

CRM08	Rev 1.10	BS	14-10-2020
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CONTINUOUS INTERNAL EVALUATION- 1

Dept:BS	Sem / Div:III/A &B	Sub:Transform Calculus ,Fourier series and Numerical Techniques	S Code:18MAT31
Date:19-10-2020	Time: 9:30-11:00 am	Max Marks: 50	Elective: N

Note: Answer any 2 full questions, choosing one full question from each part.

Q N	Questions	Marks	RBT	COs																
PART A																				
1	a Obtain the Fourier series for the function $f(x) = x $ in the interval $-\pi \leq x \leq \pi$ and hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$	8	L2	CO2																
	b Obtain sine half range Fourier series of $f(x) = \begin{cases} \frac{1}{4} - x & , 0 < x < \frac{1}{2} \\ x - \frac{3}{4} & , \frac{1}{2} < x < 1 \end{cases}$	8	L2	CO2																
	c Obtain the constant term and the first two harmonics in the Fourier series for $f(x)$ given by the following	9	L2	CO2																
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 5px;">x</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">1</td> <td style="padding: 5px;">2</td> <td style="padding: 5px;">3</td> <td style="padding: 5px;">4</td> <td style="padding: 5px;">5</td> </tr> <tr> <td style="padding: 5px;">y=f(x)</td> <td style="padding: 5px;">9</td> <td style="padding: 5px;">18</td> <td style="padding: 5px;">24</td> <td style="padding: 5px;">28</td> <td style="padding: 5px;">26</td> <td style="padding: 5px;">20</td> </tr> </table>	x	0	1	2	3	4	5	y=f(x)	9	18	24	28	26	20					
x	0	1	2	3	4	5														
y=f(x)	9	18	24	28	26	20														
OR																				
2	a Obtain the Fourier series for the function $f(x) = \begin{cases} \pi x & , 0 \leq x \leq 1 \\ \pi(2-x) & , 1 \leq x \leq 2 \end{cases}$ and hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$	8	L2	CO2																
	b If $f(x) = \begin{cases} x & , 0 < x < \frac{\pi}{2} \\ \pi - x & , \frac{\pi}{2} < x < \pi \end{cases}$. Then show that $f(x) = \frac{\pi}{4} - \frac{2}{\pi} \left[\frac{\cos 2x}{1^2} + \frac{\cos 6x}{3^2} + \frac{\cos 10x}{5^2} + \dots \right]$	8	L2	CO2																
	c Compute the constant term and first two harmonics of the Fourier series of $f(x)$ given by	9	L2	CO2																
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 5px;">x</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">$\frac{\pi}{3}$</td> <td style="padding: 5px;">$\frac{2\pi}{3}$</td> <td style="padding: 5px;">π</td> <td style="padding: 5px;">$\frac{4\pi}{3}$</td> <td style="padding: 5px;">$\frac{5\pi}{3}$</td> <td style="padding: 5px;">2π</td> </tr> <tr> <td style="padding: 5px;">f(x)</td> <td style="padding: 5px;">1</td> <td style="padding: 5px;">1.4</td> <td style="padding: 5px;">1.9</td> <td style="padding: 5px;">1.7</td> <td style="padding: 5px;">1.5</td> <td style="padding: 5px;">1.2</td> <td style="padding: 5px;">1.0</td> </tr> </table>	x	0	$\frac{\pi}{3}$	$\frac{2\pi}{3}$	π	$\frac{4\pi}{3}$	$\frac{5\pi}{3}$	2π	f(x)	1	1.4	1.9	1.7	1.5	1.2	1.0			
x	0	$\frac{\pi}{3}$	$\frac{2\pi}{3}$	π	$\frac{4\pi}{3}$	$\frac{5\pi}{3}$	2π													
f(x)	1	1.4	1.9	1.7	1.5	1.2	1.0													

CONTINUOUS INTERNAL EVALUATION- 1

PART B				
3	a	Find the Fourier transform of $f(x) = \begin{cases} 1 & \text{for } x \leq 1 \\ 0 & \text{for } x > 1 \end{cases}$ and hence evaluate $\int_0^{\infty} \frac{\sin x}{x} dx$	8	L2 CO3
	b	Find the Fourier Sine transform of $e^{- x }$ and hence show that $\int_0^{\infty} \frac{x \sin mx}{1+x^2} dx = \frac{\pi}{2} e^{-m}, m > 0$	8	L2 CO3
	c	Find the z-transform of $\cosh n\theta$ and $\sin hn\theta$ and hence find z transform of $a^n \cosh n\theta$	9	L2 CO3
OR				
4	a	Find the Fourier Sine transform of $\frac{e^{-ax}}{x}, a > 0$	8	L2 CO3
	b	Find the Z-transform of $\cos n\theta$ and $\cosh\left(\frac{n\pi}{2} + \theta\right)$	8	L2 CO3
	c	Find the Z-transform of (i) $2n + \sin \frac{n\pi}{4} + 1$ (ii) $\sin(3n+5)$ (iii) $(n-1)^3$	9	L2 CO3

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15/10/20

M. Ramananda Kamath