AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
Interdisciplinary and Specialized Credit Hours Engineering Programs
Mechatronics Engineering

Midterm Exam – Spring 2023 **Machine Vision – CSE480s-CSE480-CSE489** *Time allowed: 75 Minutes.*

The Exam Consists of **THREE** Questions in **one** Page. ***Maximum Points: 100 points*** **1 / 1**

Marks will be scaled to be 25 Marks for CSE480-CSE489 and 20 Marks for CSE480s respectively.

Important Rules:
- Having a "turned ON" mobiles inside the examination hall is forbidden and is considered as a cheating behavior. If you should have your mobile with you, it must be turned off in your own bag.
- Any kind of devices with wired/wireless connectivity is forbidden.
- It is forbidden to have any materials even if it is not related to the exam content with you in the examination hall.
- Clarify your answer with all data, sketches, and annotations.

تعليمات هامة
- حيازة التيلفون المحمول مفتوحا داخل لجنة الأمتحان يعتبر حالة غش لستوجب العقاب وإذا كان ضروري الدخول بالمحمول فيوضع مغلق ف الحقائب.
- لا يسمح بدخول الأجهزة أو الملحقات ذات خاصية الإتصال السلكي/اللاسلكي.
- لايسمح بدخول أي كتب أو ملازم أو أوراق داخل اللجنة والمخالفة تعتبر حالة غش.
- وضح جميع إجاباتك بذكر كافة المعلومات والأبعاد اللازمة.

Try All Questions and Assume Any Missing Information

Question 1: [40 PNTS]

Given the following PMF, $p_r(r) = Ar$, $p_z(z) = Be^{-(z-5)^2}$ where r ∈ {0, 1, 2, …, 49} and z ∈ {0, 1, 2, …, 9} are gray-scale image values.

a- Determine the constant A and B.

b- Find the r-z map to perform histogram matching process.

Question 2: [30 PNTS]

a- Write a pseudocode algorithm for Canny's edge detector. Explain each step, in detail.

b- Show how to apply a Gaussian filter as a 7X7 mask using an accelerated technique. What will be the speed up ratio?

Question 3: [30 PNTS]

a- Determine a filter for each of the following cases:
- i. Detecting horizontal lines.
- ii. Detecting vertical lines.
- iii. Detecting diagonal lines.

b- Derive a mask for the Laplacian filter using two different techniques. You must derive the mask parameters from scratch.

c- Explain how a scene is digitized according to the Bayer's filter approach.

End of Exam Questions

Examination Committee
Prof. Dr. Hossam Abdelmunim.

Exam. Date : 4/4/2023