FACULTY OF ENGINEERING

B.E. III Semester (CBCS) (Except I.T) (Back og) Examination, December 2019

Subject: Engineering Mathematics- III

Max. Marks:75 Time: 3 Hours

Note: Answer all questions from Part-A & any five questions from Part-B PART - A (25 Marks)

- 1. If f(z) = u(x, y) + iv(x, y) is analytic function, then prove that u(x, v) and v(x, y) are (3)harmonic functions.
- 2.5 Evaluate $\oint_{C} \frac{\sin^{2} z}{\left(z \frac{\pi}{c}\right)} dz$, where C is the circle |z| = 1. (2)
- 39 Determine the pole of the function $f(z) = \frac{z^2}{(z-1)^2(z+2)}$ and find the residue at each (2)point.
- 4; Expand $f(z) = \frac{1}{(z-1)(z-2)}$ is the region |z| < 1. (3)
- 5; Define Dirichlet's conditions for the existence of Fourier series of a function f(x). (2)
- 6. Find the half range sine series of $f(x) = x, x \in (0, \pi)$. (3)
 - 7. Form the partial differential equation by eliminating arbitrary functions from (3)Z = f(x + at) + g(x - at).
 - 8. Obtain complete solution of pq + p + q = 0. (2)
 - 9. Solve $3\frac{\partial u}{\partial x} + 2\frac{\partial u}{\partial y} = 0$, $u(x,0) = 4e^{-x}$. (3)
 - 10. Classify the partial differential equation $\frac{\partial^2 z}{\partial x^2} + 2 \frac{\partial^2 u}{\partial x \partial y} + 4 \frac{\partial^2 z}{\partial y^2} = 0$. (2)

- PART B (5 x 10 = 50 Marks)

 1(1. a) Find the analytic function f(z) = u + iv, if $u v = (x y)(x^2 + 4xy + y^2)$. (6)
 - When $\int_{C}^{\infty} \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$ where C is the circle |z| = 3. (4)

12 Find Laurent's expansion of

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$$f(z) = \frac{7z - 2}{z(z+1)(z-2)} \text{ in the region } 1 < |z+1| < 3.$$
 (4)

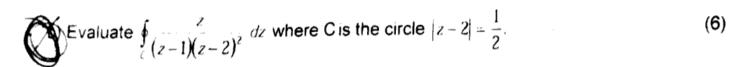
Evaluate
$$\int_{-1}^{x} \frac{x^2}{(x^2+1)(x^2+4)} dx$$
. (6)

- $f(x) = |\cos x|$, expand f(x) as a Fourier series in the interval $(-\pi, \pi)$. (10)
 - 14. a) Solve $(x^2 y^2 z^2) p + 2xyq = 2xz$. (5)
 - b) Solve $2z + p^2 + qy + 2y^2 = 0$ by using Charpit's method.) (5)2

15. A homogeneous rod of conducting material of length 100 cm has its ends kept at (10, zero temperature and the temperature initially is $u(x, 0) =\begin{cases} x, & 0 \le x \le 50 \\ 100 - x, & 50 \le x \le 100 \end{cases}$ Find the temperature u(x,t) at any time.



Find the bilinear transformation which maps the points z = 1, i, -1 onto the points (4)



17. a) Solve
$$\frac{\partial^3 z}{\partial x^3} - 2 \frac{\partial^3 z}{\partial x^2 \partial y} = 2e^{2x} + 3x^2 y$$
. (5)

(5)

b) Find the complete solution of $z^2(p^2+q^2)=x^2+y^2$.

Studied from Suid Mar.