5/12/16 (M)
Monday

[This question paper contains 8 printed pages.]

Sr. No. of Question Paper : 6108 **Your Roll No.....**

Unique Paper Code : 61011104

Name of the Paper : Statistics for Business Decisions

Name of the Course : **Bachelor of Management Studies (BMS), 2016 (CBCS)**

Semester : I

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **Five** questions.
3. Attempt all parts of a question together.
4. Use of simple calculator is allowed.

1. (a) Following is the distribution of marks in Statistics obtained by 50 students.

Marks (More Than):	0	10	20	30	40	50
No. of Students:	50	46	40	20	10	03

Calculate the median marks. What does it represent? If 60% of the students pass this test, find the minimum marks obtained by a pass candidate. (6)

(b) An organisation dealing with consumer products wants to introduce a new product in the market. Based on past experience, it has 65 percent chance of being successful. In order to help the organisation to make a decision on the new product that is, whether to introduce the product or not, it decides

to get additional information on consumer attitude towards the product. For this, the organisation decides to conduct a survey. In the past, when a product of this type was successful, the survey had yielded favourable indications 85 percent of the time, whereas unsuccessful products have received favourable survey indications 30 percent of the time. Determine the probability of the product being successful given that the survey information is favourable. (6)

(c) Calculate the Price index using the Dorbish and Bowley's method for the following data with 2013 as the base year :

	Quantity (in '000 Kg)		Price (in Rs)	
Commodity	2013	2015	2013	2015
Rice	100	90	9.3	4.5
Wheat	11	10	6.4	3.7
Pulses	5	3	5.1	2.7

(3)

2. (a) The following data is given for two companies. Combining the data for groups of male and female employees,

(i) find out which company has a higher average productivity per employee, and

(ii) which company has more consistent productivity.

Productivity per	Company A		Company B	
Employee	Male	Female	Male	Female
Mean	30	20	27	32
Variance	8	3	12	5
No. of Employees	40	10	20	30

(6)

(b) The employees of an organisation have presented the following data in support of their contention that they are entitled to a wage increase. The data represents average monthly Salary of the employees :

Year	2010	2011	2012	2013	2014	2015
Salary	10,420	10,432	10,960	11,300	11,900	12,500
CPI	126.8	129.5	136.2	141.2	152.3	165.4

Compute the Real Wages for the period 2010 to 2015. Find the amount of Salary required in the year 2015 to ensure the purchasing power equal to that enjoyed in 2011. (6)

(c) What is Probability ? Discuss the three approaches for calculating the probability with the help of appropriate examples. (3)

3. (a) A Company that manufactures Steel observed the production of steel (in metric tonnes) as follows :

Year	2009	2010	2011	2012	2013	2014	2015
Production of steel (m.t.)	80	90	92	83	94	99	92

Fit a straight line trend to the given data using the method of least squares. Calculate the trend values and eliminate trend using the Multiplication model. Estimate the production of steel for the year 2017. (9)

(b) The manager of a fast-food restaurant has to determine whether the population mean waiting time to place an order has changed in the past month from its previous population mean value of 4.5 minutes. From past experience, it is assumed that the population is normally distributed, with a standard deviation of 1.2 minutes. A sample of 25 orders during a one-hour period is selected. The sample mean is 5.1 minutes. Determine whether there is evidence at the 0.05 level of significance that the population mean waiting time to place an order has changed in the past month from its previous population mean value of 4.5 minutes. (6)

4. (a) The table given below shows the number of motor registrations in a certain city for a term of five years and the sale of motor tyres by a firm in that city for the same period.

Year	Motor Registrations	No. of Tyres Sold
1	600	1250
2	630	1100
3	720	1300
4	750	1350
5	800	1500

Find the regression equation to estimate the sale of tyres when motor registration is known. Estimate sale of tyres when registration is 850. (6)

(b) The final exam in a one-term statistics course is taken in the December exam period. Students who are sick or have other legitimate reasons for missing the exam are allowed to write a deferred exam scheduled for the first week in January. A Statistics professor has observed that only 2% of all students legitimately miss the December final exam. Suppose that the professor has 40 students registered this term.

(i) How many students can the professor expect to miss the December exam ?

(ii) What is the probability that the professor will not have to create a deferred exam ? (6)

(c) If the two lines of regression are $4x - 5y + 30 = 0$ and $20x - 9y - 107 = 0$. Which of these is the line of regression of X on Y and Y on X. Find r_{xy}, and σ_y when $\sigma_x = 3$. (3)

5. (a) Because of the relatively high interest rates, most consumers attempt to pay off their credit card bills promptly. However, this is not always possible. An analysis of the amount of interest paid monthly by a bank's Visa cardholders reveals that the amount is normally distributed with a mean of $ 27 and a standard deviation of $7.

(i) What proportion of the bank's Visa card holders pay more than $30 in interest ?

(ii) What interest payment is exceeded by only 20% of the bank's Visa cardholders ? (6)

(b) Compute Karl Pearson's correlation coefficient between the corresponding values of X and Y from the following table :

X :	2	4	5	6	8	11
Y :	18	12	10	8	7	5

Now suppose each value of variable X is multiplied by 2 and 6 is added to the product. Further, each value of Y is multiplied with 3 and 15 is subtracted from the product. Comment whether correlation coefficient will change or not. (6)

(c) Differentiate between one-tailed and two-tailed tests with reference to testing of hypothesis. (3)

6. (a) The Dean of students at a College is wondering about grade distributions at the school. She has heard grumblings that the GPAs in the Business School are about 0.25 lower than those in the College of Arts and Science. A quick random sampling produced the following GPAs.

Business	2.86	2.77	3.18	2.80	3.14	2.87	3.19	3.24	2.91
	3.00	2.83							
Arts & Science	3.35	3.32	3.36	3.63	3.41	3.37	3.45	3.43	3.44
	3.17	3.26	3.18	3.41					

Does the above data indicate that there is a factual basis for the grumblings ? State and test appropriate hypothesis at alpha = 0.05 ? (6)

(b) The following information was obtained from the records of a factory relating to the wages :

Arithmetic Mean: Rs. 56.80;

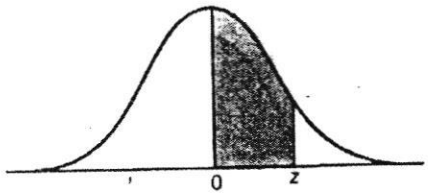
Median: Rs. 59.50;

Standard Deviation: Rs. 12.40

Calculate Mode, Coefficient of Variation and Coefficient of Skewness. Also, comment on the type of distribution. (5)

(c) Explain the terms independent and mutually exclusive events. When will the events A and B be both independent and mutually exclusive ? (4)

VII. AREA UNDER STANDARD NORMAL CURVE



z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1519	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

IV. BINOMIAL COEFFICIENTS

n	$\binom{n}{0}$	$\binom{n}{1}$	$\binom{n}{2}$	$\binom{n}{3}$	$\binom{n}{4}$	$\binom{n}{5}$	$\binom{n}{6}$	$\binom{n}{7}$	$\binom{n}{8}$	$\binom{n}{9}$	$\binom{n}{10}$
0	1										
1	1	1									
2	1	2	1								
3	1	3	3	1							
4	1	4	6	4	1						
5	1	5	10	10	5	1					
6	1	6	15	20	15	6	1				
7	1	7	21	35	35	21	7	1			
8	1	8	28	56	70	56	28	8	1		
9	1	9	36	84	126	126	84	36	9	1	
10	1	10	45	120	210	252	210	120	45	10	1
11	1	11	55	165	330	462	462	330	165	55	11
12	1	12	66	220	495	792	924	792	495	220	66
13	1	13	78	286	715	1287	1716	1716	1287	715	286
14	1	14	91	364	1001	2002	3003	3432	3003	2002	1001
15	1	15	105	455	1365	3003	5005	6435	6435	3005	3003
16	1	16	120	560	1820	4368	8008	11440	12870	11440	8008
17	1	17	136	680	2380	6188	12376	19448	24310	24310	19448
18	1	18	153	816	3060	8568	18564	31824	43758	48620	43758
19	1	19	171	969	3876	11628	27132	50388	75582	92378	92378
20	1	20	190	1140	4845	15504	38760	77520	125970	167960	184756

V. VALUES OF e^{-m} (For Computing Poisson Probabilities)
(o < m < 1)

m	0	1	2	3	4	5	6	7	8	9
0.0	1.0000	.9900	.9802	.9704	.9608	.9512	.9418	.9324	.9231	.9139
0.1	0.9048	.8958	.8860	.8781	.8694	.8607	.8521	.8437	.8353	.8270
0.2	0.8187	.8106	.8025	.7945	.7866	.7788	.7711	.7634	.7558	.7483
0.3	0.7408	.7334	.7261	.7189	.7118	.7047	.6977	.6907	.6839	.6771
0.4	0.6703	.6636	.6570	.6505	.6440	.6376	.6313	.6250	.6188	.6126
0.5	0.6065	.6005	.5945	.5886	.5827	.5770	.5712	.5655	.5599	.5543
0.6	0.5488	.5434	.5379	.5326	.5278	.5220	.5160	.5117	.5066	.5016
0.7	0.4966	.4916	.4868	.4810	.4771	.4724	.4670	.4630	.4584	.4538
0.8	0.4493	.4449	.4404	.4360	.4317	.4274	.4232	.4190	.4148	.4107
0.9	0.4066	.4025	.3985	.3946	.3906	.3867	.3829	.3791	.3753	.3716

(m = 1, 2, 3, ...10)

m	1	2	3	4	5	6	7	8	9	10
e^{-m}	.36788	.13534	.04979	.01832	.00698	.00279	.00092	.000395	.000123	.000045

Note: To obtain values of e^{-m} for other values of m, use the laws of exponents.
Example. $e^{-2.35} = (e^{-2.00})(e^{-0.35}) = (.13534)(.7047) = .095374$

P.T.O.