Ex./CE/MATH/T/221/2017(OLD)

BACHELOR OF CIVIL ENGINEERING EXAMINATION, 2017

(2nd Year, 2nd Semester, Old Syllabus)

Mathematics - IV C

Time : Three hours Full Marks : 100

Use a separate Answer Scripts for each part.

PART - I

Answer any ***five*** questions.

1. (a) Show that the function $f(z) = u + iv$, where

$$f(z) = \frac{x^3(1+i) - y^3(1-i)}{x^2 + y^2} \quad (z \neq 0)$$

$f(0) = 0$ is continuous and Cauchy-Riemann equations are satisfied at the origin. But $f'(0)$ does not exist.

(b) Define analytic function and singular point. 7+3

2. (a) Find an analytic function whose real part is $u(x,y) = x^3 - 3xy^2$.

(b) Show that an analytic function with constant modulus is constant. 5+5

(Turn over)

3. (a) Show that polar form of Cauchy-Riemann equations are

$$\frac{\partial u}{\partial r} = \frac{1}{r}\frac{\partial u}{\partial \theta}$$
$$\frac{\partial u}{\partial r} = -\frac{1}{r}\frac{\partial u}{\partial \theta}$$

(b) If $\omega = \log z$, find $\frac{\partial w}{\partial z}$ and also determine where ω is non analytic. 5+5

4. (a) Find the directional derivative of $f(x,y,z) = 2xy + z^2$ at (1,–1,3) in the direction of the vector $\hat{i} + 2\hat{j} + 2\hat{k}$.

(b) Find the curvature and torsion for the curve $x = a\cos t$, $y = a\sin t$, $z = bt$. 5+5

5. (a) If $F(\vec{r})$ is a continuously differentiable vector point function in the region V bounded by a closed surface S, then $\int_V div\,\vec{F}\,dv = \oint_S \vec{F}.\hat{\eta}ds$

where $\hat{\eta}$ is the unit outward drawn normal vector.

(b) Find the constant a, b, c so that the vector $\vec{w} = (x + 2y + az)\hat{i} + (bx - 3y - z)\hat{j} + (4x + cy + 2z)\hat{k}$ becomes irrotational. 5+5

12. State Newton's backward interpolation formula and use it to find f(3.5) from the following table.

x :	0	1	2	3	4
f(x) :	2	2.5	3.2	4.1	5.3

3+7

13. Find the median and mode of the following distribution :

Class :	160-163	164-167	168-171	172-175	176-179	180-183	184-187
f :	22	80	98	148	104	43	5

Hence find mean. 10

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