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Roll No: | | | | | | | | | | | | | |

PRANVEER SINGH INSTITUTE OF TECHNOLOGY, KANPUR

Even Semester Session 2021-22 CT -II

B. Tech. II Semester

Engineering Mathematics II (KAS203T)

CO Number	Course Outcome (Please include all COs of your Course here)
CO1	**Define (L1-Remember)** the basic terms and concepts of differential equations, sequence and series, calculus and functions of complex variables.
CO2	**Compute (L2-Understand)** various variables involved in differential equations, integral, residues and explain the process of finding convergence of sequence and series including health and society.
CO3	**Apply (L3-Apply)** the concepts to solve various problems of differential equations, sequence and series, calculus and functions of complex variables related to applications in engineering including environment and sustainability.
CO4	**Solve (L4-Aanalysis)** the dynamical system involved in various engineering problems to prove and verify **(L5-Evaluate)** analytical results and to evaluate **(L5-Evaluate)** the value of variables involved in various problems of differential equations, sequence and series, calculus and functions of complex variables including life-long learning.

Time: 1.5 Hrs. M. M. 15

Section A

(1X3 = 3 Marks)

Q1. Attempt all questions:

a) Find the value of b_n if $f(x) = x\sin x$ is expanded in Fourier series defined in $(-\pi, \pi)$. CO1

b) Write formula to find volume of a solid of revolution of $y = f(x)$ about $x-$axis. CO1

c) Find the value of a_0 if $f(x) = 1$ is expanded in half range cosine series defined in $(0, \pi)$. CO1

Section B

(2X4 = 8 Marks)

Q2. Attempt all questions:

a i) Compute volume, by Dirichlet's theorem, of the solid bounded by the coordinate planes and the surface $\sqrt{\frac{x}{a}} + \sqrt{\frac{y}{b}} + \sqrt{\frac{z}{c}} = 1$. CO2

Or

ii) Compute the volume of a spherical cap of height 'h' cut-off from a sphere of radius 'a'. CO2

b i) Compute mass, by Dirichlet's theorem, of the region enclosed by the plane $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ in the positive octant. The density at any point being $\rho = kxyz$. CO2

Or

ii) Compute area of the surface formed by the revolution of the parabola $y^2 = 4ax$ about the $x-$axis by the arc from the vertex to one end of the latus rectum. CO2

c i) Examine the convergence of the series $\frac{1}{1.2.3} + \frac{3}{2.3.4} + \frac{5}{3.4.5} + \ldots$ CO3

Or

ii) Apply the concept of Fourier series find half range cosine series of $f(x) = x\sin x$ in the interval $(0,\pi)$. CO3

d i) Examine the convergence of the series $1+\frac{x}{2}+\frac{x^2}{5}+\frac{x^3}{10}+\ldots+\frac{x^n}{n^2+1}+\ldots$ CO3

Or

ii) Apply Cauchy-Riemann equations to obtain c_1 and c_2 for the following analytic function $f(z) = x^2 + c_1y^2 - 2xy + i(c_2x^2 - y^2 + 2xy)$ CO3

Section C **(4X1 = 4 Marks)**

Q3

i) Prove that $\iiint \frac{dx\,dy\,dz}{(x+y+z+1)^3} = \frac{1}{2}\log 2 - \frac{5}{16}$, the integral being taken over all positive values of the variables x, y, z such that $x+y+z=1$ CO4

Or

ii) Obtain Fourier series of $f(x) = x^2$ in $-\pi \le x \le \pi$ and hence prove that CO4

(a) $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\frac{1}{4^2}+\frac{1}{5^2}+\ldots=\frac{\pi^2}{6}$

(a) $\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+\frac{1}{5^2}-\ldots=\frac{\pi^2}{12}$

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