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

B.TECH
(SEM II) THEORY EXAMINATION 2021-22
MATHEMATICS II

Time: 3 Hours *Total Marks: 100*

Note: Attempt all Sections. If you require any missing data, then choose suitably.

SECTION A

1. Attempt all questions in brief. 2*10 = 20

Q. No.	Questions	CO
(a)	Solve $(D+1)^3 y = 2e^{-x}$	1
(b)	What are the roots of the indicial equation for the power series solution of the differential equation $2x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + (x^2-3)y=0$	1
(c)	Find the volume of hemisphere.	2
(d)	Examine the convergence of improper integral $\int_2^\infty \frac{1}{x\log x}dx$	2
(e)	If $f(x)=1, 0<x<\pi$ is expanded in half range cosine series then find the value of b_n.	3
(f)	Discuss the convergence of sequence $\{2, 2^2, 2^3, 2^4, 2^5 \ldots\ldots\}$.	3
(g)	Define Harmonic function.	4
(h)	Find the points of invariance of the transformation $w=\frac{2z+3}{z+2}$.	4
(i)	State Cauchy integral theorem.	5
(j)	Discuss the singularity of $\sin(\frac{1}{z-2})$.	5

SECTION B

2. Attempt any three of the following: 10*3 = 30

Q. No.	Questions	CO
(a)	Solve $x\frac{d^2y}{dx^2} + (4x^2-1)\frac{dy}{dx} + 4x^3y = 2x^3$	1
(b)	Show that $\Gamma(mx).\Gamma(mx+\frac{1}{2}) = \frac{\pi}{(2^{2mx-1})}\Gamma(2mx)$ where m is positive.	2
(c)	Obtain Fourier series for $f(x)=\begin{cases} x, & 0\le x\le 1 \\ m(2-x), & 1\le x\le 2 \end{cases}$	3
(d)	Examine the nature of the function $f(z)=\begin{cases} \frac{x^2y^2(x+iy)}{x^2+y^2+y^4}, & z\neq 0 \\ 0, & z=0 \end{cases}$ in the region including the origin.	4
(e)	Evaluate $\frac{1}{2\pi i}\oint_C \frac{z^2-\sin z}{z-\frac{1}{2}}dz$, where $C=\lvert z-1\rvert=\frac{1}{2}$	5

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