

[B19 BS 1202]

I B. Tech II Semester (R19) Regular Examinations
MATHEMATICS – III
(Common to CE,CSE,ECE,EEE & IT)
MODEL QUESTION PAPER

TIME : 3 Hrs.

Max. Marks : 75 M

Answer **ONE Question** from **EACH UNIT**
 All questions carry equal marks

	UNIT-I	CO	KL	Marks
1.a)	Find the Frier series for the function $f(t) = \begin{cases} -1, & -\pi < t < -\pi/2 \\ 0, & -\pi/2 < t < \pi/2 \\ 1, & \pi/2 < t < \pi \end{cases}$	CO1	K2	7
b)	Obtain Frier series of the function $f(x) = 2x - x^2$ in $(0, 3)$ and hence deduce that $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots = \frac{\pi}{12}$	CO1	K2	8
(OR)				
2. a)	Obtain a Frier series for the function $f(x)$ given by $f(x) = \begin{cases} 1 + \frac{2x}{\pi}, & \text{if } -\pi \leq x \leq 0 \\ 1 - \frac{2x}{\pi}, & \text{if } 0 \leq x \leq \pi \end{cases}$ and deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$	CO1	K2	8
b)	Find the Half – Range cosine series for the function $f(x) = x^2$ in the range $0 \leq x \leq \pi$	CO1	K3	7
UNIT-II				
3.a)	Using the Frier Sine Transform of e^{-ax} ($a > 0$), evaluate $\int_0^{\infty} \frac{x \sin kx}{a^2 + x^2} dx$	CO2	K3	7
b)	Using Frier integral representation, show that $\int_0^{\infty} \frac{\omega \sin \omega x}{1 + \omega^2} d\omega = \frac{\pi}{2} e^{-x}, x > 0$	CO2	K3	8
(OR)				
4. a)	Find the inverse Frier sine transform $f(x)$ of $F_s(p) = \frac{p}{1+p^2}$	CO2	K2	8
b)	Using Parseval's Identity, prove that $\int_0^{\infty} \frac{x^2}{(1+x^2)^2} dx = \frac{\pi}{4}$	CO2	K3	7
UNIT-III				
5.a)	Express $\int_0^{\infty} \sqrt{x} e^{-x^3} dx$ in terms of gamma function.	CO3	K2	7
b)	Express $\int_0^1 x^m (1-x^n)^p dx$ in terms of Gamma functions and hence evaluate $\int_0^1 x^7 (1-x^5)^8 dx$	CO3	K2	8

(OR)				
6. a)	Apply change the order of integration and evaluate $\int_0^{\infty} \int_x^{\infty} \frac{e^{-y}}{y} dy dx$.	CO3	K3	8
b)	Obtain the volume of the tetrahedron bnded by $x = 0, y = 0, z = 0, x+y+z = 1$.	CO3	K3	7
UNIT-IV				
7.a)	Obtain the directional derivative of $\phi = xy + yz + zx$ at A in the direction of AB where $A = (1,2,-1)$, $B = (5,6,8)$.	CO4	K2	8
b)	Determine curl (curl F) where $\vec{F} = x^2y\vec{i} - 2xz\vec{j} + 2yz\vec{k}$	CO4	K2	7
(OR)				
8. a)	Show that the vector $(x^2 - yz)\vec{i} + (y^2 - zx)\vec{j} + (z^2 - xy)\vec{k}$ Is irrotational and find its scalar potential.	CO4	K2	8
b)	Determine the values of a and b such that the surface $a x^2 - b y z = (a+2)x$ and $4 x^2 y + z^3 = 4$ cut orthogonally at $(1, -1, 2)$.	CO4	K2	7
UNIT-V				
9.a)	Determine the work done in moving a particle once rnd the circle $x^2 + y^2 = 9$ in the xy- plane by the force $\vec{F} = (2x - y - z)\vec{i} + (x + y - z^2)\vec{j} + (3x - 2y + 4z)\vec{k}$.	CO5	K2	7
b)	Evaluate the line integral by Stokes's theorem for the vector function $\vec{F} = y^2\vec{i} + x^2\vec{j} + (z + x)\vec{k}$ and C is the triangle with vertices $(0,0,0), (1,0,0)$ and $(1,1,0)$.	CO6	K3	8
(OR)				
10	Verify Green's theorem in the plane $\int_C [(3x^2 - 8y^2)dx + (4y - 6xy)dy]$, where C is bndary of the region defined by $y = \sqrt{x}, y = x^2$	CO6	K3	15