

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						No correct choice
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						No correct choice
5				X		
6		X				
7				X		
8		X				
9					X	
10			X			

ANSWER SHEET - GREEN

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1			X			
2				X		
3	X					
4					X	
5		X				
6		X				
7				X		
8				X		
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10			X			

QUESTION SHEET - YELLOW

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

1. The *Laplace* Transform of $(t + 1)^3$ is

(a) $\frac{6}{s^4}e^s$ (b) $\frac{1}{s-1}e^{-3s}$ (c) $\frac{1}{s^4} + \frac{3}{s^3} + \frac{3}{s^2} + \frac{1}{s}$ (d) $\frac{6}{s^4} + \frac{6}{s^3} + \frac{3}{s^2} + \frac{1}{s}$ (e) $\frac{6}{(s+1)^4}$

2. The inverse *Laplace* transform of $\frac{2}{s^3}e^{-3s}$ is

(a) $(t-3)^2u_3(t)$ (b) $(t-1)^2u_1(t)$ (c) $t^2u_3(t)$ (d) t^2e^{-3t} (e) $t^2u_0(t)$

3. The inverse *Laplace* transform of $\frac{s-1}{s^2-2s+2}$ is

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

4. The function $f : \mathbb{R} \rightarrow \mathbb{R}$ satisfies $f(x + 2\pi) = f(x)$. The period of $f(2x)$ is

(a) $\frac{\pi}{2}$ (b) π (c) 2π (d) 4π (e) 2

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

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

6. The convolution of t^2 with t^2 (also denoted by $t^2 * t^2$) is given by

(a) $\frac{t^6}{720}$ (b) $\frac{t^5}{30}$ (c) $\frac{t^4}{4}$ (d) $\frac{t^4}{6}$ (e) $\frac{t^2}{2}$

7. The function $f(x) = \begin{cases} 1, & \text{if } -\pi < x < 0 \\ 0, & \text{if } 0 < x < \pi \end{cases}$ is periodic with period 2π . It has a *Fourier Series* $\frac{1}{2} + \sum_{n=1}^{\infty} b_n \sin(nx)$; b_3 is given by

(a) $-\frac{4}{\pi}$ (b) $-\frac{1}{2\pi}$ (c) 0 (d) $\frac{1}{2\pi}$ (e) $-\frac{4}{3\pi}$

8. The *Laplace* Transform of $f(t) = \sin(t - 2)u_2(t)$ is

(a) $\frac{2}{s^2+4}e^{-2s}$ (b) $\frac{1}{s(s^2+1)}e^{-2s}$ (c) $\frac{2}{s^2+4}e^{-s}$ (d) $\frac{1}{s^2+1}e^{-2s}$ (e) $\frac{2}{s(s^2+4)}e^{-s}$

9. The *Laplace* Transform of $e^{-2t} \cos t$ is

(a) $\frac{s}{(s+2)(s^2+1)}$ (b) $\frac{s}{s^2+4s+5}$ (c) $\frac{s+2}{s^2+4s+5}$ (d) $\frac{s}{s^2-4s+5}$ (e) $\frac{s-2}{s^2-4s+5}$

10. The functions $f(x) = x^2 \cos x$ and $g(x) = x$ 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

QUESTION SHEET - BLUE

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