

QP CODE: 24000588

Reg No	:	
Name	:	

B.Sc DEGREE (CBCS) REGULAR / REAPPEARANCE EXAMINATIONS, MARCH 2024

Sixth Semester

B.Sc Statistics Model I

CORE COURSE - ST6CRT10 - ANALYTICAL TOOLS FOR STATISTICS

2017 Admission Onwards

9EFE9BE8

Time: 3 Hours

Max. Marks: 80

Part A

Answer any ten questions. Each question carries 2 marks.

1. Show that

 $E^n = [1 + \Delta]^n$

2. Prove that

$$\delta = E^{rac{-1}{2}}\Delta = E^{rac{1}{2}}
abla$$

3. Show that

$$rac{\Delta}{
abla} - rac{
abla}{\Delta} = \Delta +
abla$$

- 4. Define mean operator μ
- By constructing a difference table find the sixth term of the sequence 1, 16, 63, 160, 5. 325,....
- By means of Newtons divided difference formula find a polynomial of degree three which 6. takes the values prescribed below : f(2) = 4, f(4) = 56, f(9) = 711, f(10) = 980.
- 7. State Bessel's interpolation formula.
- Define Simpson's three-eighth rule 8.
- Show that the function 9.

$$f(z) = z^2$$

is analytic function

- 10. Define singularity
- 11. State Cauchy's residue theorem.
- 12. Define upper Riemann integral of a function.

(10×2=20)

Part B

Answer any **six** questions. Each question carries **5** marks.

13. Express the following polynomial in factorial notation and thus find the first three differences

$$f(x) = 2x^3 - 5x^2 + 4x - 8$$

14. Use the method of separation of symbols prove that

$$U_x = U_{x-1} + \Delta U_{x-2} + \Delta^2 U_{x-3} + \ldots + \Delta^{n-1} U_{x-n} + \Delta^n U_{x-n}$$

- 15. Show that divided differences are symmetrical in all their arguments
- 16. Derive Newton's general interpolation formula with divided differences
- 17. By the use of Lagrange's interpolation formula find a polynomial f(x) of degree three f(x) which takes the values

$$f(0) = 1, f(1) = 1, f(2) = 2, f(4) = 5$$

18. Evaluate

$$\int_{1}^{6} \frac{dx}{x}$$

using the Trapezoidal rule take h = 1

19. Prove that

$$u=rac{1}{2}log(x^2+y^2)$$

is a harmonic function. Determine its harmonic conjugate and find the corresponding analytic function

$$f(z) = u + iv$$

20. Find the residue at its poles of the following function



$$f(z) = rac{3e^z}{z^4}$$

21. Show that the function f(x)=2x+4 integrable on [1,2] and $\int_1^2 f(x)dx=7$. (6×5=30)

Part C

Answer any **two** questions. Each question carries **15** marks.

22. Derive Newton's Backward interpolation formula. Using the table of values of the function y=f(x) , find f(37)

x	20	25	30	35	40
f(x)	0.3420	0.4226	0.5000	0.5736	0.6428

23. Apply Bessel's formula to find f(3.74) and f(3.4), given the following data.

x	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
f(x)	56.303	68.393	80.000	91.036	101.418	111.066	119.907	127.873

24. Evaluate

$$\int_{0.6}^{1.2}\sqrt{x}e^{-x}dx$$

by using Simpson's one third, Simpson's three eighth and Weddle's rule.

25. a) Define the following terms with one example each i) Removable singularity ii) Essential singularity iii) Pole

b) Find the value of the integral

$$\int_C \frac{z^2 dz}{(z^2 + 1)(z^2 - 4)}$$

taken counter clockwise around the circle C such that

$$i) \ \ C: |z| = rac{1}{2} \ \ ii) \ \ C: \ \ |z| = 3 \ \ iii) \ \ \ C: |z| = rac{3}{2}$$

(2×15=30)

