King Fahd University of Petroleum and Minerals
Department of Mathematics
Math 333
Exam II - Term 231
November 15, 2023

Time allowed: 120 minutes **Max. Mark 100**

Name: ID #:

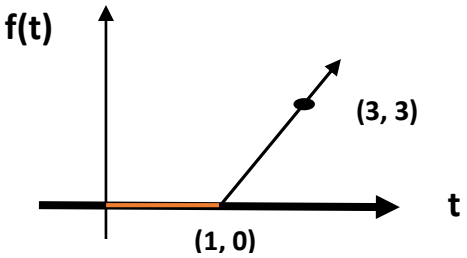
Total Number of Questions: 09

1. Write legibly.
2. Write your name, and ID number on space provided on the FRONT sheet.
3. All types of calculators, smart watches or mobile phones are NOT allowed during the examination.

Distribution of Marks

Question Number	Points	POINTS SCORED
1	12	
2	12	
3	14	
4	08	
5	10	
6	12	
7	10	
8	10	
9	12	
TOTAL POINTS	100	

Q1. (*12 points*) Evaluate $L\{f(t)\}$ of the function whose graph is



Q2. (*12 points*) Evaluate $L^{-1}\{F(s)\}$ when $F(s) = \frac{S^2+6S+9}{(S-1)(S-2)(S+4)}$

Q3. (*14 points*) Using Laplace transform solve the IVP

$$y'' - 2y' + 5y = 0, \qquad y(0) = 1, \qquad y'(0) = 3.$$

Q4. (8 *points*) Use translation theorem to find $L^{-1}\left\{\frac{S+4}{S^2+4S+8}\right\}$.

Q5. (*10 points*) Solve the integro-differential equation

$$y'(t) = 1 - sint - \int_0^t y(\tau)d\tau\,, \quad y(0) = 0$$

Q6. (*12 points*) Given $f(x) = e^x$ and $g(x) = \sin x$, find if these functions are orthogonal or not on the set $[\frac{\pi}{4}, \frac{5\pi}{4}]$?

Q7. (*10 points*) Find Fourier series representation of

$$f(x) = \begin{cases} 0 & -1 < x < 0 \\ x & 0 \leq x < 1 \end{cases}$$

Q8. (*10 points*) For $\lambda > 0$, $s$olve the SL problem

$$y'' + \lambda y = 0,$$

$$y(0) = 0, \qquad y(1) + y'(1) = 0$$

Q9. (12 *points*) Using the idea of half-range expansion, expand $f(x) = x,\ 0 < x < L$ as a Fourier sine series.