4522

Code No. 2522/CBCS

FACULTY OF ENGINEERING

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

Subject: Engineering Mathematics- III

Time: 3 Hours Max. Marks:75

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 $u(x,y)$ and $v(x,y)$ are harmonic functions. (3)
2. Evaluate $\oint_C \frac{\sin^6 z}{\left(z-\frac{\pi}{6}\right)}dz$, where C is the circle $|z|=1$. (2)
3. Determine the pole of the function $f(z)=\frac{z^2}{(z-1)^2(z+2)}$ and find the residue at each point. (2)
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 $Z=f(x+at)+g(x-at)$. (3)
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)

11. a) Find the analytic function $f(z)=u+iv$, if $u-v=(x-y)(x^2+4xy+y^2)$. (6)

b) Evaluate $\oint_C \frac{\sin\pi z^2+\cos\pi z^2}{(z-1)(z-2)}dz$ where C is the circle $|z|=3$. (4)

12. a) Find Laurent's expansion of

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

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

13. If $f(x)=|\cos x|$, 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)

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

Find the temperature $u(x,t)$ at any time.

16. a) Find the bilinear transformation which maps the points $z = 1, i, -1$ onto the points $w = i, 0, -i$. (4)

b) Evaluate $\oint_C \frac{z}{(z-1)(z-2)^2}\, dz$ where C is the circle $|z-2| = \frac{1}{2}$. (6)

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)

b) Find the complete solution of $z^2(p^2 + q^2) = x^2 + y^2$. (5)

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