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

Question Paper Code: 32002

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2018.

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 complementary function of $(D^4 + 4D^2 + 4)y = sin\,2x$

2. Find the $P.I$ of $(D^3 - 1)\, y = e^{2x}$.

3. State Green's theorem.

4. If $\vec{F} = axi + by\vec{j} + cz\vec{k}$, then find the value of the integral $\iint_S \vec{F}.\hat{n}\, ds$.

5. Check whether xy^2 is real part of an analytic function.

6. Find the fixed points of $w = \dfrac{3z-4}{z-1}$.

7. State Cauchy's integral formula for first derivative of an analytic function.

8. Expand $\dfrac{1}{z-2}$ at $z = 1$ in a Taylor's series.

9. Find L[e^t sin 2t].

10. If $L\left[f(t)\right]=\frac{s}{(s+2)^3}$, find the value of $\lim_{t\to 0} f(t)$

PART - B (5 x 16 = 80 Marks)

11. (a) (i) Solve $(D^2 - 4D + 3)y = sin3x\ cos2x$. (8)

(ii) Solve $(x^2D^2 + 3xD + 1)y = cos(log\ x)$. (8)

Or

(b) (i) Solve $(D^2+2D+5)\ y = e^{-x} \tan x$ by method of variation of parameter. (8)

(ii) Solve $\frac{dx}{dt} + y = \sin t$ and $\frac{dy}{dt} + x = \cos t$ given x = 2, y =0 when t = 0. (8)

12. (a) (i) Find the directional derivative of $\phi = xy^2 + yz^3$ at the point $(2, -1, 1)$ in the direction of $\vec{i} + 2\vec{j} + 2\vec{k}$. (8)

(ii) Prove that $\vec{F} = (6xy + z^3)\vec{i} + (3x^2 - z)\vec{j} + (3xz^2 - y)\vec{k}$ is irrotational vector and find the scalar potential such that $\vec{F} = \Delta\phi$. (8)

Or

(b) Verify Stoke ' s theorem for $\overline{F} = y\vec{i} + z\vec{j} + x\vec{k}$, where S is the upper half surface of the sphere $x^2 + y^2 + z^2 = 1$ and C is its boundary. (16)

13. (a) (i) If $f(z)$ = u + iv is a regular function of z, then show that

$$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|\, f(z)\,|^p = p^2\,|\, f(z)\,|^{p-2}|\, f'(z)\,|^2.$$ (8)

(ii) Find the bilinear transformation which maps x = 1, i , -1 respectively onto w = i, 0, -i. . (8)

Or

(b) (i) If $f(z)$ = u + iv an analytic function and $u - v = e^x(\cos y - \sin y)$ find $f(z)$ interms of z. (8)

(ii) Find the image of $|z - 2i| = 2$, under the transformation w = 1/z. (8)

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

(ii) Evaluate $\int_0^\infty \frac{x^2}{(x^2+1)(x^2+4)}dx$. (8)

Or

(b) (i) Find Laurent's series expansion of $f(z) = \frac{7z-2}{z(z-2)(z+1)}$ valid $1 < |z+1| < 3$ (8)

. (ii) Evaluate $\int_0^{2\pi} \frac{d\theta}{2+\cos\theta}$. (8)

15. (a) (i) Solve by using Laplace transform $(D^2 + 1)\, y = 2e^t$, given that if $y(0) = 1, y'(0) = 2$. (8)

(ii) Verify initial value and final value theorem for the function $1 + e^{-2t}$. (8)

Or

(b) (i) Find the Laplace transform of the Half-wave rectifier function

$$f(t) = \begin{cases} \sin \omega t, & 0 < t < \frac{\pi}{\omega} \\ 0, & \frac{\pi}{\omega} < t < \frac{2\pi}{\omega} \end{cases}, \text{with } f\left(t + \frac{2\pi}{\omega}\right) = f(t).$$ (8)

(ii) Solve the initial value problem $y'' - 3y' + 2y = 4t,\ y(0) = 1,\ y'(0) = -1.$ (8)

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