question carries 17 marks. Answer each of these questions in about **600—750** words or 04—05 pages.

Section—A

1. The measure of kurtosis is
2. Write the arithmetic mean of first n odd numbers.
3. If A and B are mutually exclusive event, then $P(A \cap B) = \dots\dots\dots$
4. Two regression lines are perpendicular, if $r = ?$
5. If $R_{123} = 1$, then $R_{3, 12} = ?$
6. There is complete dis-association between the attributes, if $Q = ?$
7. If we use properties instead of percentage, Time Reversal test is
8. $\Delta \log f(x) = ?$

Section—B

9. If first moment about the value 1.5 of a distribution is 4.5, obtain mean.
10. A coin is tossed 3 times. Find the probability of getting head or tail alternately.

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11. If two regression coefficients are 0.8 and 0.2, then find the value of correlation coefficient.
12. If $r_{12} = 0.6$, $r_{13} = -0.4$ and $r_{23} = 0.7$, then prove that lines are inconsistent.
13. Prove that the data :
N = 2100, (A) = 1000, (B) = 1300 and (AB) = 1100 are inconsistent.
14. If h is the interval of differencing, then find $\Delta(\tan^{-1} x)$.

Section—C

15. Show that the formula for mean deviation from the mean can be written in the form :

$$\text{M. D.} = \frac{2}{N} \left[\begin{array}{l} \bar{x} \sum f_i - \sum f_i x_i \\ x_i < \bar{x} \end{array} \right]$$

16. A variate takes the values 2, 4, 8, 16,, 2^n , find the Arithmetic Mean, G. M. and H. M.
17. Is it possible to get the following from a set of experimental data ?

$$r_{23} = 0.8$$

$$r_{31} = -0.5$$

$$r_{12} = 0.6$$

18. Obtain the function whose first difference is $r^2 + 3x + 5x + 12$.

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Section—D

19. A bag contains 2 white and 3 black balls. Four persons A, B, C and D in the order named each draw on ball and do not replace it. The person to draw a white ball receives ₹ 200. Determine their expectations.
20. Write a short note on Sheppard's corrections.
21. Using the method of separation of symbds, prove that :

$$\Delta^n u_{x-n} = u_x - {}^n C_1 u_{x-1} + {}^n C_2 u_{x-2} + \dots$$

22. The monthly incomes of 10 families in a certain locality are given below :

A	85
B	70
C	15
D	75
E	500
F	20
G	45
H	250
I	40
J	36
Total	1,136

Calculate the arithmetic average, the geometric mean and harmonic mean of the above incomes.

Section—E

23. Calculate the standard deviation of the following two series. Which shows greater deviation ?

Series A	Series B
192	83
288	87
236	93
229	109
184	124
260	126
348	126
291	101
330	102
243	108

24. From the chain base index numbers given below, prepare fixed base index numbers :

1945	92
1946	102
1947	104
1948	98
1949	103
1950	101

O-6308**M. A./M. Sc. (Final)****Term End Examination, Jan.-Dec., 2020****MATHEMATICS****Paper Fourth****(Object Oriented Programming in C++)***Time : Three Hours]**[Maximum Marks : 70**[Minimum Pass Marks : 14***Instructions for Candidate :**

Section-A : Question Nos. **01** to **08** are very short answer type questions. Attempt all questions. Each question carries 01 mark. Answer each of these questions in **1** or **2** words/**1** sentence.

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Section—A

1. Write name of any *two* header files used in C++ programs.
2. Write name of any *two* C++ compilers.
3. What is size of character data type in C++ program ?
4. Write name of access specifiers in C++.
5. What do you mean by pointers in C++ ?
6. What is Program Testing ?
7. What is C++ Token ?
8. What do you mean by Variable ?

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Section—B

9. What is Function ?
10. What is the role of main() function in C++ ?
11. What do you mean by Compiler ? Write name of any *four* C++ compilers.
12. Explain different data type in C++.
13. Write a program in C++ to print "Hello".
14. Explain array in C++.

Section—C

15. Differentiate if and if-else statement with examples.
16. Explain that, C++ language is rich in operators.
17. Write a program to find out smallest of two numbers using function.
18. Write a program to perform addition of two arrays in C++.

Section—D

19. Differentiate between Call by Value and Call by Reference.
20. What do you mean by Friend Function ? Explain with example.
21. What are Constructor and Destructor ? Explain with example.
22. Explain multiple and multilevel inheritance with example.

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Section—E

23. Write programs :

- (i) To find out factorial of a number.
- (ii) To print the following structure :

```
1 0 0 0
0 1 0 0
0 0 1 0
0 0 0 1
```

24. What is Polymorphism ? Explain its types with programs.

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