Reg.No:

(15)

END SEMESTER EXAMINATIONS – MAY 2011
B.E/B.Tech- Second Semester– (Regulation 2008)

MA 9161 MATHEMATICS-II

Time: 3 hours | *Answer All Questions* | Max Marks: 100

Part A (10x2=20)

1. Find the particular integral of $(D^2+3D+2)y=5$.
2. Solve $\frac{d^3x}{dt^3}-3\frac{d^2x}{dt^2}+3\frac{dx}{dt}-x=0$.
3. Find the normal vector to the surface $xy^3z^2=4$ at the point (-1,-1, 2).
4. Find 'a' if $\vec{F}=(axy-z^3)\vec{i}+(a-2)x^2\vec{j}+(1-a)xz^2\vec{k}$ is an irrotational vector.
5. Check for analyticity at any point for the function $f(z)=|z|^2$.
6. If $z=i$ is the fixed point of the bilinear transformation $w=\frac{1}{z+c}$ then find 'c'.
7. State Cauchy's integral formula.
8. Find the residue of $ze^{1/z}$ at its singular point.
9. Find $L[t\sin 2t]$.
10. If $f(t)=e^{-2t}\sin 2t$, find $L[f'(t)]$.

Part B (5X16=80)

11 (i) Solve $\frac{d^2y}{dx^2}+y=\operatorname{cosec} x$ by using method of variation of parameters. (8)

(ii) Solve $x^2\frac{d^2y}{dx^2}-x\frac{dy}{dx}-3y=x^2\log x$. (8)

12(a) (i) If $\nabla\phi=2xyz^3\vec{i}+x^2z^3\vec{j}+3x^2yz^2\vec{k}$, find $\phi(x,y,z)$ such that $\phi(1,-2,2)=4$. (8)

(ii) Using Green's theorem evaluate $\int_C (xy+x^2)dx+(x^2+y^2)dy$, where C is the square formed by the lines $x=\pm1, y=\pm1$. (8)

[OR]

12(b) Verify Gauss Divergence theorem for $\vec{F}=4xz\vec{i}-y^2\vec{j}+yz\vec{k}$ over the cube $x=0, x=1, y=0, y=1, z=0$ and z=1. (16)

[P.T.O]

13.(a) (i) An electrostatic field in the xy-plane is given by the potential function $\phi = 3x^2y - y^3$, find the stream function. (8)

(ii) Discuss the transformation $w = \frac{1}{z}$, and hence find the image of $|z-2i| = 2$ under the same transformation. (8)

[OR]

13.(b) (i) Find the bilinear transformation which maps $z = 0, -1, i$ onto $w = i, 0, \infty$. (8)

(ii) Find the analytic function whose imaginary part is $e^x(x\cos y - y\sin y)$ (8)

14.(a) (i) Evaluate $\int_C \frac{z+4}{z^2+2z+5}dz$, where C is the circle $|z+1-i| = 2$. (8)

(ii) Expand $f(z) = \frac{z^2-1}{(z+2)(z+3)}$ in a Laurent's series of $2 < |z| < 3$. (8)

[OR]

14. (b) (i) Obtain the Taylor's series expansion of $\log(1+z)$ when $|z| < 1$. (4)

(ii) By integrating around a unit circle, evaluate $\int_0^{2\pi} \frac{d\theta}{13+5\cos\theta}$. (12)

15. (a) (i) Evaluate $\int_0^{\infty} te^{-3t}\sin t\,dt$. (6)

(ii) Find the Laplace transform of the square-wave function of period **a** defined as $f(t) = \begin{cases} 1 & when\ 0 < t < \frac{a}{2} \\ -1 & when\ \frac{a}{2} < t < a. \end{cases}$ and $f(t+a) = f(t)$ (10)

[OR]

15. (b)(i) Find $L^{-1}\left[\frac{1}{s(s^2+1)}\right]$ using convolution theorem. (6)

(ii) Solve using Laplace transformation,

$$\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = \sin t; \quad y(0) = 2, y'(0) = 0$$ (10)

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