Regn. No: | | | | | | | | | |

Anna University, Chennai 600 025
B.E / B.Tech (Full Time) Degree End Semester Examinations - April / May 2013
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. Solve $(D^4 + 2D^2 + 1)y = 0$.
2. Guess the trial solution of the particular integral for the differential equation $y'' - 2y' + y = xe^x$ using method of undetermined coefficients.
3. If $\overline{\mathbf{F}} = \overline{\nabla}\phi$, then find $\int_A^B \overline{\mathbf{F}} \cdot d\overline{\mathbf{r}}$.
4. State Stoke's theorem.
5. Verify whether or not $f(z) = e^x(\cos y + i \sin y)$ is analytic.
6. State Cauchy-Riemann equations in polar coordinates.
7. Evaluate $\int_C \frac{1}{(z-2)} dz$, where C is the circle $|z - 2| = 4$.
8. Find the residue for the function $\frac{z^2}{(z-2)^2}$ at its pole.
9. Find the Laplace transform of $f(t) = t \cosh t$.
10. Find the inverse Laplace transform of $\frac{1}{s^2 + 2s + 2}$.

Part B — (5 X 16=80 Marks)

11.a(i) Using method of variation of parameters, solve $y'' - 3y' + 2y = 12e^{-x}$. (8 Marks)

(ii) Solve $(x+1)^2 y'' + (x+1)y' + y = 2\sin[\log(1+x)]$. (8 Marks)

12.a(i) Verify Stoke's theorem for the vector field $\overline{\mathbf{F}} = -y\hat{\mathbf{i}} + 2yz\hat{\mathbf{j}} + y^2\hat{\mathbf{k}}$, where S is the upper half sphere $x^2 + y^2 + z^2 = 1$ and C is the circle $x^2 + y^2 = 1, z = 0$. (8 Marks)

(ii) Verify Green's theorem for $\int_C [(xy + y^2)dx + x^2 dy]$ where C is the boundary of the common area between $y = x^2$ and $y = x$. (8 Marks)

(OR)

12.b(i) Verify Gauss divergence theorem for the vector function $\bar{F} = x^3\hat{i} + y^3\hat{j} + z^3\hat{k}$, where E is the cube bounded by $x = 0, x = a, y = 0, y = b, z = 0$ and $z = c$. (16 Marks)

13.a(i) Find the analytic function $f(z) = u(x, y) + iv(x, y)$, given that $u - v = (x - y)(x^2 + 4xy + y^2)$. (8 Marks)

(ii) Find the image of the circle $|z - 2i| = 2$ and the region $1 < x < 2$ under the map $w = 1/z$. (8 Marks)

(OR)

13.b(i) Under the mapping $w = z^2$, find the image (in w-plane) of the triangular region with vertices $(0, 0), (1, 0), (0, 1)$. (8 Marks)

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

14.a(i) If $f(a) = \int_C \frac{3z^2 + 7z + 1}{z - a} dz$ where C is $|z| = 2$, then find $f(3), f'(1 - i), f''(1 - i)$ and $f(1 - i)$. (8 Marks)

(ii) Using Contour integration on unit circle, evaluate $\int_0^{2\pi} \frac{d\theta}{(13 + 5 \sin \theta)}$. (8 Marks)

(OR)

14.b(i) Find the Laurent's series expansion of $f(z) = \frac{7z - 2}{(z - 2)(z + 1)}$ valid in the regions $|z + 1| < 1$ and $|z + 1| > 3$. (8 Marks)

(ii) Using Contour integration, evaluate $\int_{-\infty}^{\infty} \frac{x^2}{(x^2 + 4)(x^2 + 9)} dx$. (8 Marks)

15.a(i) Solve $y'' - 2y' + y = te^t, y(0) = 1, y'(0) = 1$ by Laplace transform method. (8 Marks)

(ii) Using convolution theorem find the inverse Laplace transform of $\frac{1}{(s^2 + 9)^2}$. (8 Marks)

(OR)

15.b(i) Find the Laplace transform of the periodic function defined by $f(t) = kt$ for $0 \le t < 1$ and $f(t + 1) = f(t)$. (8 Marks)

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

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