20764 **M-5592**

Sl.No. Total No. of Pages : 3

VI Semester B.Sc. Examination, April/May - 2019
(Semester Scheme)
MATHEMATICS (Paper - VIII) (2015-16 Batch and Onwards)
Complex Analysis and Numerical Analysis

Time : 3 Hours **Max. Marks : 80**

Instruction : Answer all the sections.

SECTION - A

I. Answer any eight questions. Each question carries two marks.

a) Evaluate $\lim_{Z\to 2}\frac{Z^3-2Z^2+2Z-4}{Z^2-3Z+2}$.

b) Show that an analytic function with constant real part is constant.

c) Prove that $u=\log\sqrt{x^2+y^2}$ is harmonic.

d) Evaluate $\int_C$ Re (z) dZ, where C is the line joining Z = 0 and Z=1+i.

e) Evaluate $\int_C \frac{dZ}{Z+2}$, around the circle |Z| = 2.

f) State Cauchy's inequality.

g) Explain briefly the Bisection method of finding a real root of the equation f(x) = 0.

h) By using Newton-Raphson method find $\sqrt[3]{10}$ correct to three decimal places.

i) Solve $\frac{dy}{dx}=x+y$, given $y(0)=1$ using Picard's method up to 3rd approximation.

j) Construct the forward difference table from.

x	0	1	2	3	4
y	1	3	7	13	21

k) Evaluate

$\Delta^{10}(1+3x)(1-9x^2)(1-6x^3)(1+5x^4)$

l) State Simpson's $\frac{3}{8}$th rule for n intervals.

P.T.O.

SECTION - B

II. Answer any eight questions. Each question carries four marks.

a) Find the equation of the circle passing through the points 1, i, and 1+i.

b) Find the derivative of $f(Z)=\frac{Z-1}{Z+1}$ at 2–i using definition of derivative.

c) Show that the real and imaginary parts of an analytic function are harmonic.

d) If $f(z) = u + iv$ is analytic and $u-v = e^x$ [cos y – sin y]. Find $f(z)$ in terms of z.

e) If u and v are harmonic functions, show that $(u_y - v_x) + i\,(u_x + v_y)$ is analytic.

f) Evaluate $\int_{(0,3)}^{(2,4)} (2y-x^2)\,dx+(3x-y)\,dy$ along the curve $x = 2t$, $y = t^2+3$.

g) State and prove Cauchy's integral theorem.

h) Evaluate $\int_C \frac{\cos(2\Pi Z)}{(2Z-1)(Z-3)}\,dz$, where C is the circle $|z| = ½$.

i) Evaluate $\int_c \frac{e^{-2z}}{(z+4)^3}\,dZ$, where c is the circle $|Z| = 4$.

j) State and prove Liouville's theorem.

SECTION - C

III. Answer any eight questions. Each question carries four marks.

a) Find a real root of the equation $x^3-5x + 3 = 0$ correct to three decimal places using Bisection method.

b) Find a real root of the equation $x^3-x-10 = 0$ correct to three decimal places by Regula-falsi method.

c) Use Euler's modified method to compute y(0,4) for x = 0(0.2)0.4 given that $\frac{dy}{dx}=1-2xy, y(0)=0$.

d) Solve $\frac{dy}{dx} = y - x$, given $y(0) = 0$, at x = 0.4 with h = 0.2 by Runge-Kutta fourth order method.

e) Estimate f (2.5) from the given table by using forward interpolation formula.

x	1	2	3	4	5	6
f(x)	1	8	27	64	125	216

f) Express $\frac{3x^2+x+1}{(x-1)(x-2)(x-3)}$ as a sum of partial fractions by using Legrange's inter polation formula.

g) Using Newton - Gregory formula. Find a polynomial $f(x)$ from the following table.

x	0	1	2	3
f(x)	1	2	4	7

h) Derive Simpson's $\frac{1}{3}$rd rule using general quadrature formula for n intervals.

i) Evaluate $\int_0^1 \frac{dx}{1+x}$ by Trapezoidal rule with n = 5, Hence find an approximate value of log2.

j) Find the value of $\int_0^{0.6} \frac{dx}{1+x^2}$ by using Weddle's rule with seven ordinates.

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