EXAMINATION COVERSHEET

SPRING 2020 Final Examination

UNIVERSITY OF WOLLONGONG IN DUBAI

THIS EXAMINATION CONTENT IS STRICTLY CONFIDENTIAL

Students must comply with requirements stated in the Online Examination Procedures

Student Number:	
First Name:	
Family Name:	
Date of Examination: (17/05/20)	
Subject Code:	**Math 141**
Subject Title:	**Fundamentals of Engineering Mathematics**
Time Permitted to Write Exam:	2 Hours
Time Permitted to Upload Exam Paper:	45 Minutes
Total Number of Questions:	**15**
Total Number of Pages *(including this page):*	**11**

INSTRUCTIONS TO STUDENTS FOR THE EXAM (*FURTHER TO INSTRUCTIONS POSTED ON MOODLE SITE*)

1) Download the final examination question paper onto your laptop/desktop.
2) Answers should be submitted within the time-frame specified above.
3) Part A - Moodle-MCQ / 10 questions. The marks are shown next to each question and the total is 50 marks.
4) Part B - Written to be scanned and submit/ 5 questions. The marks are shown next to each question and the total is 50 marks.
5) Total marks for this Final Exam is 100. This Exam is worth 30 % of your final marks.

INSTRUCTIONS TO STUDENTS FOR UPLOADING EXAMS

- **Descriptive/Case Studies Format questions** – type you answer and have your submission saved in word document (.docx). Name the file as **(Your Student Number_Subject Code)**
- Attach picture of any drawing, figure etc and attach it to your document.
- **Problem Solving Format questions** – answer the questions on paper with clear indication of which solution belongs to which question.
- **For Online Testing Using Moodle** – answer the questions in the Moodle.
- Ensure to take clear scan or pictures/images of all your working and solutions.
- Save all your solutions of the final examination in a single folder **(zip file)** for submission.
- Keep your answer sheets for reference in case the images are not readable or corrupted.
- Upload your submission document by the deadline specified above.
- If you are unable to upload the answer paper(s) (on Turnitin) before the due time, DO NOT PANIC. Email it to the lecturer at xxxxxx@uowdubai.ac.ae within the time-limit or (use the upload link to upload it to the box as instructed by the lecturer).
- You will be permitted only one single attempt to upload your submission for the final examination.
- The Lecturer will have the discretion to conduct viva on the submission made, if needed.
- Answers must to be posted on Moodle/Turnitin or through an online portal as specified by the Lecturer.

Part 1 MCQ (50%)

(5*pts*)**Problem 1**

Let

$$z = \frac{-9+3i}{1-2i}.$$

The modulus of z is equal to

(a) $|z| = \sqrt{18}$

(b) $|z| = 3\sqrt{8}$

(c) $|z| = 9$

(d) $|z| = 2\sqrt{5}$

(e) $|z| = \sqrt{10}$

(5*pts*)**Problem 2**
Solve the quadratic equation

$$2z^2 - 2iz - 5 = 0.$$

If z_1 and z_2 are the solutions, then $z_1^2 + z_2^2$ is equal to

(a) 4

(b) 2

(c) 6/4

(d) 3/2

(e) 3

(5*pts*)**Problem 3**

If $x(1+i)^2 + y(2-i)^2 = 3 + 10i$, then $x + y$ is equal to

(a) 8

(b) 7

(c) 6

(d) 5

(e) 4

(5*pts*)**Problem 4**
Let

$$z = \frac{-9+3i}{1-2i}.$$

The argument of z is equal to

(a) $\frac{-3\pi}{4}$

(b) $\frac{\pi}{4}$

(c) $\frac{\pi}{6}$

(d) $\frac{-2\pi}{3}$

(e) π

(5*pts*)**Problem 5**
Find k so that $\mathbf{u} = \langle 3,\ -2\rangle$ and $\mathbf{v} = \langle 1, k\rangle$ are perpendicular

$(a)\quad \frac{3}{2}$

$(b)\quad \frac{1}{4}$

$(c)\quad \frac{5}{6}$

$(d)\quad \frac{4}{3}$

$(e)\quad \frac{1}{2}$

(5*pts*)**Problem 6** Find the vector projection of $\mathbf{u} = \langle 2, 7\rangle$ on $\mathbf{v} = \langle -3, 1\rangle$.

$(a)\quad \left\langle \frac{-3}{10}, \frac{1}{10}\right\rangle$

$(b)\quad \left\langle \frac{-3}{7}, \frac{1}{7}\right\rangle$

$(c)\quad \left\langle \frac{1}{10}, \frac{3}{10}\right\rangle$

$(d)\quad \langle -2, -7\rangle$

$(e)\quad \langle 3, -1\rangle$

(5*pts*)**Problem 7**
Find k so that $\mathbf{u} = \langle 3, -2\rangle$ and $v = \langle 1, k\rangle$ are parallel.

(a) $\frac{-2}{3}$

(b) -2

(c) $\frac{5}{3}$

(d) $\frac{7}{3}$

(e) $\frac{9}{2}$

(5*pts*)**Problem 8**

The equation

$$x^2 + y^2 + z^2 - 2x - 4y + 8z = 15$$

represents

(a) a sphere with center $(1, 2, -4)$ and radius 6

(b) a sphere with center $\left(0, -2, \frac{1}{2}\right)$ and radius 7

(c) a sphere with center $(0, 0, 0)$ and radius $\frac{1}{5}$

(d) a point

(e) no graph in R^3

(5*pts*)**Problem 9**

The area of the triangle that is determined by
$P_1 = (0,0,0)$ $P_2 = (1,2,3)$ $P_3 = (3,2,1)$
is

(a) $2\sqrt{6}$
(b) $2\sqrt{2}$
(c) $4\sqrt{6}$
(d) $8\sqrt{3}$
(e) $4\sqrt{2}$

(5*pts*)**Problem 10**

At which point does the line with parametric equations

$$x = -1 + 3t \quad y = 2 - 2t \quad z = 3 + t$$

intersect the plane $3x + y - 4z = -4$?

(a) $(8, -4, 6)$

(b) $(0, 0, 1)$

(c) $(1, 1, 2)$

(d) $\left(2, 4, \frac{7}{2}\right)$

(e) they do not intersect

Part 2 Written Questions (50%)

(10pts)**Problem 1**
Find the equation of the line that passes through the point $(-1, -2, 3)$ and perpendicular to the plane $x - 2y - 5z = 9$.

(10pts)**Problem 2**
Which of the points $A(0,0,0)$ and $B(1,1,1)$ is closer to the plane $3x+2y+z=4$? (Justify your answer and show your work)

(10pts)**Problem 3**

Let

$$A = \begin{bmatrix} 1 & 3 \\ 0 & -1 \\ -1 & 2 \\ 3 & 0 \end{bmatrix}, \quad B = \begin{bmatrix} 1 & 1 \\ -2 & 3 \\ 2 & -1 \\ 0 & 1 \end{bmatrix}, \quad C = \begin{bmatrix} 2 & 0 & 1 \\ 3 & 1 & 0 \end{bmatrix}$$

Find, if possible

a) AB **b)** AC

(10*pts*)**Problem 4**
Use the **Gauss Jordan method** to find the inverse of the matrix

$$A = \begin{pmatrix} 4 & 2 \\ 3 & 1 \end{pmatrix}.$$

Rk: You must use the Gauss Jordan method and show your work.

(10*pts*)**Problem 5**
Use the Cramer's rule to solve the linear system

$$\begin{aligned} x_1 - 2x_2 + 2x_3 &= 5 \\ x_1 - x_2 \qquad\quad &= -1 \\ -x_1 + x_2 + x_3 &= 5 \end{aligned}$$