Seat No.: _____ Enrolment No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BPLAN – SEMESTER II– • EXAMINATION – WINTER 2016

Subject Code: 1025504 **Date: 21/11/2016**

Subject Name: Statistical and Quantitative Methods in Planning - II

Time:02:30 PM to 04:30 PM **Total Marks: 50**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 (a) (1) A random sample of 34,562 athletes is taken across India. Sample mean age of them quitting the sports is found out to be 29 years. For estimating the claim that mean age of quitting the sports is less than 29 years, what will be your null hypothesis for hypothesis testing **06**

(a) H0 = 29 (b) H0 <= 29
(c) H0 >=29 (d) H0 > 29

(2) What does sample correlation coefficient r denotes when it is closer to 0

(a) Strong negative linear relationship (b) Strong positive linear relationship
(c) Weak liner relationship (d) None of the above

(3) In simple linear regression model, b0 denotes

(a) Regression slope (b) Dependent variable
(c) Regression intercept (d) Independent variable

(4) For a data set with degree of freedom 12 and confidence level of 99%, chi square critical value would be

(a) 24.725 (b) 31.264
(c) 26.217 (d) 32.910

(5) Decision making analysis is a method for

(a) Reducing uncertainty (b) Getting perfect information
(c) Increasing uncertainty (d) None of the above

(6) Incorrect rejection of a true null hypothesis is

(a) Type II error (b) Not an error
(c) Type I error (d) Type III error

(b) Define following terms: (Any Two) **04**

(1) Type II error
(2) Sum of square of regression
(3) Expected value of perfect information
(4) Coefficient of determination

Q.2 **(a)** A soft drink manufacturing company states on the product label that all its bottles contains 300 ml. of soft drink. A sample of 1200 bottles is tested and sample mean of 294 ml. is derived. Considering the population standard deviation to be 45, estimate weather all bottles contain 300 ml. of soft drink or not. **05**

(b) Explain in detail, Type I and Type II errors in reference of hypothesis testing **05**

OR

(b) A random sample of 15 enthusiasts was carried out in Parimal garden. Below mentioned is their calorie intake in (kcal) in food per day. **05**

1.8 1.5 1.7 2.2 2.4 1.6 1.5 2.1 2.2 2.0 1.9 1.9 1.4 1.7 1.6

Assuming that the sample came from an underlying normal distribution, investigate the claim that their mean calorie intake exceeds 1.7 kcal / day.

Q.3 For working out electricity requirements in MBSIR, electricity requirements of 5 cities are studied and they are as per below

Population of City (Lakhs)	Electricity (KW)
18	120
20	185
22	180
36	275
42	280

For the given data set

(a) Find values of all y caps and draw a regression line model diagram **05**
24

(b) Estimate –

(i) Electricity requirement (KW) for a population of 35,00,000 **05**
(ii) Optimum population size for electricity consumption of 150 KW

OR

Q.3 **(a)** Find out SST, SSR and SSE **05**

(b) What is coefficient of determination **05**

Q.4

x	y
24	43
32	65
16	54
17	23
19	45

For the given data set

(a) Find the value of r **05**

(b) Plot a regression line diagram **05**

OR

Q.4 A real estate developer is planning to develop a township on a piece of land. The investment requirement for the project is around 18 crores and if the project gets completely sold out then he will generate profit of Rs. 45 crores. However looking at the current scenario, there are only 25% chances that the project will get sold out completely, so under that situation he will have to incur losses of Rs. 12 crores.

He has also got an offer to sell of the land and in that scenario; he will out rightly make a profit of Rs. 22 crores.

For the above given situation

(a) What decision should the developer take under **05**

(i) Maximax criterion
(ii) Maximin criterion
(iii) Maximum likelihood criterion
(iv) Even state of probabilities
(v) Given state of probabilities

(b) (i) What is the maximum amount that he should invest in hiring a market specialist? **05**

(ii) Prepare a decision tree for even and given state of probabilities

Q.5 A survey has been conducted in four major cities to identify the professional interest of young students

Name of State / Career Option	Medical	Engineering	Management
Delhi	20	22	16
Mumbai	14	15	24
Chennai	16	21	18
Kolkata	18	15	18
Bhopal	27	21	8

(a) Find out critical value for chi-square analysis for the above given data for confidence level of 90%, 97.5% and 99.99% **05**

(b) Is there a relation between the student opting for professional career and region he belongs to? **05**

OR

Q.5

220	180	150	130	210
190	310	350	280	270
250	160	140	330	290

Above data shows ticket prices of various multiplexes in the city over weekend. It is known that standard deviation in the prices over peak demand is 30.

(a) Estimate the mean price of ticket with 95% confidence **05**

(b) How many samples would be required, if we need the estimate range to be between 5 rs. on either side at confidence level of 99% **05**

STANDARD NORMAL DISTRIBUTION: Table Values Represent AREA to the LEFT of the Z score.

Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.50000	.50399	.50798	.51197	.51595	.51994	.52392	.52790	.53188	.53586
0.1	.53983	.54380	.54776	.55172	.55567	.55962	.56356	.56749	.57142	.57535
0.2	.57926	.58317	.58706	.59095	.59483	.59871	.60257	.60642	.61026	.61409
0.3	.61791	.62172	.62552	.62930	.63307	.63683	.64058	.64431	.64803	.65173
0.4	.65542	.65910	.66276	.66640	.67003	.67364	.67724	.68082	.68439	.68793
0.5	.69146	.69497	.69847	.70194	.70540	.70884	.71226	.71566	.71904	.72240
0.6	.72575	.72907	.73237	.73565	.73891	.74215	.74537	.74857	.75175	.75490
0.7	.75804	.76115	.76424	.76730	.77035	.77337	.77637	.77935	.78230	.78524
0.8	.78814	.79103	.79389	.79673	.79955	.80234	.80511	.80785	.81057	.81327
0.9	.81594	.81859	.82121	.82381	.82639	.82894	.83147	.83398	.83646	.83891
1.0	.84134	.84375	.84614	.84849	.85083	.85314	.85543	.85769	.85993	.86214
1.1	.86433	.86650	.86864	.87076	.87286	.87493	.87698	.87900	.88100	.88298
1.2	.88493	.88686	.88877	.89065	.89251	.89435	.89617	.89796	.89973	.90147
1.3	.90320	.90490	.90658	.90824	.90988	.91149	.91309	.91466	.91621	.91774
1.4	.91924	.92073	.92220	.92364	.92507	.92647	.92785	.92922	.93056	.93189
1.5	.93319	.93448	.93574	.93699	.93822	.93943	.94062	.94179	.94295	.94408
1.6	.94520	.94630	.94738	.94845	.94950	.95053	.95154	.95254	.95352	.95449
1.7	.95543	.95637	.95728	.95818	.95907	.95994	.96080	.96164	.96246	.96327
1.8	.96407	.96485	.96562	.96638	.96712	.96784	.96856	.96926	.96995	.97062
1.9	.97128	.97193	.97257	.97320	.97381	.97441	.97500	.97558	.97615	.97670
2.0	.97725	.97778	.97831	.97882	.97932	.97982	.98030	.98077	.98124	.98169
2.1	.98214	.98257	.98300	.98341	.98382	.98422	.98461	.98500	.98537	.98574
2.2	.98610	.98645	.98679	.98713	.98745	.98778	.98809	.98840	.98870	.98899
2.3	.98928	.98956	.98983	.99010	.99036	.99061	.99086	.99111	.99134	.99158
2.4	.99180	.99202	.99224	.99245	.99266	.99286	.99305	.99324	.99343	.99361
2.5	.99379	.99396	.99413	.99430	.99446	.99461	.99477	.99492	.99506	.99520
2.6	.99534	.99547	.99560	.99573	.99585	.99598	.99609	.99621	.99632	.99643
2.7	.99653	.99664	.99674	.99683	.99693	.99702	.99711	.99720	.99728	.99736
2.8	.99744	.99752	.99760	.99767	.99774	.99781	.99788	.99795	.99801	.99807
2.9	.99813	.99819	.99825	.99831	.99836	.99841	.99846	.99851	.99856	.99861
3.0	.99865	.99869	.99874	.99878	.99882	.99886	.99889	.99893	.99896	.99900
3.1	.99903	.99906	.99910	.99913	.99916	.99918	.99921	.99924	.99926	.99929
3.2	.99931	.99934	.99936	.99938	.99940	.99942	.99944	.99946	.99948	.99950
3.3	.99952	.99953	.99955	.99957	.99958	.99960	.99961	.99962	.99964	.99965
3.4	.99966	.99968	.99969	.99970	.99971	.99972	.99973	.99974	.99975	.99976
3.5	.99977	.99978	.99978	.99979	.99980	.99981	.99981	.99982	.99983	.99983
3.6	.99984	.99985	.99985	.99986	.99986	.99987	.99987	.99988	.99988	.99989
3.7	.99989	.99990	.99990	.99990	.99991	.99991	.99992	.99992	.99992	.99992
3.8	.99993	.99993	.99993	.99994	.99994	.99994	.99994	.99995	.99995	.99995
3.9	.99995	.99995	.99996	.99996	.99996	.99996	.99996	.99996	.99997	.99997

Upper critical values of chi-square distribution with ν degrees of freedom

ν	Probability of exceeding the critical value 0.10	0.05	0.025	0.01	0.001
1	2.706	3.841	5.024	6.635	10.828
2	4.605	5.991	7.378	9.210	13.816
3	6.251	7.815	9.348	11.345	16.266
4	7.779	9.488	11.143	13.277	18.467
5	9.236	11.070	12.833	15.086	20.515
6	10.645	12.592	14.449	16.812	22.458
7	12.017	14.067	16.013	18.475	24.322
8	13.362	15.507	17.535	20.090	26.125
9	14.684	16.919	19.023	21.666	27.877
10	15.987	18.307	20.483	23.209	29.588
11	17.275	19.675	21.920	24.725	31.264
12	18.549	21.026	23.337	26.217	32.910
13	19.812	22.362	24.736	27.688	34.528
14	21.064	23.685	26.119	29.141	36.123
15	22.307	24.996	27.488	30.578	37.697
16	23.542	26.296	28.845	32.000	39.252
17	24.769	27.587	30.191	33.409	40.790
18	25.989	28.869	31.526	34.805	42.312
19	27.204	30.144	32.852	36.191	43.820
20	28.412	31.410	34.170	37.566	45.315
21	29.615	32.671	35.479	38.932	46.797
22	30.813	33.924	36.781	40.289	48.268
23	32.007	35.172	38.076	41.638	49.728
24	33.196	36.415	39.364	42.980	51.179
25	34.382	37.652	40.646	44.314	52.620
26	35.563	38.885	41.923	45.642	54.052
27	36.741	40.113	43.195	46.963	55.476
28	37.916	41.337	44.461	48.278	56.892
29	39.087	42.557	45.722	49.588	58.301
30	40.256	43.773	46.979	50.892	59.703
31	41.422	44.985	48.232	52.191	61.098
32	42.585	46.194	49.480	53.486	62.487
33	43.745	47.400	50.725	54.776	63.870
34	44.903	48.602	51.966	56.061	65.247
35	46.059	49.802	53.203	57.342	66.619
36	47.212	50.998	54.437	58.619	67.985
37	48.363	52.192	55.668	59.893	69.347
38	49.513	53.384	56.896	61.162	70.703
39	50.660	54.572	58.120	62.428	72.055
40	51.805	55.758	59.342	63.691	73.402
41	52.949	56.942	60.561	64.950	74.745
42	54.090	58.124	61.777	66.206	76.084
43	55.230	59.304	62.990	67.459	77.419
44	56.369	60.481	64.201	68.710	78.750
45	57.505	61.656	65.410	69.957	80.077
46	58.641	62.830	66.617	71.201	81.400
47	59.774	64.001	67.821	72.443	82.720
48	60.907	65.171	69.023	73.683	84.037
49	62.038	66.339	70.222	74.919	85.351
50	63.167	67.505	71.420	76.154	86.661
51	64.295	68.669	72.616	77.386	87.968
52	65.422	69.832	73.810	78.616	89.272
53	66.548	70.993	75.002	79.843	90.573
54	67.673	72.153	76.192	81.069	91.872
55	68.796	73.311	77.380	82.292	93.168
56	69.919	74.468	78.567	83.513	94.461
57	71.040	75.624	79.752	84.733	95.751
58	72.160	76.778	80.936	85.950	97.039
59	73.279	77.931	82.117	87.166	98.324
60	74.397	79.082	83.298	88.379	99.607
61	75.514	80.232	84.476	89.591	100.888
62	76.630	81.381	85.654	90.802	102.166
63	77.745	82.529	86.830	92.010	103.442
64	78.860	83.675	88.004	93.217	104.716
65	79.973	84.821	89.177	94.422	105.988
66	81.085	85.965	90.349	95.626	107.258
67	82.197	87.108	91.519	96.828	108.526
68	83.308	88.250	92.689	98.028	109.791
69	84.418	89.391	93.856	99.228	111.055

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