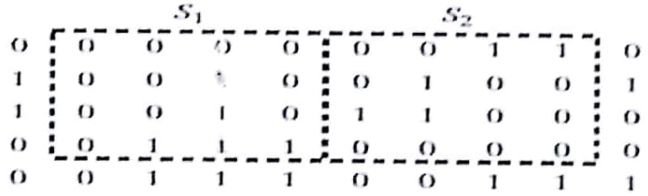
FIRST INTERNAL ASSESSMENT

Sem: VII **Sub: Digital Image Processing** **Sub. Code: 15EC72**
Date: 10/09/2018 **Time: 3:00PM-4:00PM** **Max. Marks:25**

Note: Answer two full questions, draw sketches wherever necessary.

Q. No		Description of Question	Marks	CO	RBT LEVEL
1	a	Explain the applications of digital image processing.	6	CO402.1	L2
	b	What is digital image processing? Explain fundamental steps in digital image processing.	7	CO402.1	L2
		OR			
2	a	Define spatial and gray level resolution. Briefly discuss the effects resulting from a reduction in number of pixels and gray levels.	6	CO402.1	L2
	b	Explain the concept of sampling and quantization of an image.	7	CO402.1	L2
3	a	Let V={0,1} compute D_4,D_8 and D_e distance between pixel p and q (p) 1 1 2 3 0 1 2 1 1 1 0 2 2 1 1 1 (q)	6	CO402.1	L2
	b	Explain the process of image acquisition using microdensitometer.	6	CO402.1	L2
		OR			
4	a	Consider two image subsets, S1 and S2 shown in figure bellow. For V={1}, determine whether these two subsets are: i) 4-adjacent ii) 8-adjacent iii) m-adjacent. 	6	CO402.1	L2
	b	With neat block diagram, describe various components used in image processing system.	6	CO402.1	L2

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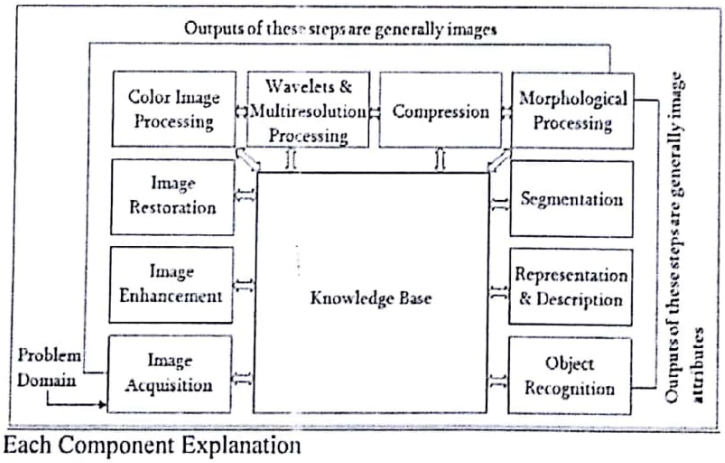
IA - I SCHEME OF EVALUATION

Sem :VII		Subject : Digital Image Processing	Sub Code : 15EC72		Date:15/09/2018	
Q. No.	**Bit**	**Description**	**Marks**		**CO's**	**RBT LEVEL**
1	a	**Explain the applications of digital image processing.** • Medical Imaging • Radiology • X- rays Images • Ultrasound Scanned Images • Computed Tomography(CT) • PET and SPECT • Magnetic Resonance Imaging(MRI) • Digital Infrared Thermal Imaging(DITI) • Electro Encephalography(EEG) • Electro Cardiography (ECG) • Remote sensing • Astronomy • Business • Video Conference • Entertainment • Security and Surveillance • Machine/Robot vision(Robotics) • Colour processing	6		CO402.1	L2
2	b	**What is digital image processing? Explain fundamental steps in digital image processing.** Digital image processing is the use of computer *algorithms* to perform *image processing* on *digital images*. **Fundamental Steps In Digital Image Processing**  Each Component Explanation **1) Image Acquisition:** • This is the first step of the fundamental steps of digital image processing.It gives information about how to acquire an image • Image acquisition gives the image in digital form.	7 1 2 4		CO402.1	L2

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		2) Image Enhancement: • Image enhancement technique is used to bring out details that is obscured or simply highlight certain feature of interest in image. • Image enhancement is subjective process. **3) Image Restoration:** • Image restoration i an area that also deals with improving the appearance of an image. • Image restoration is removal of noise. **4) Colour Image Processing :** • Colour image processing is an area that has been gaining its importance because of the significant increase in the use of digital images over the Internet. • This may include colour modelling and processing in a digital domain. **5). Wavelets and Multi-Resolution Processing:** • Wavelets are the foundation for representing images in various degrees of resolution. • Wavelets are used in image data compression **6) Compression:** • Compression is a technique used for reducing the storage required to save an image or the bandwidth to transmit it. • Compression is useful in internet which enables sending of pictures.Ex: JPEG **7) Morphological Processing:** • Morphological processing deals with tools for extracting image components that are useful in the representation and description of shape. • Morphological processing helps in process output image features. **8) Segmentation:** • Segmentation procedures partition an image into its constituent parts or objects. • Segmentation procedure helps in object identification **9. Representation and Description:** There are two types of representation ➢ Boundary representation: it is suitable when the focus is on external shape. ➢ Regional representation : it is appropriate when the focus is on internal characteristics. • **Description:** Description deals with extracting attributes that result in some quantitative information of interest **10) Object recognition:** • Recognition is the process that assigns a label to an object based on its description. **11) Knowledge Base:** • It gives knowledge about problem domain in image processing system. • It guides operation of each possible module. • It also controls interaction between module.			

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Q. No.	Bit	Description	Marks		CO's	RBT LEVEL
2	a	**Define spatial and gray level resolution. Briefly discuss the effects resulting from a reduction in number of pixels and gray levels.** **Spatial resolution:** Spatial resolution is the smallest discernible detail in an image. • The subsampling was accomplished by deleting the appropriate number of rows and columns from the original image. • The 512x512 image was obtained by deleting every other row and column from the 1024x1024 image. • The 256x256 image was generated by deleting every other row and column in the 512x512 image. • The 128x128 image was generated by deleting every other row and column in the 256x256 image. • The 64x64 image was generated by deleting every other row and column in the 128x128 image. • The 32x32 image was generated by deleting every other row and column in the 64x64 image. • a very slight fine checkerboard will appear in 256X256 image. These effects are much more visible in the 128*128 image and they become pronounced in the 64*64 and 32*32 images. **Gray Level resolution:** • Gray Level resolution is the discernible change in an gray level. • In Gray Level resolution the number of samples are kept constant and reduce the number of gray levels from 256 to 2, in integer powers of 2. • Where $L=2^k$ (K range from 1 to 8) • while keeping the spatial resolution constant, The 256-, 128-, and 64-level images are visually identical for all practical purposes. The 32-level image however, has an almost imperceptible set of very fine ridge like structures in areas of smooth gray levels. This effect, caused by the use of an insufficient number of gray levels in smooth areas of a digital image, is called false contouring. False contouring generally is quite visible in images displayed using 16 or less uniformly spaced gray levels.	6 3 3		CO402.1	L2

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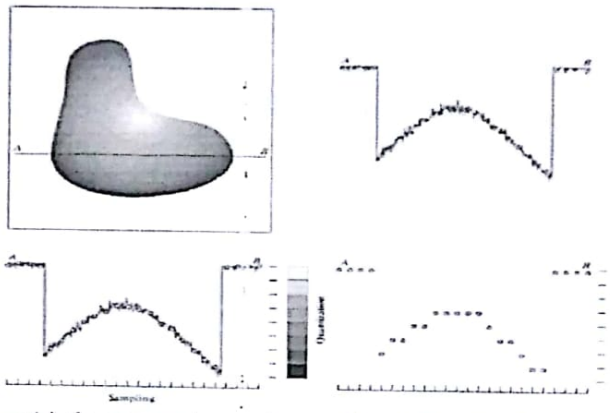
Q. No.	**Bit**	**Description**	**Marks**	**CO's**	**RBT LEVEL**
2	b	**Explain the concept of sampling and quantization of an image.**	7	CO402.1	L2
			4		
		Figure (a) shows a continuous image, f(x, y), that is to be converted into the digital form. An image may be continuous with respect to the x- and y-coordinates, and also in amplitude. To convert it to digital form, we have to sample the function in both coordinates and in amplitude. Digitizing the coordinate values is called sampling. Digitizing the amplitude values is called quantization. The one-dimensional function shown in Fig (b) is a plot of amplitude (gray level) values of the continuous image along the line segment AB in Fig (a).The random variations are due to image noise. To sample this function, equally spaced samples along line AB are taken, as shown in Fig.(c). the values of the samples still span (vertically) a continuous range of gray-level values. In order to form a digital function, the gray-level values also must be converted (quantized) into discrete quantities. The right side of Fig.(c) shows the gray-level scale divided into eight discrete levels, ranging from black to white. The vertical tick marks indicate the specific value assigned to each of the eight gray levels. The continuous gray levels are quantized simply by assigning one of the eight discrete gray levels to each sample. The digital samples resulting from both sampling and quantization are shown in Fig.(d). Starting at the top of the image and carrying out this procedure line by line produces a two-dimensional digital image.	3		
3	a	**Let V={0,1} compute D4,D8 and De distance between pixel p and q**	6	CO402.1	L2
		(p) 1 1 2 3 0 1 2 1 1 1 0 2 2 1 1 1 (q) Point q co-ordinates are (0,0) =(x, y) Point q co-ordinates are (3,3) =(s, t)			

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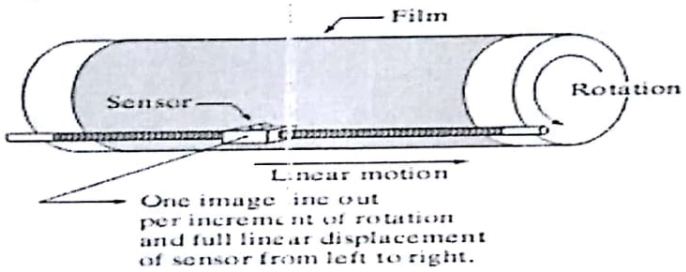
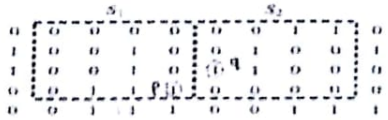
Q. No.	**Bit**	**Description**	**Marks**	**CO's**	**RBT LEVEL**	
		• $D_4(p, q) = \lvert x-s \rvert + \lvert y-t \rvert$ $= \lvert 0-3 \rvert + \lvert 0-3 \rvert$ $D_4(p, q) = 6$	2			
		• $D_8(p, q) = \max(\lvert x-s \rvert + \lvert y-t \rvert)$ $= \lvert 0-3 \rvert + \lvert 0-3 \rvert$ $D_8(p, q) = 3$	2			
		• $D_e(p, q) = [(x-s)^2+(x-s)^2]^{1/2}$ $= [(0-3)^2+(0-3)^2]^{1/2}$ $D_e(p, q) = 3\sqrt{2}$	2			
3	b	**Explain the process of image acquisition using microdensitometer.**  In order to generate a 2-D image using a single sensor, there has to be relative displacements in both the x- and y-directions between the sensor and the area to be imaged. Fig. shows an arrangement used in high-precision scanning, where a film negative is mounted onto a drum whose mechanical rotation provides displacement in one dimension. The single sensor is mounted on a lead screw that provides motion in the perpendicular direction. Since mechanical motion can be controlled with high precision, this method is an inexpensive (but slow) way to obtain high-resolution images. Other similar mechanical arrangements use a flat bed, with the sensor moving in two linear directions. These types of mechanical digitizers sometimes are referred to as microdensitometers.	6 3 3	CO402.1	L2	
4	*a*	**Consider two image subsets, S1 and S2 shown in figure bellow. For V={1}, determine wether these two subsets are: i) 4-adjacent ii) 8-adjacent iii) m-adjacent.**  Let V={1}  	6	CO402.1	L2	

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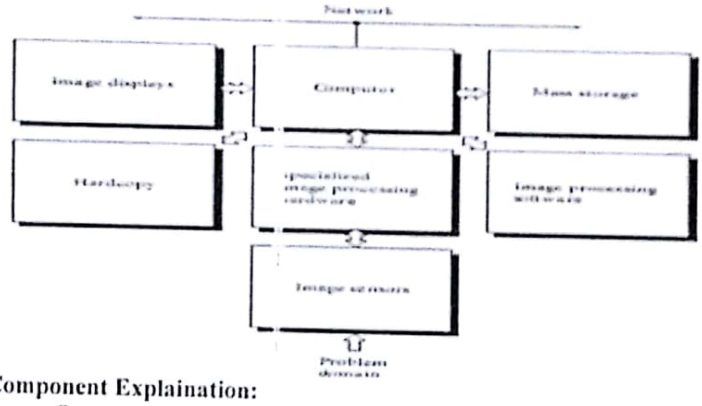
Q. No.	**Bit**	**Description**	**Marks**	**CO's**	**RBT LEVEL**
		i)4-adjacenct : S1 and S2 are not 4 connected because q is not in the set of $N_4(p)$	2		
		i)8-adjacenct : S1 and S2 are 8 connected because q is in the set of $N_8(p)$	2		
		i)m-adjacenct : S1 and S2 are m connected because q is in the set of $N_D(p)$	2		
4	b	**With neat block diagram, describe various components used in image processing system.**	6	CO402.1	L2
			3		
		Component Explaination: **Image Sensors:** • Image Sensor is a physical device that produces an electrical output proportional to light intensity. Example: CCD, Photo Diode. **Specialized Image Processing Hardware:** • It consist of digitizer, which converts output of physical sensing device into digital form. It helps in removal of noise from image. **Computer:** • Image Processing requires intensive processing capability to handle large data. Some computer to super computers are required. **Software:** • It consist of specialized module that performs specific task such as enhancing image, filtering image. **Mass Storage:** • **Short term Storage**: During image processing in computer • **On-line storage:** Ex. Drive, Cloud, Drop box. • **Archival storage:** Ex: Magnetic Tapes and Optical Disk. **Image Display:** • Display are part of computer system, some time it is necessary to have stereo display(3D) **Hard Copy:** • Laser Printer, Digital Printing. **Networking:** • It helps in transmission. • The key factor for image transmission bandwidth.	4		

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