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Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
Sixth Semester B.Tech Degree (S,FE) Examination May 2023 (2015 Scheme)

Course Code: MR304

Course Name: DIGITAL IMAGE PROCESSING AND MACHINE VISION

Max. Marks: 100   Duration: 3 Hours

PART A
Answer all questions, each carries 5 marks.   **Marks**

1	Define Image. Explain the term range.	5
2	Give a brief note on Harmonic Mean Filter.	5
3	Classify the noise and suggest appropriate filters to handle these noise(s). Justify your suggested filters for specific noise type too.	5
4	List edge detection operators.	5
5	Classify the additive and difference colour scheme with suitable example.	5
6	Define 'Haar' Wavelets as a lossy image compression technique.	5
7	What do you mean by erosion and dilation?	5
8	What do you mean by image pre-processing? Draw the process flow chart.	5

PART B
Answer any three questions, each carries 10 marks.

9	Explain the spatial domain linear transformation processes with block diagram.	10
10 a)	Explain dictionary coding and its types for image compression.	5
b)	Given an initial dictionary consisting of the letters a b r y #, encode the following message using the LZW algorithm: **a#bar#array#by#barrayar#bay**.	5

Index	Entry
1	#
2	a
3	b
4	r
5	y

11	Explain in detail the classification of image segmentation process with example.	10
12	We see a diffuse sphere centred at the origin, with radius one and albedo ρ, in an orthographic camera, looking down the z-axis. This sphere is illuminated	10

by a distant point light source whose source direction is (0, 0, 1). There is no

other illumination. Show that the shading field in the camera is $\rho\sqrt{1 - x^2 - y^2}$

13 a) State the convolution and correlation properties of 2D Fourier transform. 5

   b) Compare spatial and frequency domain filters. 5

PART C
Answer any two questions, each carries 15 marks.

14 a) Compute the Haar Basis for N=4. 7

   b) Also, interpret the reason for multiplied power of $\sqrt{2}$. 8

15   Comment on machine vision and computer vision. Give a detailed description of various levels of machine vision. 15

16 a) Explain the impact of calibration of the camera for stereo vision. 7

   b) Explain the terms CCD and CID. 8

17   You are selected to design a security surveillance system for metro rail to ensure pedestrian safety. Consider the situation that every platform has a yellow line marker to alert the traveller to stay behind it when the train passes through the platform. Your task is to create a flow chart and define every single point considered for the surveillance alarming when any person is overlapping/crossing the yellow line. At the same time, the metro is either entering or passing through the station. 15

Consider a static camera mounted at a suitable height is recording every frame for input images. Your solution must consider the following points: Image acquisition, Pre-processing, Feature extraction, Motion Control, and Conditions for raising the alarm etc.

Two sample images are given for clear visualization of safe position marked in green outline and the alarming situation in red highlight.

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