MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

II SEMESTER M.TECH. (Industrial Automation and Robotics)
End Sem Examination

SUBJECT: Machine Vision and Image Processing
Date: 17/12/2021

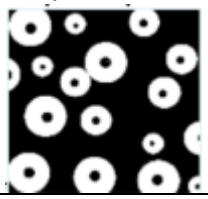
Time: 45 min Exam time: 11-11.50AM **MAX. MARKS: 30**

Instructions to Candidates:

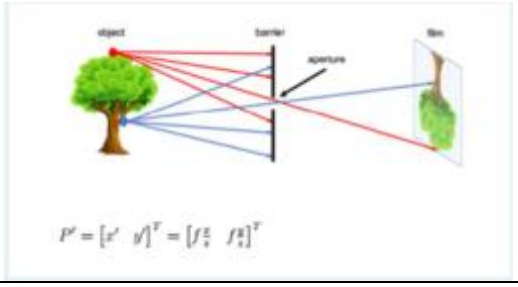
- Answer ALL the questions.
- Missing data may be suitably assumed and justified.

Q. No	Question	M	CO	LO	BL
1	Scale invariance of Harris corner detector is addressed in SIFT algorithm using _____method. a. **DoG at various scale levels and selecting the max value** b. Running harris corner algorithm for every scale c. Using filtering process d. None of the above	1	1	1	1
2	Which information is necessarily required (a prior) by K-means algorithm based segmentation? a. distance metric b. number of clusters c. initial guess as to cluster centroids d. **all of the above**	1	1	1	4
3	Color model used in printer is_____ a. RGB b. **CMYK** c. HSV d. LUV	1	1	1	1
4	Harris Corner detection algorithm is completely invariant to_____ a. **rotation** b. scale c. illumination d. perspective	1	1	1	1
5	Of the 4 kernels pictured below, which would be best for finding horizontal lines in the image? a. np.array([-1,0,1],[-2,8,2],[-1,0,1]) b. np.array([-1,0,1],[-2,6,2],[-1,0,1]) c. np.array([-1,0,1],[-2,0,2],[-1,0,1]) d. **np.array([-1,-2,-1],[0,0,0],[1,2,1])**	1	1	2	4
6	Which of the following is false regarding LOG and DOG? a. DoG can be considered an approximation to the LoG b. **DoG is used for low pass filter; LoG is used for high pass filter.** c. The LoG kernel is separable, as LoG can be computed using 1D convolutions d. DoG is the difference of gaussians with varying standard deviation.	1	1	2	4

7	Consider an image with the coordinates written as a complex number S(K)=Xo+Yo form. What is the effect after nullifying the higher components of the Fourier descriptor of the boundary points? a. **Smoothens the boundary** b. Normalizes the centroid c. Crops the image d. Changes the scale 	1	1	2	4
8	Extrinsic parameters of the camera are _____ a. R b. T c. **R and T** d. None of the above $P' = K\begin{bmatrix} R & T \end{bmatrix} P_w = MP_w$	1	2	2	1
9	$P' = MP = \begin{bmatrix} \alpha & 0 & c_x \\ 0 & \beta & c_y \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} I & 0 \end{bmatrix} P = K \begin{bmatrix} I & 0 \end{bmatrix} P$ In this matrix, K represents a. **camera intrinsic parameter** b. camera extrinsic parameter c. rotation matrix d. None of the above	1	2	2	1
10	The second image can be obtained by modifying Hue component of the first image. Identify the operation required to obtain the second image from the first image. a. adding a constant value to Hue b. subtracting a constant value from Hue c. **changing the Hue value based on threshold** d. multiplying the Hue value by a constant 	1	3	2	4
11	Select the applications where optical flow method is useful as given below a. video segmentation b. structure from motion c. tracking of vehicle d. **All the above**	1	3	2	4

12	The degree of freedom in the camera intrinsic parameters are a. 1 b. 3 c. **5** d. 9 $K = \begin{bmatrix} x' \\ y' \\ z \end{bmatrix} = \begin{bmatrix} \alpha & -\alpha \cot\theta & c_x \\ 0 & \frac{\beta}{\sin\theta} & c_y \\ 0 & 0 & 1 \end{bmatrix}$	1	2	2	1
13	Morphological opening operation is the process of a. **erosion followed by dilation** b. dilation followed by erosion c. erosion followed by erosion d. dilation followed by dilation	1	1	2	1
14	Which of the following filter can be used to identify the regions in an image to provide the gradient of image intensity function in the diagonal direction? a. np.array([0,1],[0,1]) b. np.array([0,1],[0,-1]) c. **np.array([0,1],[-1,0])** d. np.array([-1,1],[0,-1])	1	1	2	4
15	Select the steps required for counting the number of washers in this image. a. Opening b. Connected component analysis c. Closing d. Dilation (1 Point) a. a,c b. d,a c. b,a d. **a,b** 	1	1	2	4
16	Region growing is a ……image segmentation approach. a. **bottom-up** b. Top down c. tree based d. none of the above	1	1	2	1
17	Identify the sensors used for sensor fusion in the figure. a. **camera and laser** b. camera and IMU c. camera and radar d. camera and ultrasonic	1	3	2	4

					
18	Which type of enhancement operations are used to modify pixel values according to the value of the pixels in neighbors? a. point operations b. local operations c. global operations d. **mask operations**	1	1	2	4
19	Fourier descriptor can be normalized with respect to scale, location, and rotation by operation. a. make DC coefficient as zero b. divide the spectrum by first frequency c. **both a and b** d. None of the above	1	1	2	4
20	Select the model used in Kalman filter for prediction of position and velocity. a. **Dynamic** b. Static c. measurement d. None of the above	1	3	2	4
21	The spatial resolution of an image depends on the a.color b.number of intensity levels c.**number of pixels** d.range of pixel values	1	1	2	1
22	The output image can be obtained from input image using the operation. a. segmenting RGB image using otsu threshold b. **segmenting H of HSV image with proper theshold** segmenting U of YUV image with proper theshold c. segmenting Cr of YCrCb image with proper theshold 	1	3	2	4
23	Choose the correct answer from the options. The location of pixel in the image plane as per pinhole camera model is shown in the figure provided. What does f refer to?	1	2	2	4

	a. **focal length of the camera** b. width of aperture c. distance between camera and object d. height of the object 				
24	For the given image, select the proper Structuring Element (SE) shape to separate the pins. a. **vertical line** b. horizontal line c. disc d. square 	1	1	2	4
25	In an autocorrelation matrix for an image, Ix represents a. **gradient in x direction** b. gradient in y direction c. gradient in x and y direction d. None of the above	1	1	2	4
26	Kalman filter is used to track an object although multiple sensor data in self driving cars. Because a. **It is not 100% sure that the measure is the correct one** b. It tries to estimate the next position c. It corrects the errors based on prediction and measurement d. All the above	1	3	2	4
27	Which of the following fact(s) is/are true for the relationship between high frequency component of Fourier transform and the rate of change of gray levels? a. **Moving away from the origin of transform the high frequency corresponds to smooth gray level** variation b. Moving away from the origin of transform the higher frequencies corresponds to abrupt change in gray level c. a and b d. none of the above	1	1	2	4
28	Arrange the Lucas Kanade optical flow algorithm steps in order.	1	3	2	4

	a. Build an image pyramid of the two image frame at t and t+1. b. For each level of the pyramid, calculate the x and y derivatives of the first image. c. For each level of the pyramid, starting at the smallest level, compute the optical flow for that level of the pyramid. d. For a certain number of iterations, solve the LK least squares for a given window, and set the new guess as the solution. Repeat iteration until maximum iterations has been reached. a. b-c-a-d b. **a-b-c-d** c. c-b-a-d d. b-a-c-d				
29	Smoothing spatial filters can be used for: a. blurring b. noise reduction c. **a & b** d. None of the above	1	1	2	1
30	Kalman gain tries to improve the result by calculating the between the measurement and the measurement estimate, we can refine the car model to make a better estimate for *x*(1 Point) a. **Error** b. motion c.model d.position	1	3	2	1