ADANA ALPARSLAN TÜRKEŞ
SCIENCE AND TECHNOLOGY UNIVERSITY

EEE225 - Eng Math. I
Final Exam
Prepared by Dr Kasım Zor

4th Jan 2023, 15:15–17:00

Full Name : _____ Student ID: _____

Grade Table (for Lecturer use only)

Question	Points	Score
1	20	
2	20	
3	20	
4	20	
5	20	
Total:	100	

Instructions for Final Exam

Welcome to the final exam of EEE225 - Engineering Mathematics I and good luck!

Please read the following rules and confirm by signing that you have read and understood the rules before you receive your exam:

- The final exam shall be conducted between 15:15 and 17:00. Exam duration is 105 minutes. Students must finalise the exam by delivering it before 17:00. Students are not allowed to leave the exam in the first 30 minutes.
- Student ID cards shall visibly be on the edge of desks till the end of the exam. Students without the student ID cards or Turkish identity cards shall not be participated into the exam.
- This is a closed-book exam which means that students are not allowed to take notes, books, or any other reference material into the exam. Throughout the exam, students shall not possess mobile phones and electronic devices that are capable of storing, receiving, or transmitting information or electronic signals, such as computerised watches.
- Students are not allowed to take a glance at the exam questions until told to do so. Students shall not communicate with any other student under any circumstances during the exam period. A student, who cheats, tries to cheat during the exam, or is identified to be cheating after investigating exam documents, is given 0 (zero) for that exam and a disciplinary investigation is opened against the student.
- An incorrect answer to a question is awarded no marks with no consideration of any partial credit. Therefore, no partial credit will be given.

In recognition of and in the spirit of the above rules which constitute Adana Alparslan Türkeş Science and Technology University Honour Code, I certify that I will neither give nor receive unpermitted aid on this examination.

Signature: _____

1. Answer the following questions.

   (a) **(10 points)** Show that

$$\mathscr{L}\{e^{at}\} = \frac{1}{s-a}$$

   (b) **(10 points)** $f(t)$ is illustrated in Figure 1. Find $\mathscr{L}\{f(t)\}$.

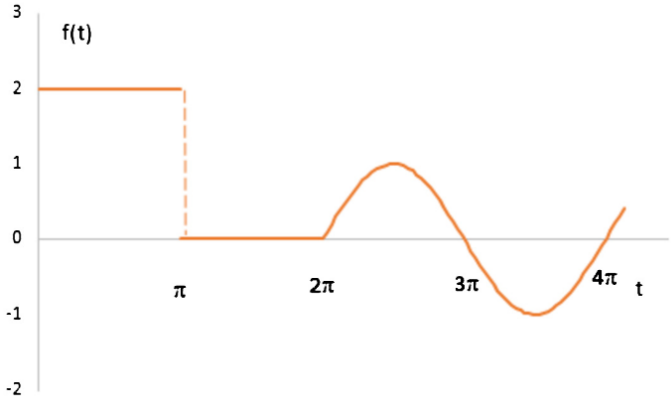

Figure 1: Illustration of $f(t)$ versus time

Answer:_____

2. Find $\mathscr{L}^{-1}\{F(s)\}$ in (a) and (b).

(a) **(10 points)**

$$F(s) = \frac{3s+5}{s^2+4}$$

Answer:_____

(b) **(10 points)**

$$F(s) = \frac{s+7}{2+s-s^2}$$

Answer:_____

3. **(20 points)** Using the Laplace transform and assuming zero initial conditions, find the kernel $K(t-\tau)$ for the system governed by

$$\frac{d^3y}{dt^3} + 16\frac{d^2y}{dt^2} + 81\frac{dy}{dt} + 126y = \delta(t)$$

Answer:_____

4. **(20 points)** Using the matrix Laplace transform, solve

$$\dot{\underline{x}} = \begin{pmatrix} -5 & -4 \\ 5 & -1 \end{pmatrix} \underline{x} + \begin{pmatrix} 1 \\ 3 \end{pmatrix} \cos 2t, \quad \underline{x}(0) = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$$

Answer:

5. **(20 points)** Suppose for the circuit in Figure 2, $I_{dc} = 24$ mA, $R = 625\ \Omega$, $L = 25$ mH, and $C = 25$ nF. There is no energy stored in the circuit when the switch opens at $t = 0$. Find $v(t)$ by using the Laplace transform.

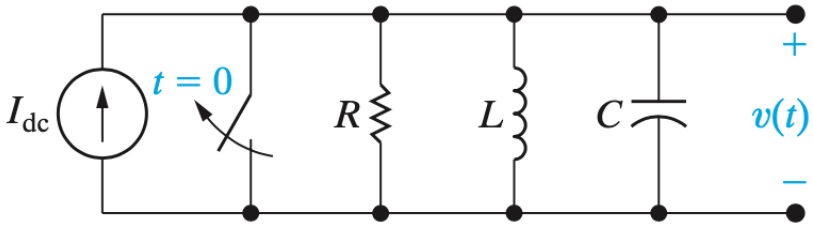

Figure 2: A parallel RLC circuit.

Answer:_____