

Jaypee University of Information Technology, Wanknaghat

TEST-2 Examination - October 2017

Course Title: Research Methodology and Computational Techniques Program: B.Tech (All Branches)
 Course Code: 10P1NGE201 Marks: 25 marks
 Semester: I Time: 90 min

Instructions: All questions are compulsory. Necessary statistical tables are provided.

1. Consider the following 3×3 matrix: (4 Marks)

$$A = \begin{bmatrix} 1 & -1 & 1 \\ 0 & 0 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

Compute all eigenvalues of A.

2. Perform four iterations of *Newton's method* to find an approximate root of $f(x) = x^4 - 11x + 8 = 0$.
 Take the initial approximation to the root as $x_0 = 2$. (4 Marks)
3. Solve the following *LPP* using *simplex* method: (4 Marks)

$$\begin{aligned} \text{Max } z &= 2x_1 + 5x_2 + 7x_3 \\ \text{subject to } 3x_1 + 2x_2 + 4x_3 &\leq 100 \\ x_1 + 4x_2 + 2x_3 &\leq 100 \\ x_1 + x_2 + 3x_3 &\leq 100 \\ x_1, x_2, x_3 &\geq 0 \end{aligned}$$

4. Solve the following *assignment* problem (4 Marks)

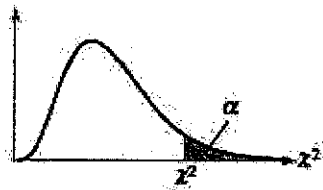
	1	2	3	4	5
A	11	17	8	16	20
B	9	7	12	6	15
C	13	16	15	12	16
D	21	24	17	28	26
E	14	10	12	11	15

5. You pay a game in which you roll a standard six-sided die. You lose one dollar if the die is 1, 2, 3 or 4. You get zero dollar if the die is a 5, and if the die is a 6 you get \$2. Suppose X denote the amount you gain in this game. (3 Marks)
- (a) Calculate the expected gain for you in this game.
- (b) You randomly select a sample of size $n = 50$. What is the the *expected value* for the sample mean \bar{x} and the *standard deviation* $\sigma_{\bar{x}}$ for the *sampling distribution*?
6. The breakdown voltage of a randomly chosen diode of a certain type is known to be normally distributed with mean value 40 volts and standard deviation 1.5 volts. What value is such that only 15% of all diodes have voltages exceeding that value? (3 Marks)
7. A three-sided die with equally likely outcomes was tossed 30 times with the observed frequencies shown below. Test whether the die shows evidence of bias at 5% level of significance. (3 Marks)

Result	1	2	3
Observed Frequency	5	10	15

* * * * *

χ^2 Probability distribution table:



Right tail

Degrees of freedom	α									
	0.995	0.99	0.975	0.95	0.90	0.10	0.05	0.025	0.01	0.005
1	—	—	0.001	0.004	0.016	2.706	3.841	5.024	6.635	7.879
2	0.010	0.020	0.051	0.103	0.211	3.000	3.841	4.605	5.991	7.378
3	0.072	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345	12.838
4	0.215	0.297	0.484	0.717	1.064	7.779	9.488	11.143	13.277	14.860
5	0.412	0.554	0.831	1.145	1.610	9.236	11.071	12.833	15.086	16.750
6	0.676	0.872	1.237	1.635	2.202	10.591	12.592	14.454	16.750	18.548
7	0.989	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.475	20.278
8	1.312	1.646	2.180	2.733	3.490	13.362	15.507	17.535	20.090	21.955
9	1.735	2.088	2.700	3.325	4.168	14.684	16.919	19.023	21.666	23.589
10	2.156	2.558	3.247	3.938	4.865	15.987	18.307	20.483	23.163	25.188
11	2.603	3.053	3.816	4.575	5.578	17.275	19.675	21.920	24.725	26.757
12	3.078	3.572	4.418	5.226	6.317	18.575	21.026	23.337	26.217	28.307
13	3.565	4.107	5.009	5.892	7.042	19.812	22.362	24.736	27.688	29.819
14	4.075	4.660	5.628	6.578	7.763	21.064	23.685	26.119	29.141	31.319
15	4.601	5.229	6.262	7.261	8.547	22.307	24.996	27.488	30.578	32.801
16	5.142	5.812	6.912	7.962	9.392	23.542	26.296	28.845	32.006	34.267
17	5.697	6.408	7.564	8.672	10.085	24.769	27.587	30.191	33.409	35.718
18	6.265	7.016	8.226	9.391	10.826	25.989	28.869	31.526	34.815	37.156
19	6.844	7.633	8.907	10.117	11.651	27.204	30.144	32.852	36.191	38.582
20	7.434	8.260	9.591	10.853	12.443	28.416	31.526	34.204	37.566	39.997
21	8.034	8.897	10.283	11.591	13.240	29.615	32.671	35.479	38.932	41.401
22	8.643	9.542	10.983	12.341	14.042	30.813	33.924	36.781	40.289	42.796
23	9.260	10.196	11.689	13.091	14.848	32.007	35.172	38.076	41.638	44.181
24	9.885	10.859	12.401	13.850	15.657	33.196	36.425	39.364	42.980	45.559
25	10.520	11.524	13.120	14.611	16.473	34.382	37.652	40.646	44.314	46.928
26	11.163	12.191	13.846	15.383	17.294	35.567	38.882	41.923	45.642	48.290
27	11.808	12.879	14.573	16.151	18.114	36.741	40.113	43.194	46.963	49.645
28	12.461	13.565	15.304	16.924	18.932	37.916	41.337	44.461	48.278	50.993
29	13.121	14.257	16.047	17.708	19.768	39.087	42.557	45.722	49.588	52.336
30	13.787	14.952	16.783	18.493	20.591	40.256	43.772	46.979	50.892	53.672
40	20.707	22.164	24.433	26.509	29.051	51.805	55.758	59.342	63.691	66.766
50	27.189	28.716	31.526	33.989	37.566	63.167	67.505	71.420	76.154	79.490
60	35.534	37.485	40.482	43.188	46.459	74.397	79.082	83.298	88.379	91.952
70	45.155	47.154	49.989	52.929	55.927	85.527	91.529	95.023	100.425	104.215
80	51.172	53.540	57.153	60.391	64.278	96.578	101.879	106.629	112.329	116.321
90	59.896	61.754	65.647	69.126	72.921	107.565	113.145	118.136	124.016	128.299
100	67.328	70.065	74.222	77.929	82.358	118.498	124.342	129.561	135.807	140.169