Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2023/2024

COURSE NAME	:	IMAGE PROCESSING AND VISION SYSTEM
COURSE CODE	:	BND 46303
PROGRAMME CODE	:	BND
EXAMINATION DATE	:	JULY 2024
DURATION	:	2 HOURS 30 MINUTES
INSTRUCTIONS	:	1. ANSWER ALL QUESTIONS 2. THIS FINAL EXAMINATION IS CONDUCTED VIA ☐ Open book ☒ Closed book 3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

Q1 (a) Describe a typical perception pipeline in computer vision systems. Discuss each component's role in processing visual data from input to decision-making.

(15 marks)

(b) With suitable diagrams and discussion, describe five applications of computer vision from the list provided in the chapter (e.g., Object Recognition, Face Detection, Virtual Fitting), and explain how each utilizes computer vision technologies to solve real-world problems.

(10 marks)

Q2 (a) In the field of digital image processing, transformations are fundamental for modifying and improving images according to specific criteria or for particular applications.

i) Define image filtering in the context of image processing.

(4 marks)

ii) Describe two types of image filtering techniques available in digital image processing.

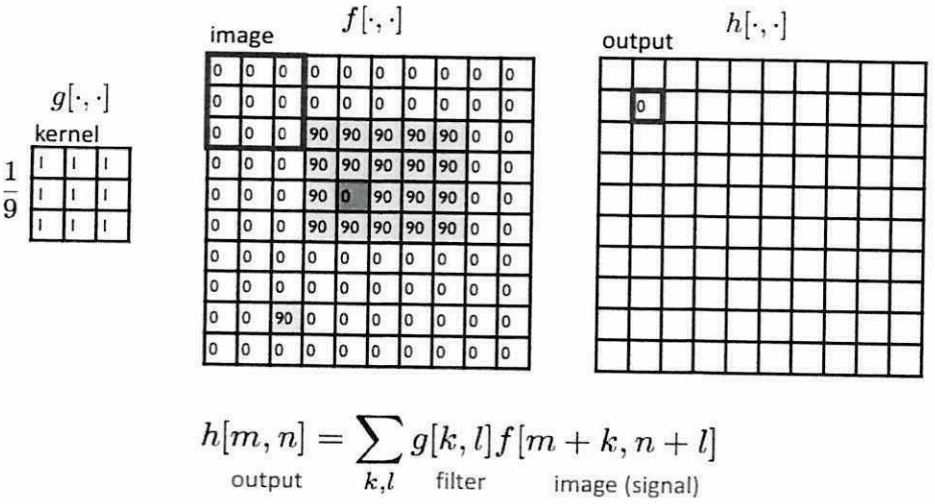
(8 marks)

(b) A box filter, also known as an averaging filter, works on an image by smoothing it.

i) Describe how a box filter works on an image and explain the impact of applying a box filter on an image's visual quality.

(6 marks)

ii) Based on **Figure Q2.1,** analyze and provide the full-scale output resulting from the completed filtering process.



$$h[m,n] = \sum_{k,l} g[k,l] f[m+k, n+l]$$

output filter image (signal)

Figure Q2.1

(7 marks)

Q3 (a) The fundamental steps and components of Machine Vision Systems includes Image Acquisition and Image Processing.

Differentiate between Image Acquisition and Image Processing and provide **THREE (3)** examples of Image Acquisition and Image Processing application in the industry.

(15 marks)

(b) Machine Vision Systems applications includes medical imaging, remote sensing, and satellite image processing.

Explain (with example) of the field of medical imaging that uses Machine Vision Systems.

(5 marks)

(c) Explain the advantages of Machine Vision Systems.

(5 marks)

Q4 (a) Describe **FOUR (4)** different approaches of motion analysis.

(8 marks)

(b) Differentiate between motion field and optical flow.

(5 marks)

(c) Illustrate and elaborate **FOUR (4)** basic elements of motion.

(8 marks)

(d) Explain the optical flow in motion analysis.

(4 marks)

-END OF QUESTIONS –