Model Paper-II

B. TECH(SEM-II)
SUBJECT (Sub Code): MATHEMATICS-II (BAS-203)

SECTION-A

Q.1	Attempt all parts	(2x7=14)

a.	Define order and degree of differential equation with example.	CO1
b.	Find C.F. of $(D-3)^4 y = x$	CO1
c.	Find the Laplace transform of $\int_0^t \sin t.dt$.	CO2
d.	Find the Laplace transform of $t.e^{2t}$.	CO2
e.	State D'Alembert test.	CO3
f.	Define conformal mapping.	CO4
g.	Define singularity of function with an example.	CO5

SECTION-B

Q.2	Attempt any three parts	(3×7=21)

a.	Solve $\left(D^2+2D+1\right)y=\dfrac{e^{-x}}{x+7}$.	CO1
b.	Find $L^{-1}\left[\log\left(\dfrac{s^2+4s+5}{s^2+2s+5}\right)\right]$.	CO2
c.	Examine whether the function $f(x)=x\sin x$ is even or odd. Hence expand it in the form Fourier series in the interval $(-\pi,\pi)$.	CO3
d.	Define harmonic function. Show that the function $v=\log(x^2+y^2)+x-2y$ is harmonic. Also find the analytic function $f(z)=u+iv$.	CO4
e.	Expand $\dfrac{1}{z^2-3z+2}$ in the region $1<\lvert z\rvert<2$.	CO5

SECTION-C

Q.3	Attempt any one part	(1×7=7)

A	Solve by changing the independent variable:-$x^6\frac{d^2y}{dx^2}+3x^5\frac{dy}{dx}+a^2y=\frac{1}{x^2}$	CO1
b	Solve by the method of Variation of Parameter:- $(D^2+1)y=2(1-e^{-2x})^{-1/2}$	CO1

Q.4	Attempt any one part	(1×7=7)
a.	Use Convolution theorem to find the inverse Laplace transform of $\left(\frac{16}{(p-2)(p+2)^2}\right)$.	CO2
b.	Find the inverse Laplace transform of $\frac{2s^2-6s+5}{s^3-6s^2+11s-6}$.	CO2

Q.5	Attempt any one part	(1×7=7)
A	Obtain a Fourier series for $f(x) = \lvert \sin x \rvert \quad for \quad -\pi < x < \pi$.	CO3
b	Find the Fourier series expansion for the function $f(x) = \begin{cases} -1, & -\pi < x < -\pi/2 \\ 0, & -\pi/2 < x < \pi/2 \\ 1, & \pi/2 < x < \pi \end{cases}$ Hence deduce that $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \ldots\ldots\ldots \quad \ldots$	CO3
Q.6	Attempt any one part	(1×7=7)
A	Evaluate by Cauchy integral formula $\oint_C \frac{z^2-2z}{(z+1)^2(z^2+4)}dz$ where C is the circle $\lvert z\rvert = 3$.	CO4
b	Evaluating using Cauchy integral formula $\oint_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)}dz$, where C is the circle $\lvert z\rvert = 4$.	CO4
Q.7	Attempt any one part	(1×7=7)
A	Evaluate the following integrals by using calculus of residues $\int_0^{2\pi} \frac{d\theta}{5-3\cos\theta}$	CO5
b	Use residue theorem to evaluate $\oint_C \frac{24z-7}{(z-1)^2(2z+3)}dz$, where C is the circle of radius 2 with centre at the origin.	CO5