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VI Semester B.Sc. Examination, April/May - 2018
(Semester : Scheme)
MATHEMATICS (Paper - VIII)
Complex Analysis and Numerical Analysis
(2015-16 Batch and Onwards)

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

Instruction: Answer all the sections.

SECTION - A

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

a) Find the equation of the line joining the points 2+3i and 1+2i.

b) If f(z) = sinz. find $f'(z)$ at z = i using the definition of derivative.

c) Prove that $f(z) = z^2$ is analytic.

d) Evaluate $\int_0^{1+i} (x^2 - iy)\,dz$ along the curve $y = x$

e) Evaluate $\int_C \frac{1}{z-2}\,dz$ where C is the circle |z|=4

f) State fundamental theorem of Algebra.

g) Find an interval in which a real root of x^3-x - 4= 0 lies.

h) Use Newton - Raphson method to find $\sqrt{17}$ correct to three decimal Places.

i) Solve $\frac{dy}{dx} = y - x$, by Picard's method upto two approximations given y(0) = 1.

j) Prove that $(1+\Delta)(1-\nabla) = 1$

k) Construct the forward difference table for $f(x) = x^3 + 1$ for $x = 0\ (1)5$

l) State simpson's $\frac{1}{3}^{rd}$ rule for 'n' intervals.

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SECTION - B

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

a) Define continuity of f (z) at $z = z_0$ and show that $f(z) = \frac{z^2}{z^4 + z^2 + 1}$ is continuous at $z = e^{i\pi/2}$

b) Find whether the points (2,1), (3, 5), (-2,0) and (1,-1) are concyclic or not.

c) State and prove cauchy - Riemann equations in polar form.

d) Find the analytic function f (z) whole real part is e^x cosy and find its imaginary part.

e) Prove that the function $u = x^3 - 3xy^2$ is harmonic and find its harmonic conjugate.

f) State and prove cauchy's integral formula.

g) Evaluate $\int (\bar{z})^2 \, dz$ around the circle $|z-1| = 1$.

h) Show that $\int_C \frac{z^2 - 4}{z(z^2+9)} dz = \frac{-8\pi i}{9}$ where 'C' is the circle $|z| = 1$

i) Evaluate $\int_C \frac{z\cos z}{(z - \pi/2)^2} dz$ where c is the cricle $|z - i| = 3$.

j) State and prove cauchy's inequality.

SECTION - C

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

a) Find a real root of the equation $x^3 - 2x - 5 = 0$ by Bisection method correct to three decimal places.

b) Find a real root of the equation $\cos x - 3x + 1 = 0$ correct to three decimal places by the method of false position.

c) Use modified Euler's method to solve $\frac{dy}{dx} = x - y^2$, given that $y(0) = 1$ for $x = 0.2$ with $h = 0.1$

d) Apply Runge - Kutta fourth order method to solve

$dy/dx = 2x - y$ with $y(0) = 1$, for $x = 0(0.5)1$

e) Estimate the population for the year 1995 from the given table.

Year	1960	1970	1980	1990	2000
Population in crores	46	66	81	93	101

f) Use Newton - Gregory formula to find a polynomial in x for the data.

x	0	1	2	3
$f(x)$	2	3	12	35

g) Using Lagrange's interpolation formula find $f(5)$ given that $f(1) = 2, f(2) = 4, f(3) = 8$ and $f(7) = 128$

h) Derive general quadrature formula.

i) Evaluate $\int_0^1 \frac{x}{1+x^4}\,dx$ with n= 4 using trapezoidal rule, hence find an approximate value of π.

j) Evaluate $\int_0^3 (x^4 + x)\,dx$ with n = 6 by using weddle's rule.