Reg. No. : | | | | | | | | | | |

Question Paper Code: 31022

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2017

Second Semester

Civil Engineering

01UMA202 - ENGINEERING MATHEMATICS - II

(Common to ALL branches)

(Regulation 2013)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Find the particular integral of $(\mathrm{D}^2 + 2\mathrm{D} + 1)\mathrm{y} = \mathrm{e}^{-\mathrm{x}}\mathrm{cosx}$.

2. Transform the equation $(2x+3)^2 \frac{d^2y}{dx^2} - 2(2x+3)\frac{dy}{dx} - 12y = 6x$.

3. Evaluate $\int_c (2x-y)dx + (x+y)dy$ where c is the boundary of the circle $x^2 + y^2 = 1$ in the XOY plane.

4. Find 'a' such that $\vec{F} = (x+3y)\vec{i} + (y-2z)\vec{j} + (x+az)\vec{k}$ is solenoidal.

5. Find the inverse Laplace transform of $\frac{1}{(s+1)(s+2)}$.

6. Find the Laplace transform of $e^{-t}t^2 sint$.

7. Show that $\frac{x}{x^2+y^2}$ is harmonic.

8. Find the invariant points of the transformation $= \frac{2z+6}{z+7}$.

9. Find the residues of $\frac{1-e^{2z}}{z^4}$ $at\ z = 0$.

10. Define singular point.

PART - B (5 x 16 = 80 Marks)

11. (a) (i) Solve $(D^2 - 3D + 2)y = 2\cos(2x + 3) + 2e^{2x}$. (8)

(ii) Solve $\frac{dx}{dt} + 5x - 2y = t, \frac{dy}{dt} + 2x + y = 0$. (8)

Or

(b) (i) Solve $(D^2 + 4)y = \cot 2x$ by method of variation of parameters. (8)

(ii) Solve$(1 + x)^2 \frac{d^2y}{dx^2} + (1 + x)\frac{dy}{dx} + y = 4\cos[\log(1 + x)]$. (8)

12. (a) (i) Verify Stoke's theorem for $\vec{F} = (x^2 + y^2)\vec{i} - 2xy\vec{j}$ taken around the rectangle bounded by the lines x= ±a, y=0, y=b. (8)

(ii) Find $\nabla^2(r^n)$ and hence deduce $\nabla^2\left(\frac{1}{r}\right)$ where r=$|\vec{r}|$ and $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$. (8)

Or

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

13. (a) (i) Find the analytic function, $f(z) = u + iv$ given$v = x^2 - y^2 + \frac{x}{x^2+y^2}$. (8)

(ii) If $f(z)$ is a regular function of z prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$. (8)

Or

(b) (i) Find the Bilinear transformation which maps the points $z = 1, i, -1$ into $w = i, 0, -i$ respectively. Also find the image of $|z| < 1$. (8)

(ii) Find the image of the circle$|z - 3i| = 3$, under the transformation $w = \frac{1}{z}$. (8)

14. (a) (i) Evaluate $\int_c \frac{z\,dz}{(z-1)(z-2)^2}$ where C is $|z - 2| = \frac{1}{2}$ by using cauchy's Integral formula. (8)

(ii) Evaluate $\int_0^{\infty} \frac{x^2\,dx}{(x^2+a^2)(x^2+b^2)}$, $a > 0, b > 0$ using contour integration. (8)

Or

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(b) (i) Obtain Laurent's series expansion for $f(z) = \frac{1}{(z-1)(z-2)}$ in the region $|z| < 2$. (8)

(ii) Expand $f(z) = \frac{1}{(z+1)(z+3)}$ in Laurent's series valid for the region $|z| > 3$ & $|z| < 3$. (8)

15. (a) (i) Using convolution theorem, find $L^{-1}\left[\frac{s}{(s^2+1)(s^2+4)}\right]$ (8)

(ii) Using Laplace transform, solve $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = e^{3t}$, given $y = 2$ and $\frac{dy}{dx} = 3$ when $t = 0$. (8)

Or

(b) (i) find $L[t^3 e^{-3t} sin2t]$. (8)

(ii) Solve using Laplace transform $\frac{d^2y}{dx^2} + 9y = 18t$ given that $y(0) = 0$ and $y\left(\frac{\pi}{2}\right) = 0$. (8)