

For each question, "X" indicates a correct choice.

ANSWER SHEET - YELLOW

Question	a	b	c	d	e	Do not write in this column
1		X				
2	X					
3			X			
4				X		
5			X			
6					X	
7		X				
8		X				
9					X	
10					X	

ANSWER SHEET - BLUE

Question	a	b	c	d	e	Do not write in this column
1					X	
2					X	
3		X				
4			X			
5					X	
6				X		
7	X					
8		X				
9			X			
10		X				

ANSWER SHEET - GREEN

Question	a	b	c	d	e	Do not write in this column
1					X	
2		X				
3			X			
4	X					
5				X		
6					X	
7		X				
8			X			
9					X	
10		X				

ANSWER SHEET - WHITE

Question	a	b	c	d	e	Do not write in this column
1				X		
2		X				
3					X	
4					X	
5			X			
6			X			
7					X	
8		X				
9	X					
10		X				

QUESTION SHEET - YELLOW

All $f(t)$ are defined for $t \geq 0$.

1. The function $f(x) = \begin{cases} 0, & \text{if } -\pi < x < 0 \\ 2, & \text{if } 0 < x < \pi \end{cases}$ is periodic with period 2π . It has a *Fourier Series* $1 + \sum_{n=1}^{\infty} a_n \cos(nx) + \sum_{n=1}^{\infty} b_n \sin(nx)$; a_3 is given by

(a) $-\frac{2}{3\pi}$ (b) 0 (c) $\frac{2}{\pi}$ (d) $\frac{2}{3\pi}$ (e) $\frac{4}{3\pi}$

2. The inverse *Laplace* transform of $\frac{s}{s^2-4}e^{-s}$ is

(a) $\cosh 2(t-1) u_1(t)$ (b) $\sinh 2(t-1) u_1(t)$ (c) $\cosh(2t-2)$ (d) $\cosh 2t u_1(t)$ (e) $\cos 2t u_1(t)$

3. The *Laplace* Transform of $t \sinh t$ is

(a) $\frac{1}{s(s^2-1)}$ (b) $\frac{1}{s^2(s^2-1)}$ (c) $\frac{2s}{(s^2-1)^2}$ (d) $\frac{2s}{(s^2+1)^2}$ (e) non existent

4. The coefficient a_0 in the *Fourier Series* for the periodic function $f(x) = |x|$ if $-1 < x < 1$ with period 2 has the value

(a) 0 (b) $\frac{1}{4}$ (c) $\frac{1}{2}$ (d) 1 (e) 2

5. The *Laplace* Transform of $f(t) = e^{-3(t-2)} u_2(t)$ is

(a) $\frac{1}{s+3}e^{-2(s-3)}$ (b) $\frac{1}{s+2}e^{-3s}$ (c) $\frac{1}{s+3}e^{-2s}$ (d) $\frac{1}{s(s+3)}$ (e) $\frac{s}{s^2+9}e^{-2s}$

6. The partial fraction expansion (PFE) of $\frac{s-1}{s(s+1)(s+3)}$ is

(a) $\frac{1/3}{s} - \frac{1}{s+1} + \frac{2/3}{s+3}$ (b) $\frac{1/3}{s} - \frac{1/3}{s+3}$
 (c) $-\frac{1}{s+1} + \frac{2}{s+3}$ (d) $-\frac{1/2}{s+1} + \frac{1/2}{s+3}$ (e) $-\frac{1/3}{s} + \frac{1}{s+1} - \frac{2/3}{s+3}$

7. The convolution of e^{2t} with $u_0(t)$ (also denoted by $e^{2t} * u_0(t)$) is given by

(a) $e^{2t} - 1$ (b) $\frac{e^{2t} - 1}{2}$ (c) $u_0(t)$ (d) $u_2(t)$ (e) e^{2t}

8. The functions $f(x) = x^2 \sin x$ and $g(x) = x + x^3/3$ defined on $-2 < x < 2$ have the property that

(a) both are even (b) both are odd (c) f is odd and g is even
 (d) f is even and g is odd (e) at least one is neither even nor odd

9. The function $f : \mathbb{R} \rightarrow \mathbb{R}$ has period 2π . The period of $f(x/3)$ is

(a) $\frac{2\pi}{3}$ (b) $\frac{3\pi}{2}$ (c) 2π (d) 3π (e) 6π

10. The *Laplace* Transform of $e^{-3t} \sin t$ is

(a) $\frac{1}{(s+3)(s^2+1)}$ (b) $\frac{1}{s^2-6s+10}$ (c) $\frac{1}{s^2+1}e^{-3s}$ (d) $\frac{1}{s^2+9}$ (e) $\frac{1}{s^2+6s+10}$

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All $f(t)$ are defined for $t \geq 0$.

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2. The Laplace Transform of $e^{-3t} \sin t$ is

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