# GANPAT UNIVERSITY
## M. TECH SEM. II INFORMATION TECHNOLOGY
## REGULAR EXAMINATION MAY/JUNE: 2014
### 3IT201: Digital Image Processing

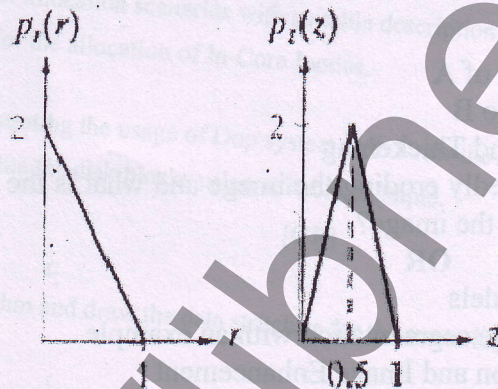Time: 3 Hours]                                                                 [Total Marks: 70

**Instructions:**  1. Figures to the right indicate full marks of the question.
2. All questions are compulsory.
3. Each section should be written in a separate answer book.

## SECTION: I

Q:1  (a)   An image with intensity in the range [0 1] has the input PDF $p_r(r)$   [7]
and specified PDF $p_z(z)$ shown in below fig. Find the
transformation that will accomplish this.



(b)   Develop an algorithm for converting a one pixel thick 8-path to a   [5]
4-path

**OR**

Q:1  (a)   Suppose that a flat area with centre at (x0, y0) is illuminated by a   [4]
light source with intensity distribution

$$i(x,y) = K.e^{[(x-x_0)^2 + (y-y_0)^2]}$$

Assume for simplicity that the reflectance of the area is constant
and equal to 1.0 and let k==255. If the resulting image is digitized
with k bits of intensity resolution and the eye can detect an abrupt
change of eight shades of intensity between adjacent pixels, what
value of k will cause visible false contouring?

(b)   Distinguish Dark, Bright, low contrast and High contrast image   [4]
based on their histograms.

(c)   Describe laplacian filters.   [4]

Q:2  (a)   Show that a second pass of histogram equalization will produce   [4]
exactly the same result.

(b) Derive Fourier transform of Impulse and Shifted impulse [5]
(c) Describe Convolution briefly [2]

**OR**

Q:2 (a) Show that Laplacian is isotropic. You will need the following [6]
equations relating coordinates for axis rotation by an angle θ

$$x = x'\cos\theta - y'\sin\theta$$
$$y = x'\sin\theta + y'\cos\theta$$

Where (x, y) are unrotated coordinates and (x', y') are rotated
coordinates

(b) Define Histogram and Normalized Histogram [2]
(c) Describe Non-liner filters in brief. [3]

Q:3 (a) Define Impulse, Ringing effect. and discuss various High pass [6]
filters.

(b) Elaborate the following keywords [6]
(i) Contrast stretching (ii) Bi-Cubic Interpolation (iii) Brightness
Adaptation and Simultaneous Contrast

# SECTION: II

Q:4 (a) Prove the following [6]
    (i)    A o B is a subset of A
    (ii)   (A o B) o B = A o B

(b) Briefly describe Thinning and Thickening [4]
(c) What is the effect of repeatedly eroding the image and what is the [2]
effect of repeatedly dilating the image?

**OR**

Q:4 (a) Elaborate various Noise models [8]
(b) Discuss the purpose of Image segmentation with an example [2]
(c) Distinguish Image restoration and Image Enhancement [2]

Q:5 (a) Explain Moore boundary tracking algorithm with an example [3]
(b) Derive Difference of Gaussians and show how does it approximate [5]
Laplacian of Gaussian?
(c) Define segmentation, its types and its purpose. [3]

**OR**

Q:5 (a) Briefly explain Morphological watershed. [5]
(b) Show Erosion operation with an example [2]
(c) Explain Intensity thresholding. [4]

Q:6 (a) Describe the solution of image segmentation with multiple [6]
thresholds through the of Otsu's method
(b) Explain the edge linking using Hough transformation. [6]

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