

MODULE PORTFOLIO
ODD SEMESTER ACADEMIC YEAR 2020/2021

MODULE NAME	: Ordinary Differential Equation	LECTURER:																				
MODULE CODE	: 4420103109																					
CLASS	: 2019																					
SEMESTER	: 3																					
DATE	:																					
COURSE LEARNING OUTCOMES	<p>Knowledge (KNO-2) Identifying and explaining the characteristics of mathematical problems CLO-1: Identify the characteristic of the 1st order and the 2nd order of ODEs (Ordinary Differential Equations) CLO-2: Explain the characteristics of mathematical problems in the 1st order and the 2nd order ODEs</p> <p>Skill (SKI-2) Applying the basic principles of mathematics to solve simple* mathematical problems. CLO-3: Implement basic principle of mathematics to solve the 1st order and the 2nd order of ODEs</p> <p>Competences (COM-3) Solving mathematical problems using technology CLO-4: Solve mathematical problem in the 1st order and the 2nd order of ODEs using technology</p> <p>: Attitude and Social (SOC-1) Working collaboratively and having social sensitivity (obligations as citizens and towards religion) and being able to bring change to a techno-ecopreneurship community. CLO-5: Working collaboratively and active to participate in the process of solving mathematical problems in the 1st order and the 2nd order of ODEs.</p> <p style="text-align: center;">Correlation Between PLO and CLO Ordinary Differential Equation</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>ODE</th> <th>KNO-2</th> <th>SKI-2</th> <th>COM-3</th> <th>SOC-1</th> </tr> </thead> <tbody> <tr> <td>CLO-1</td> <td style="text-align: center;">√</td> <td></td> <td></td> <td></td> </tr> <tr> <td>CLO-2</td> <td style="text-align: center;">√</td> <td></td> <td></td> <td></td> </tr> <tr> <td>CLO-3</td> <td></td> <td style="text-align: center;">√</td> <td></td> <td></td> </tr> </tbody> </table>		ODE	KNO-2	SKI-2	COM-3	SOC-1	CLO-1	√				CLO-2	√				CLO-3		√		
ODE	KNO-2	SKI-2	COM-3	SOC-1																		
CLO-1	√																					
CLO-2	√																					
CLO-3		√																				

		CLO-4			√		
		CLO-5				√	
LEARNING STRATEGIES	:	Lectures are carried out by activating students with the following strategies: Lectures. Discussions. Practices. Presentations. and Group Assignments					
ASSESSMENT	:	<p>The assessment carried out during the lecture includes the following three components.</p> <ol style="list-style-type: none"> 1. Assignment (Quiz and Presentation) 2. Midterm Exam (UTS) 3. Final Exam (UAS) <p>1. Assignment</p> <ul style="list-style-type: none"> ✓ Assignments were given twice in one semester, before UTS (a quiz) and after UTS (a presentation) ✓ The quiz was an independent/individual task in the form of a description of the materials that have been discussed before the UTS ✓ The quiz was held in the classroom for 100 minutes ✓ The presentation was a group assignment in the form of a group presentation about the materials to be discussed after the UTS. ✓ Each group presented one material while the other groups provided an assessment of the progressing group according to the Presentation Assessment Rubric ✓ The assignment was carried out to see the achievements of the PLO and CLO which are in accordance with the characteristics of the ordinary differential equation module <p>2. Midterm Exam (UTS)</p> <ul style="list-style-type: none"> ✓ UTS was held at the 8th meeting ✓ UTS was carried out in the classroom with an implementation time of 100 minutes according to the module schedule ✓ The UTS was carried out to see the achievements of the PLO and CLO which are in accordance with the characteristics of the ordinary differential equation module <p>3. Final Exam (UAS)</p> <ul style="list-style-type: none"> ✓ UAS was held at the 16th meeting ✓ UAS was carried out in the classroom with an implementation time of 100 minutes which follows the UAS implementation schedule of the department 					

✓ The UAS was carried out to see the achievements of the PLO and CLO which are in accordance with the characteristics of the ordinary differential equation module

Assessmen Plan

ODE	KNO-2	SKI-2	COM-3	SOC-1
CLO-1	Tugas, UTS, UAS			
CLO-2	Tugas, UTS, UAS			
CLO-3		Tugas, UTS, UAS		
CLO-4			Tugas	
CLO-5				Tugas

Weight of Test Ability

ODE	KNO-2	SKI-2	COM-3	SOC-1
Tugas	20%	20%	30%	30%
UTS	40%	60%	0%	0%
UAS	40%	60%	0%	0%

The Calculation of PLO's Weight

PLO's Weight				
	T	UTS	UAS	
KNO-2	0.2	0.4	0.4	1
SKI-2	0.2	0.6	0.6	1.4
COM-3	0.3	0	0	0.3
SOC-1	0.3	0	0	0.3
	1	1	1	3

LEARNING OUTCOMES

:

The Calculation of PLO and The predicate of PLO for each students

NO	NIM	SCORE OF PLO				PREDICATE OF PLO			
		KNO-2	SKI-2	COM-3	SOC-1	KNO-2	SKI-2	COM-3	SOC-1
1	19030214001	75.77	75.83	75.00	75.00	G	G	G	G

		2	19030214003	75.00	75.00	75.00	75.00	G	G	G	G
		3	19030214005	89.62	90.83	75.00	75.00	E	E	G	G
		4	19030214007	91.15	92.50	75.00	75.00	E	E	G	G
		5	19030214009	94.23	95.83	75.00	75.00	E	E	G	G
		6	19030214011	65.69	64.67	78.00	78.00	S	S	G	G
		7	19030214013	83.46	84.17	75.00	75.00	E	E	G	G
		8	19030214015	71.15	70.83	75.00	75.00	G	G	G	G
		9	19030214021	68.08	67.50	75.00	75.00	S	S	G	G
		10	19030214023	85.00	85.83	75.00	75.00	E	E	G	G
		11	19030214025	67.31	66.67	75.00	75.00	S	S	G	G
		12	19030214027	57.31	55.83	75.00	75.00	S	S	G	G
		13	19030214029	77.31	77.50	75.00	75.00	G	G	G	G
		14	19030214031	61.54	60.42	75.00	75.00	S	S	G	G
		15	19030214033	63.46	62.50	75.00	75.00	S	S	G	G
		16	19030214035	52.69	50.83	75.00	75.00	F	F	G	G
		17	19030214037	62.69	61.67	75.00	75.00	S	S	G	G

		18	19030214039	75.77	75.8 3	75.00	75.00	G	G	G	G
		19	19030214041	60.38	59.1 7	75.00	75.00	S	S	G	G
		20	19030214043	82.69	83.3 3	75.00	75.00	E	E	G	G
		21	19030214049	71.15	70.8 3	75.00	75.00	G	G	G	G
		22	19030214051	68.08	67.5 0	75.00	75.00	S	S	G	G
		23	19030214053	56.54	55.0 0	75.00	75.00	S	S	G	G
		24	19030214055	52.69	50.8 3	75.00	75.00	F	F	G	G
		25	19030214057	60.38	59.1 7	75.00	75.00	S	S	G	G
		26	19030214061	67.31	66.6 7	75.00	75.00	S	S	G	G
		27	19030214065	55.00	53.3 3	75.00	75.00	S	F	G	G
		28	19030214067	51.92	50.0 0	75.00	75.00	F	F	G	G
		29	16030214009	44.92	41.3 3	88.00	88.00	F	F	E	E
		30	17030214017	61.08	58.8 3	88.00	88.00	S	S	E	E
		31	19030214002	68.31	66.6 7	88.00	88.00	S	S	E	E
		32	19030214004	63.38	61.3 3	88.00	88.00	S	S	E	E
		33	19030214006	61.54	59.3 3	88.00	88.00	S	S	E	E

		34	19030214008	77.23	76.3 3	88.00	88.00	G	G	E	E
		35	19030214010	59.69	57.3 3	88.00	88.00	S	S	E	E
		36	19030214012	63.38	61.3 3	88.00	88.00	S	S	E	E
		37	19030214014	79.54	78.8 3	88.00	88.00	G	G	E	E
		38	19030214016	65.69	63.8 3	88.00	88.00	S	S	E	E
		39	19030214018	71.23	69.8 3	88.00	88.00	G	S	E	E
		40	19030214020	63.38	61.3 3	88.00	88.00	S	S	E	E
		41	19030214024	61.08	58.8 3	88.00	88.00	S	S	E	E
		42	19030214028	62.92	60.8 3	88.00	88.00	S	S	E	E
		43	19030214030	52.77	49.8 3	88.00	88.00	F	F	E	E
		44	19030214034	58.31	55.8 3	88.00	88.00	S	S	E	E
		45	19030214036	63.69	61.6 7	88.00	88.00	S	S	E	E
		46	19030214038	63.85	61.8 3	88.00	88.00	S	S	E	E
		47	19030214042	68.00	66.3 3	88.00	88.00	S	S	E	E
		48	19030214044	73.08	71.8 3	88.00	88.00	G	G	E	E
		49	19030214046	64.77	62.8 3	88.00	88.00	S	S	E	E

			50	19030214048	62.92	60.8 3	88.00	88.00	S	S	E	E
			51	19030214050	66.15	64.3 3	88.00	88.00	S	S	E	E
			52	19030214052	63.38	61.3 3	88.00	88.00	S	S	E	E
			53	19030214058	74.92	73.8 3	88.00	88.00	G	G	E	E
			54	19030214060	68.77	67.1 7	88.00	88.00	S	S	E	E
			55	19030214062	65.69	63.8 3	88.00	88.00	S	S	E	E
			56	19030214064	71.23	69.8 3	88.00	88.00	G	S	E	E
			57	19030214066	72.46	71.1 7	88.00	88.00	G	G	E	E

E = Excellent
G = Good
S = Satisfy
F = Fail

LEARNING OUTCOMES ANALYSIS	PLO Assessment Rubric					
	PLO	Description	Excellent $x \geq 80$	Good $70 \leq x < 80$	Satisfy $55 \leq x < 70$	Fail $x < 55$
:	KNO-2	Able to identify and explain the characteristics of mathematical problems	Students be able to identify the characteristic of the 1 st order and the 2 nd order of ODEs (Ordinary Differential Equations) and explain the	Students be able to identify the characteristic of the 1 st order and the 2 nd order of ODEs (Ordinary Differential Equations) and explain the characteristics of mathematical problems	Students be able to identify the characteristic of the 1 st order and the 2 nd order of ODEs (Ordinary Differential Equations) and explain the characteristics of mathematical problems	Students be able to identify the characteristic of the 1 st order and the 2 nd order of ODEs (Ordinary Differential Equations) and explain the characteristics of mathematical problems

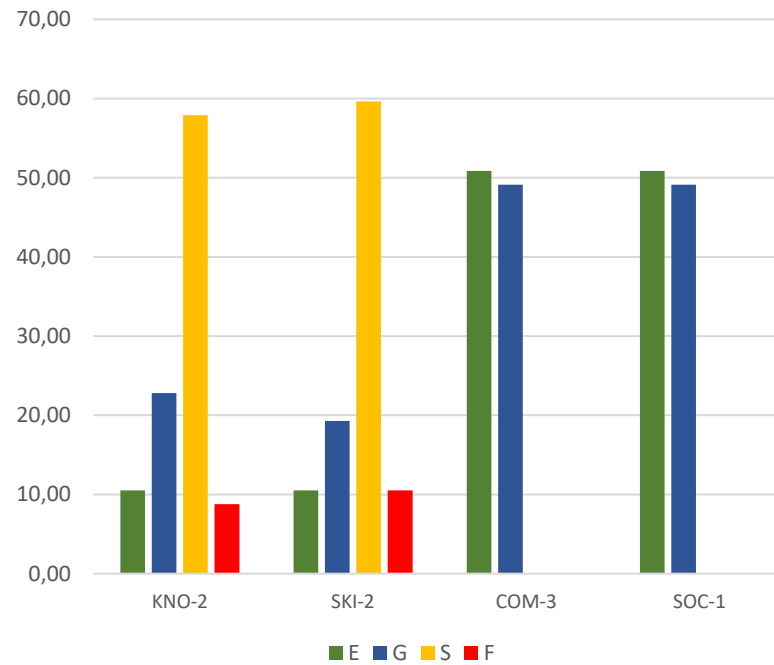
			characteristics of mathematical problems in the 1 st order and the 2 nd order ODEs with score at least 80.	in the 1 st order and the 2 nd order ODEs with score at least 70 and less than 80.	in the 1 st order and the 2 nd order ODEs with score at least 55 and less than 70.	in the 1 st order and the 2 nd order ODEs with score less than 55.
	SKI-2	Able to apply the basic principles of mathematics to solve simple* mathematical problems.	Student be able to implement basic principle of mathematics to solve the 1 st order and the 2 nd order of ODEs with score at least 80.	Student be able to implement basic principle of mathematics to solve the 1 st order and the 2 nd order of ODEs with score at least 70 and less than 80..	Student be able to implement basic principle of mathematics to solve the 1 st order and the 2 nd order of ODEs with score at least 55 and less than 70	Student be able to implement basic principle of mathematics to solve the 1 st order and the 2 nd order of ODEs with score less than 55.
	COM-3	Able to solve mathematical problems using technology	Student be able to solve mathematical problem in the 1 st order and the 2 nd order of ODEs using technology with score at least 80.	Student be able to solve mathematical problem in the 1 st order and the 2 nd order of ODEs using technology with score at least 70 and less than 80.	Student be able to solve mathematical problem in the 1 st order and the 2 nd order of ODEs using technology with score at least 55 and less than 70.	Student be able to solve mathematical problem in the 1 st order and the 2 nd order of ODEs using technology with score less than 55.
	SOC-1	Able to work collaboratively and having social sensitivity (obligations as citizens and towards religion) and being able to bring change to	Student be able to work collaboratively and active to participate in the process of solving mathematical problems in the 1 st order and the 2 nd order of ODEs with score at least 80.	Student be able to work collaboratively and active to participate in the process of solving mathematical problems in the 1 st order and the 2 nd order of ODEs with score at least 70 and less than 80	Student be able to work collaboratively and active to participate in the process of solving mathematical problems in the 1 st order and the 2 nd order of ODEs with score at least 55 and less than 70.	Student be able to work collaboratively and active to participate in the process of solving mathematical problems in the 1 st order and the 2 nd order of ODEs with score less than 55

a techno-ecopreneurship community

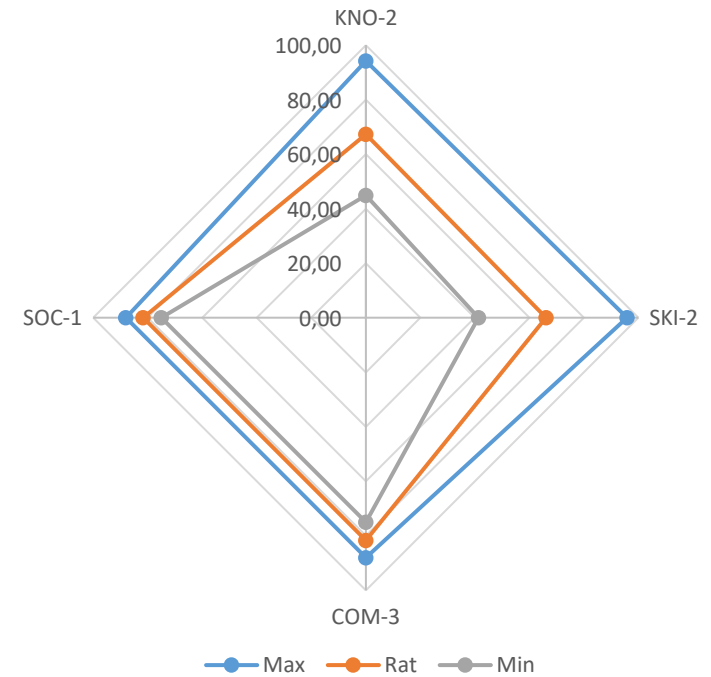
	CLASSICAL VALUE OF PLO			
	KNO-2	SKI-2	COM-3	SOC-1
Max	94.23	95.83	88.00	88.00
Rat	67.31	66.12	81.67	81.67
Min	44.92	41.33	75.00	75.00
	ACHIEVEMENT NUMBER OF PLO			

E	6.00	6.00	29.00	29.00
G	13.00	11.00	28.00	28.00
S	33.00	34.00	0.00	0.00
F	5.00	6.00	0.00	0.00
	57.00	57.00	57.00	57.00
	ACHIEVEMENT PERCENTAGE OF PLO (%)			
E	10.53	10.53	50.88	50.88
G	22.81	19.30	49.12	49.12
S	57.89	59.65	0.00	0.00
F	8.77	10.53	0.00	0.00
	100.00	100.00	100.00	100.00

ACHIEVEMENT PERCENTAGE OF PLO



CLASSICAL VALUE OF PLO



STUDENT'S LEARNING PERFORMANCE ANALYSIS

In general, the students in ordinary differential course have mastered the knowledge, skill, competences and social attitude in the course. From 57 students, 6% of students achieved excellent criteria in KNO-2, 6% of students achieved excellent criteria in SKI-2, 29% of students achieved excellent criteria in COM-3 and 29% of students achieved excellent criteria in SOC-1. We can also see that some students achieved satisfy criteria in KNO-2 and SKI-2. However, there are still some students have failed in this course. It's about 5% and 6% of student have failed criteria in KNO-2 and SKI-2, respectively. It seems that they have some difficulties in identifying the characteristic of the 1st order and the 2nd order of ODEs (Ordinary Differential Equations) and explaining the characteristics of mathematical problems in the 1st order and the 2nd order of ODE. They also have problem to implement basic principle of mathematics to solve the 1st order and the 2nd order of ODEs.

RECOMMENDATION FOR FUTURE LEARNING	<p>Several recommendations based on the last course of ordinary differential equation for better course in the future are as follow:</p> <ol style="list-style-type: none"> 1. Motivate the students more in identifying the characteristic of the 1st order and the 2nd order of ODEs (Ordinary Differential Equations) and explaining the characteristics of mathematical problems in the 1st order and the 2nd order of ODE. They have to practice more in implementing basic principle of mathematics to solve the 1st order and the 2nd order of ODEs. Beside the presentation of the materials, the students should be asked to share their opinion in class. This should extend the students understanding better and force them to read thoroughly 2. Several products by the students can be extended and develop more for students own portfolios
RECOMMENDATION FOR INSTITUTION	NA



DOCUMENT OF ODD SEMESTER MIDTERM EXAMINATION ACADEMIC YEAR OF 2021/2022

Course/Code : Ordinary Differential Equation
 Lecturer : Rudianto Artiono, M.Si
 Program/Class : S1/2020D
 Date and Time : Wednesday, 13 Oktober 2021
 Duration : 100 minutes
 Type : Closed

1. Write your answers on a sheet of paper with **identification** on each sheet.
2. Avoid using a pencil in writing answers.
3. Photograph/scan your answer sheet so that your answers can be read properly.
4. Sort the answers from the smallest question number and upload your answers in one file (pdf) with the file name: **NIM_NAMA**.
5. Work independently **without any resources but yourself**

1. Determine the solution to the following initial value problem in explicit form

a. $y' = \frac{(3x^2 - e^x)}{(2y-5)}, \quad y(0) = 1$

b. $y' = \frac{x(x^2+1)}{4y^3}, \quad y(0) = -\frac{1}{\sqrt{2}}$

(Score 20)

2. Determine whether the following equations are exact equations. If yes, determine the solution

a. $(ye^{xy} \cos 2x - 2e^{xy} \sin 2x + 2x) + (xe^{xy} \cos 2x - 3)y' = 0$

b. $\frac{x}{(x^2+y^2)^{\frac{3}{2}}} + \frac{y}{(x^2+y^2)^{\frac{3}{2}}} \frac{dy}{dx} = 0$

(Score 20)

3. Determine the general solution of the following equation

$$(2x^2 + 2y^2 + x)dx + (x^2 + y^2 + y)dy = 0$$

with the integration factor depending on $w(x, y) = x^2 + y^2$

(Score 20)

4. Solve the following initial value problem

$$y' - \frac{3}{4}y = x^4 y^{\frac{1}{3}}, \quad y(0) = 1$$

(Score 20)

5. Find the solution of the following equation if the special function is given

$$\frac{dy}{dt} = \frac{2 \cos^2 t - \sin^2 t + y^2}{2 \cos t}, \quad y_1 = \sin t$$

(Score 20)

-----Good Luck-----



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UNIVERSITAS NEGERI SURABAYA
FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM
JURUSAN MATEMATIKA

Kampus Ketintang, Jalan Ketintang, Surabaya 60231

Telepon : +6231- 8297677, email: matematika@unesa.ac.id, Laman : <https://matematika.fmipa.unesa.ac.id/>

BLUE PRINT OF ODD SEMESTER MISTERM EXAMINATION

Examination Subjects : Ordinary Differential Equations

Lectures : Team

Program : Mathematics

No.	Indicator	Test	Key of the answer	Cognitive Domain	Score
1.	Able to solve initial value problems by using separable equations method to solve a first-order differential equations (CLO-2, CLO-4)	Determine the solution to the following initial value problem in explicit form a. $y' = \frac{(3x^2 - e^x)}{(2y-5)}$, $y(0) = 1$ b. $y' = \frac{x(x^2+1)}{4y^3}$, $y(0) = -\frac{1}{\sqrt{2}}$	<ul style="list-style-type: none"> Separate the equation Integrating both side of the equations Determine the value of constant obtained from the integration prosses Determine the solution 	C3	20
2.	Able to identify an exact equation of first-order differential equation and able to solve it. (CLO-2, CLO-4)	Determine whether the following equations are exact equations. If yes, determine the solution a. $(ye^{xy} \cos 2x - 2e^{xy} \sin 2x + 2x) + (xe^{xy} \cos 2x - 3)y' = 0$ b. $\frac{x}{(x^2+y^2)^{\frac{3}{2}}} + \frac{y}{(x^2+y^2)^{\frac{3}{2}}} \frac{dy}{dx} = 0$	<ul style="list-style-type: none"> Identify wheater the equation is exact or not. Use the method of exact equation Determine the solution 	C4	20
3.	Able to solve a non-exact first-order differential equation (CLO-4)	Determine the general solution of the following equation $(2x^2 + 2y^2 + x)dx + (x^2 + y^2 + y)dy = 0$	<ul style="list-style-type: none"> Identify wheater the equation is exact or not. Use the method of non-exact equation Determine the solution 	C4	20



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JURUSAN MATEMATIKA

Kampus Ketintang, Jalan Ketintang, Surabaya 60231

Telepon : +6231- 8297677, email: matematika@unesa.ac.id, Laman : <https://matematika.fmipa.unesa.ac.id/>

		with the integration factor depending on $w(x, y) = x^2 + y^2$			
4	Able to solve a Bernoulli equation (CLO-4)	Solve the following initial value problem $y' - \frac{3}{4}y = x^4y^{\frac{1}{3}}, y(0) = 1$	<ul style="list-style-type: none"> • Divide both side of the equation by $y^{\frac{1}{3}}$ • Convert the equation obtained to first-order linear differential equation • Determine the integrating factor • Solve the equation obtained by using integrating factor • Determine the constan • Determine the solution 	C3	20
5	Able to solve a Ricatti equation (CLO-4)	Find the solution of the following equation if the special function is given $\frac{dy}{dt} = \frac{2 \cos^2 t - \sin^2 t + y^2}{2 \cos t},$ $y_1 = \sin t$	<ul style="list-style-type: none"> • Convert the equation to the Bernoulli equation by using y_1. 	C3	20



**DOCUMENT OF ODD SEMESTER FINAL EXAMINATION
ACADEMIC YEAR OF 2021/2022**

Course/Code : Ordinary Differential Equation
Lecturer : Team
Program/Class : S1/2020
Date and Time : Wednesday, 15 Desember 2021
Duration : 100 minutes
Type : Closed book

1. Write your answers on a sheet of paper with **identification** on each sheet.
2. Avoid using a pencil in writing answers.
3. Photograph/scan your answer sheet so that your answers can be read properly.
4. Sort the answers from the smallest question number and upload your answers in one file (pdf) with the file name: **NIM_NAMA**.
5. **Work independently without any resources but yourself**

Complete all of the following questions

1. Given the following differential equation.

$$y'' + 2y' + 5y = 3e^{-t} \sin(2t) + 2t \cos(t); y(0) = 1; y'(0) = m \geq 0.$$

- a. Determine the solution of the above equation. (20)
- b. Determine the value of m such that $y(0) = 0$. (10)

2. Given the following differential equation.

$$y'' + 4y = \cot(2t)$$

Find a function that satisfies the above equation. (20)

3. Find the Laplace inverse ($f(t)$) of the following function.

- a. $F(s) = \frac{s^2 + 2s - 5}{s^3 - 2s^2 + 9s - 18}$ (10)

- b. $F(s) = \frac{(s+2)e^{-2s}}{s^2 - 4s + 1}$ (10)

4. Determine the solution to the equation

$$y'' - 2y' + 2y = f(t)$$

with

$$f(t) = \begin{cases} 2t & , 0 \leq t < 3 \\ t + 2 & , 3 \leq t < 7 \\ 1 & , t \geq 7 \end{cases}$$

and $y(0) = 0, y'(0) = 1$.

Please see the Laplace Transform table below. (30)

"Honesty is the gate of your success"
~ Don't play with a mask to hide the truth ~

TABLE 6.2.1 Elementary Laplace Transforms

$f(t) = \mathcal{L}^{-1}\{F(s)\}$	$F(s) = \mathcal{L}\{f(t)\}$	Notes
1. 1	$\frac{1}{s}, \quad s > 0$	Sec. 6.1; Ex. 4
2. e^{at}	$\frac{1}{s-a}, \quad s > a$	Sec. 6.1; Ex. 5
3. $t^n, \quad n$ a positive integer	$\frac{n!}{s^{n+1}}, \quad s > 0$	Sec. 6.1; Prob. 24
4. $t^p, \quad p > -1$	$\frac{\Gamma(p+1)}{s^{p+1}}, \quad s > 0$	Sec. 6.1; Prob. 24
5. $\sin(at)$	$\frac{a}{s^2+a^2}, \quad s > 0$	Sec. 6.1; Ex. 7
6. $\cos(at)$	$\frac{s}{s^2+a^2}, \quad s > 0$	Sec. 6.1; Prob. 5
7. $\sinh(at)$	$\frac{a}{s^2-a^2}, \quad s > a $	Sec. 6.1; Prob. 7
8. $\cosh(at)$	$\frac{s}{s^2-a^2}, \quad s > a $	Sec. 6.1; Prob. 6
9. $e^{at} \sin(bt)$	$\frac{b}{(s-a)^2+b^2}, \quad s > a$	Sec. 6.1; Prob. 10
10. $e^{at} \cos(bt)$	$\frac{s-a}{(s-a)^2+b^2}, \quad s > a$	Sec. 6.1; Prob. 11
11. $t^n e^{at}, \quad n$ a positive integer	$\frac{n!}{(s-a)^{n+1}}, \quad s > a$	Sec. 6.1; Prob. 14
12. $u_c(t) = \begin{cases} 0 & t < c \\ 1 & t \geq c \end{cases}$	$\frac{e^{-cs}}{s}, \quad s > 0$	Sec. 6.3
13. $u_c(t) f(t-c)$	$e^{-cs} F(s)$	Sec. 6.3
14. $e^{ct} f(t)$	$F(s-c)$	Sec. 6.3
15. $f(ct)$	$\frac{1}{c} F\left(\frac{s}{c}\right), \quad c > 0$	Sec. 6.3; Prob. 17
16. $(f * g)(t) = \int_0^t f(t-\tau)g(\tau) d\tau$	$F(s)G(s)$	Sec. 6.6
17. $\delta(t-c)$	e^{-cs}	Sec. 6.5
18. $f^{(n)}(t)$	$s^n F(s) - s^{n-1} f(0) - \dots - f^{(n-1)}(0)$	Sec. 6.2; Cor. 6.2.2
19. $(-t)^n f(t)$	$F^{(n)}(s)$	Sec. 6.2; Prob. 21



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JURUSAN MATEMATIKA

Kampus Ketintang, Jalan Ketintang, Surabaya 60231

Telepon : +6231- 8297677, email: matematika@unesa.ac.id, Laman : <https://matematika.fmipa.unesa.ac.id/>

BLUE PRINT OF ODD SEMESTER FINAL EXAMINATION

Examination Subjects : Ordinary Differential Equations

Lectures : Team

Program : Mathematics

No.	Indicator	Test	Key of the answer	Cognitive Domain	Score
1.	Able to use undetermined coefficients method to solve a second-order differential equations (CLO-2, CLO-4)	Consider the following differential equation. $y'' + 2y' + 5y = 3e^{-t} \sin(2t) + 2t \cos(t); y(0) = 1; y'(0) = m \geq 0.$ a. Determine the solution of the equation above. b. Determine the value of m such that $y(0) = 0$.	<ul style="list-style-type: none"> Find the solution of the homogenous equation Find the Y_{p1} and Y_{p2} Find general solution Find the particular solution by substituting the initial value Find the value of m 	C3	30
2.	Able to use variation of parameters method to solve a second-order differential equations (CLO-2, CLO-4)	Consider the following differential equation. $y'' + 4y = \cot(2t)$ Find the function y that satisfies the equation above.	<ul style="list-style-type: none"> Find the solution of the homogenous equation Determine Y_1 and Y_2 Find U_1 and U_2 by using the variation of parameters method 	C4	20
3.	Able to find the laplace inverse of a function (CLO-4)	Find the Laplace Inverse ($f(t)$) of the following functions. a. $F(s) = \frac{s^2+2s-5}{s^3-2s^2+9s-18}$ b. $F(s) = \frac{(s+2)e^{-2s}}{s^2-4s+1}$	<ul style="list-style-type: none"> Modify the algebraic form of the function $F(s)$ Match the form with the laplace transform table Determine the inverse 	C4	20
4	Able to use laplace transform to solve a second-order ODE with unit function (CLO-4)	Determine the solution of the ODE below. $y'' - 2y' + 2y = f(t)$ where	<ul style="list-style-type: none"> Express $f(t)$ in step function form. Find the laplace transform of the equation 	C5	30



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		$f(t) = \begin{cases} 2t & , 0 \leq t < 3 \\ t + 2 & , 3 \leq t < 7 \\ 1 & , t \geq 7 \end{cases}$ <p>and $y(0) = 0, y'(0) = 1$.</p> <p>See the Laplace Transform table below.</p>	<ul style="list-style-type: none"> • Modify the algebraic of of the function obtained • Find the inverse of the function F(s) • Determine the solution 	
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