Name:	
Enrolment No:	**UPES** UNIVERSITY OF TOMORROW

UPES
End Semester Examination, May 2023

Course: Digital Signal and Image Processing   Semester: II
Program: M.Tech Automation and Robotics   Time   : 03 hrs.
Course Code: ECEG7033   Max. Marks: 100

Instructions:

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Define the following terms: (i) Image (ii) Resolution (iii) Pixel and (iv) Digital Image.	4M	CO1
Q 2	Explain the sampling and quantization for 2D images with suitable examples.	4M	CO1
Q 3	Explain the meaning of frequency in Image. What are the filtering methods in image processing?	4M	CO1
Q 4	List the properties of 2D Fourier Transform.	4M	CO2
Q 5	Write a short note on walsh transform.	4M	CO2

SECTION B
(4Qx10M= 40 Marks)

Q 6	Explain the following terms with the help of suitable examples: i) image restoration, ii) Compression, iii) Segmentation, iv) morphological processing.	10M	CO1
Q 7	Explain the architecture of an artificial neural network (ANN) with the help of a neat sketch. What are the advantages and applications of ANN in image processing?	10M	CO5
Q 8	Explain the working of convolution neural networks. What are the three types of layers in convolutional neural networks?	10M	CO5

Q 9	Compute the 2-D Z-transform of
	    a. $x(n_1, n_2) = a^{n_1} b^{n_2} u(n_1, n_2)$.
	    b. $x(n_1, n_2) = a^{n_1} \delta(n_1 - n_2) u(n_1, n_2)$.
	
	          OR
	
	Derive the discrete cosine transformation function in 1D and 2D and write all its properties.
		10M	CO2

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<tr>
<td colspan="2" align="center">SECTION-C
(2Qx20M=40 Marks)</td>
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<td>Q 10</td>
<td>Attempt any two sections

a. Write and explain the continuous wavelet transformation with suitable examples. Explain the multiresolution properties of wavelets.
b. Define Haar Transform? What is the procedure to compute the Haar transformation matrix?
c. What is the definition of convolution? Compute the 2D convolution of the input matrices x and h shown below.

<table><tr><td>25</td><td>100</td><td>75</td><td>49</td><td>130</td></tr><tr><td>50</td><td>80</td><td>0</td><td>70</td><td>100</td></tr><tr><td>5</td><td>10</td><td>20</td><td>30</td><td>0</td></tr><tr><td>60</td><td>50</td><td>12</td><td>24</td><td>32</td></tr><tr><td>37</td><td>53</td><td>55</td><td>21</td><td>90</td></tr><tr><td>140</td><td>17</td><td>0</td><td>23</td><td>222</td></tr></table>
<div align="center">x</div>
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<div align="center">h</div></td>
<td align="center">20M
(10+10)</td>
<td align="center">CO4</td>
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<td>Q 11</td>
<td>a. What are the different types of gray-level transformations? Explain piece-wise linear transformation.
b. Compare image enhancement and image restoration. What are the applications of Image segmentation?</td>
<td align="center">20M
(10+10)</td>
<td align="center">CO3</td>
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