

# United International University

Dept. of CSE

Trimester: Spring 2022

Course: CSI 423 (Simulation & Modeling)

Class Test-04

Total Marks: 20

**Submit hardcopy on Wednesday [as assignment]**

## Question#01 [ 6 Marks]

The National Center for Health Statistics (NCHS) provided data on the distribution of weight (in categories) among Americans in 2002 based on specific values of body mass index (BMI). There were 4 different categories: underweight, normal weight, overweight and obese. Americans in 2002 were distributed as follows: **2% Underweight, 39% Normal Weight, 36% Overweight, and 23% Obese**. Suppose we want to assess whether the distribution of BMI is different in the Framingham Offspring sample. Using data from the n=3326 participants we created the BMI categories as defined and observed the following:

	Underweight BMI<18.5	Normal Weight BMI 18.5-24.9	Overweight BMI 25.0-29.9	Obese BMI ≥ 30	Total
# of Participants	20	932	1374	1000	3326

Use Chi-squared test with 5% level of significance to determine whether the distributions are different or not. Necessary table attached at the end of the question.

## Question#02 [ 7 Marks]

Generate 4 random variates from an exponential distribution with rate parameter  $\lambda = 0.25$  using the Inverse Transform method.

Use {0.57, 0.22, 0.91, 0.32} as random numbers picked from Uniform(0,1).

## Question#03 [ 7 Marks]

Find CDF for the following PDF:

$$f(x) = \begin{cases} \frac{1}{2}x & 0 \leq x < 1 \\ \frac{1}{2} & 1 \leq x < 2 \\ \frac{1}{2}(3-x) & 2 \leq x < 3 \\ 0 & \text{otherwise} \end{cases}$$

### Percentage Points of the Chi-Square Distribution

Degrees of Freedom	Probability of a larger value of $\chi^2$								
	0.99	0.95	0.90	0.75	0.50	0.25	0.10	0.05	0.01
1	0.000	0.004	0.016	0.102	0.455	1.32	2.71	3.84	6.63
2	0.020	0.103	0.211	0.575	1.386	2.77	4.61	5.99	9.21
3	0.115	0.352	0.584	1.212	2.366	4.11	6.25	7.81	11.34
4	0.297	0.711	1.064	1.923	3.357	5.39	7.78	9.49	13.28
5	0.554	1.145	1.610	2.675	4.351	6.63	9.24	11.07	15.09
6	0.872	1.635	2.204	3.455	5.348	7.84	10.64	12.59	16.81
7	1.239	2.167	2.833	4.255	6.346	9.04	12.02	14.07	18.48
8	1.647	2.733	3.490	5.071	7.344	10.22	13.36	15.51	20.09
9	2.088	3.325	4.168	5.899	8.343	11.39	14.68	16.92	21.67
10	2.558	3.940	4.865	6.737	9.342	12.55	15.99	18.31	23.21
11	3.053	4.575	5.578	7.584	10.341	13.70	17.28	19.68	24.72
12	3.571	5.226	6.304	8.438	11.340	14.85	18.55	21.03	26.22
13	4.107	5.892	7.042	9.299	12.340	15.98	19.81	22.36	27.69
14	4.660	6.571	7.790	10.165	13.339	17.12	21.06	23.68	29.14
15	5.229	7.261	8.547	11.037	14.339	18.25	22.31	25.00	30.58
16	5.812	7.962	9.312	11.912	15.338	19.37	23.54	26.30	32.00
17	6.408	8.672	10.085	12.792	16.338	20.49	24.77	27.59	33.41
18	7.015	9.390	10.865	13.675	17.338	21.60	25.99	28.87	34.80
19	7.633	10.117	11.651	14.562	18.338	22.72	27.20	30.14	36.19
20	8.260	10.851	12.443	15.452	19.337	23.83	28.41	31.41	37.57
22	9.542	12.338	14.041	17.240	21.337	26.04	30.81	33.92	40.29
24	10.856	13.848	15.659	19.037	23.337	28.24	33.20	36.42	42.98
26	12.198	15.379	17.292	20.843	25.336	30.43	35.56	38.89	45.64
28	13.565	16.928	18.939	22.657	27.336	32.62	37.92	41.34	48.28
30	14.953	18.493	20.599	24.478	29.336	34.80	40.26	43.77	50.89
40	22.164	26.509	29.051	33.660	39.335	45.62	51.80	55.76	63.69
50	27.707	34.764	37.689	42.942	49.335	56.33	63.17	67.50	76.15
60	37.485	43.188	46.459	52.294	59.335	66.98	74.40	79.08	88.38