12/10/12

Regn. No:

Anna University, Chennai 600 025

B.E / B.Tech (Full Time) Degree End Semester Examinations - NOV / DEC 2012

II Semester B.E /B.Tech - Common to All Branches

MA9161 - Mathematics II- (Regulation 2008)

Duration: 3 Hours — Total marks= 100

Part A — (10 x 2 = 20 Marks)

1. Find the particular integral of $(D^2+2D+1)y = e^{-x}\sin x$.
2. Reduce $(2x+3)^2y'' - 2(2x+3)y' - 12y = 0$ into a differential equation with constant coefficients. (Do not solve it)
3. Find the directional derivative of $\phi = x^2 - 3yz$ at the point $(1,1,1)$ in the direction of the vector $2\hat{\mathbf{i}} + \hat{\mathbf{j}} - 2\hat{\mathbf{k}}$.
4. State Green's theorem in a plane.
5. State Cauchy-Riemann equations in polar coordinates.
6. Find the fixed point(s) of $w = \dfrac{5z-4}{z+3}$.
7. Evaluate $\displaystyle\int_C \frac{5z^2+6z+1000}{(z-10)^2}dz$, where C is the circle $|z| = 2$.
8. Identify and classify the singularity of the function $f(z) = ze^{1/z}$.
9. Find the Laplace transform of $f(t) = t\cos t$.
10. Find the inverse Laplace transform of $\dfrac{1}{s^2+2s+1}$.

Part B — (5 X 16=80 Marks)

11.a(i) Using method of variation of parameters solve the differential equation $y'' + y = \tan x$. (8 Marks)

11.a(i) Solve $y'' + y = \cos x$ by method of undetermined coefficients. (8 Marks)

12.a(i) Verify Stoke's theorem for the vector field $\overline{\mathbf{F}} = z\hat{\mathbf{i}} + x\hat{\mathbf{j}} + y\hat{\mathbf{k}}$, where S is the part of the plane $x+y+z=1$ in the first octant. (16 Marks)

(OR)

12.b(i) Verify Gauss divergence theorem for the vector function $\bar{F} = x^2\hat{i} + y^2\hat{j} + z^2\hat{k}$, where E is the cube bounded by $x=0, x=1, y=0, y=1, z=0$ and $z=1$. (16 Marks)

13.a(i) Find the analytic function $f(z) = u(x,y) + iv(x,y)$, given that $u(x,y) - v(x,y) = e^x[\cos y - \sin y]$. (8 Marks)

(ii) Find the bilinear transformation which maps the points $z = 1, -1, 0$ into the points $w = 0, \infty, -1$ respectively. (8 Marks)

(OR)

13.b(i) Under the mapping $w = z^2$, find the image (in w-plane) of the square region with vertices $(0,0), (2,0), (2,2)$ and $(0,2)$. (8 Marks)

(ii) Find the image of the circle $|z+1| = 1$ and the line $2x + y = 1$ under the map $w = 1/z$. (8 Marks)

14.a(i) Find the Laurent's series expansion of $f(z) = \dfrac{7z-1}{(z-1)(z-3)(z+2)}$ valid in the region $2 < |z-3| < 5$. (8 Marks)

(ii) Using Contour integration on unit circle, evaluate $\displaystyle\int_0^{2\pi} \frac{d\theta}{(2+\cos\theta)}$. (8 Marks)

(OR)

14.b(i) Using Contour integration, evaluate $\displaystyle\int_{-\infty}^{\infty} \frac{x^2}{(x^2+1)(x^2+4)} dx$. (8 Marks)

(ii) Using Cauchy's residue theorem, evaluate $\displaystyle\int_C \frac{\cos \pi z^2}{(z+1)(z+2)} dz$, where $C : |z| = 3$. (8 Marks)

15.a(i) Solve $y'' - 6y' + 9y = te^{3t}, y(0) = 2, y'(0) = 6$ by Laplace transform method. (8 Marks)

(ii) Using convolution theorem find the inverse Laplace transform of $\dfrac{s}{(s^2+4)^2}$. (8 Marks)

(OR)

15.b(i) Verify initial and final value theorems for the function $f(t) = 1 + e^{-t}(\sin t + \cos t)$. (8 Marks)

(ii) Find the inverse Laplace transform of $\dfrac{5s+3}{(s-1)(s^2+2s+5)}$. (8 Marks)

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