Printed Pages: 02 **Sub Code: KAS203**

Paper Id: 199243 **Roll No.**

B. TECH.
(SEM II) THEORY EXAMINATION 2018-19
MATHEMATICS-II

Time: 3 Hours ***Total Marks: 100***

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

SECTION A

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

QNo.	Question	Marks	CO
a.	Find the P.I of $\frac{d^2y}{dx^2} + 4y = sin2x$	2	1
b.	Solve simultaneous equations $\frac{dx}{dt} = 3y$, $\frac{dy}{dt} = 3x$	2	1
c.	Find the volume of solid generated by revolving the circle $x^2 + y^2 = 25$ about y-axis.	2	2
d.	Evaluate $\Gamma\left(-\frac{5}{2}\right)$. where Γ is gamma function	2	2
e.	Find the Fourier constant a_1 of $f(x) = x^2$, $-\pi \le x \le \pi$	2	3
f.	Discuss the convergence of sequence $a_n = \frac{2n}{n^2+1}$.	2	3
g.	Show that complex function $f(z) = z^3$ is analytic.	2	4
h.	Define Conformal mapping.	2	4
i.	Evaluate $\int_0^{1+i}(x^2 - iy)dz$ along the path $y = x$.	2	5
j.	Find residue of $f(z) = \frac{cosz}{z(z+5)}$ at $z = 0$	2	5

SECTION B

2. Attempt any *three* of the following:

QNo.	Question	Marks	CO
a.	Use Frobenius method to solve $9x(1-x)\frac{d^2y}{dx^2} - 12\frac{dy}{dx} + 4y = 0$	10	1
b.	Apply Dirichlet integral to find the volume of an octant of the sphere $x^2 + y^2 + z^2 = 25$.	10	2
c.	Find half range sine series of $f(x) = \begin{cases} x & 0 < x < 2 \\ 4 - x & 2 < x < 4 \end{cases}$	10	3
d.	Show that $u = x^4 - 6x^2y^2 + y^4$ is harmonic function. Find complex function $f(z)$ whose u is a real part.	10	4
e.	Expand $f(z) = \frac{1}{(z-1)(z-2)}$ in regions (i) $1 < \|z\| < 2$ (ii) $2 < \|z\|$	10	5

SECTION C

3. Attempt any *one* part of the following:

QNo.	Question	Marks	CO
a.	Solve $\frac{d^2y}{dx^2} + y = tanx$ by method of variation of parameter.	10	1

b.	Solve $x^2\frac{d^2y}{dx^2}-2(x^2+x)\frac{dy}{dx}+(x^2+2x+2)y=0$ by Normal Form.	10	1

4. Attempt any *one* part of the following:

QNo.	Question	Marks	CO
a.	Prove that $\beta(m,n)=\frac{\Gamma m\Gamma n}{\Gamma(m+n)}$ where Γ is gamma function	10	2
b.	Use Beta and Gamma function to solve $\int_0^\infty \frac{1}{1+x^4}dx\int_0^{\frac{\pi}{2}}\sqrt{\cot\theta}\,d\theta$	10	2

5. Attempt any *one* part of the following:

QNo.	Question	Marks	CO
a.	Find the Fourier series of $f(x)=xsinx\quad,-\pi\le x\le\pi$	10	3
b.	State D' Alembert's test. Test the series $1+\frac{x}{2}+\frac{x^2}{5}+\frac{x^3}{10}\dots\dots+\frac{x^n}{n^2+1}+\cdots\dots\dots\dots.$	10	3

6. Attempt any *one* part of the following:

QNo.	Question	Marks	CO
a.	Let $f(z)=\frac{x^2y^5(x+iy)}{x^4+y^{10}}$ $when\ z\neq 0,$ $f(z)=0\ when\ z=0.$ Prove that Cauchy Riemann satisfies at $z=0$ but function is not differentiable at $z=0$.	10	4
b.	Find Mobius transformation that maps points $z=0,-i,2i$ into the points $w=5i,\infty,-\frac{i}{3}$ respectively.	10	4

7. Attempt any *one* part of the following:

QNo.	Question	Marks	CO
a.	Using Cauchy Integral formula evaluate $\int_c \frac{\sin z}{(z^2+25)^2}dz$ where c is circle $\lvert z\rvert=8$	10	5
b.	Apply residue theorem to evaluate $\int_{-\infty}^{\infty}\frac{x^2dx}{(x^2+1)(x^2+4)}$	10	5