Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BPLAN – SEMESTER II • EXAMINATION – SUMMER 2015

Subject Code: 1025504 **Date:03/06/2015**

Subject Name: Statistical and Quantitative Methods in Planning - II

Time: 10.30am-12.30pm **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 4000 children is taken across Gujarat. Sample mean age of children starting their formal education is found out to be 5 years. For estimating the claim that mean age of a child starting his/her formal education is more than 5 years, what will be your null hypothesis for hypothesis testing **06**

(a) H0 = 5 (b) H0 <= 5
(c) H0 >= 5 (d) H0 > 5

(2) Correlation analysis is used to measure _____ of the association between two variables

(a) cause (b) strength
(c) both (d) none

(3) In sample linear regression model, b0 denotes

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

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

(a) 26.217 (b) 32.910
(c) 21.026 (d) 18.549

(5) For any decision maker, doing nothing is

(a) An alternative (b) State of nature
(c) Prior Probability (d) Payoff

(6) For any given linear programming model, the optimum output will occur at

(a) (X,0) (b) (0,Y)
(c) (X,Y) (d) (0,0)

(b) Define following: (Any Four) **04**

(1) Type I error
(2) Scatter plot (with an example)
(3) Sum of square of regression
(4) Expected Monetary Value (EMV)
(5) Expected Frequency
(6) Slack variable

Q.2 **(a)** A bottled water manufacturer states on the product label that each bottle contains 500 ml of water. You work in a government organization that protects consumers by testing product volumes. A sample of 500 bottles have been tested and sample mean has been 495 ml. Considering the population standard deviation to be 50, estimate whether all packed bottles contain 500ml of water or not. **05**

(b) What is the difference between a two tailed hypothesis testing and a one tailed hypothesis testing? Explain in detail with diagram. **05**

OR

(b) A random sample of 12 students was carried out in 1st year, B. Plan. Course. With 50% passing marks, below mentioned are their internal marks out of 50 in SQMP-II. **05**

25 24 28 30 22 14 18 27 28 16 24 25

Assuming that this sample came from an underlying normal distribution, investigate the claim that its mean exceeds the passing marks.

Q.3 Gujarat is planning a new city on the lines of Gandhinagar. Majority of infrastructure provisions have been worked out, but for understanding the electric consumption (MW/day) 5 cities have been studied in respect to their population (LAKHS).

Population (Lakhs)	Electric Consumption (MW) / Day
15	5
22	7
7	4
12	6
18	8

For the given data set

(a) Draw a regression line model diagram **05**

(b) Estimate the amount of electric supply required for population of 25,00,000 and how much population would be optimum for an electric supply of 10 MW / day **05**

OR

Q.3 For above given data

(a) What are the values of SST, SSR and SSE **05**
(b) What is coefficient of determination **05**

Q.4

x	y
35	100
42	125
28	175
52	220
47	180

For the above given data

(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 Rs.10 crores and if the project gets completely sold out then he will generate of profit of Rs. 35 crores. However looking the current scenario, there are only 40% chances that the project will get completely sold out, so under that situation he will have to incur the loss of Rs. 10 crores.

He has also got an offer to sell off his land, in that scenario he will out rightly make a profit of Rs. 8 crores.

For the above given situation

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

1. Maximax criterion
2. Maximin criterion
3. Maximum likelihood criterion
4. Even state of probabilities
5. Given state of probabilities

(b) 1. What is maximum amount of money that he should invest in hiring a market specialist? **05**
2. Prepare a decision tree for even and given state of probabilities

Q.5

A survey 20 students from different parts of the state has been conducted to identify various stream options chosen by them.

Name of District/ Career Options	Science	Commerce	Art
Ahmedabad	6	12	2
Rajkot	8	8	4
Surat	5	9	6
Vadodara	5	10	5
Kachchh	15	4	1

(a) Find out critical value for chi-square analysis for the above given data for confidence level of 95%, 97.5% and 99% **05**

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(b) Is there a relationship between student opting for stream and the district he/she is coming from? **05**

OR

Q.5 For a given farmland of 240 acres, what amount of wheat and cotton should be grown to earn maximum profit?

The farmer makes a profit of Rs. 400 / acre from wheat and Rs. 300 / acre from cotton, however wheat takes 2 hrs. / acre of labour to harvest and cotton takes 1 hour / acre to harvest. He only has a total of 320 hours of labour that he can invest in this.

(a) List down the decision variables, objective function and constrains for the above given situation and with the help of graphical method, solve the above given situation **05**

(b) Will there be any change in the situation if the area under cotton is restricted to maximum 40 acres? If yes, provide the maximum profit earning breakup for this situation. **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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