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DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY,
LONERE - RAIGAD - 402 103
Summer Semester Examination, May - 2019

Branch: B. Tech. (CE / CSE / CS)

Semester: IV

Subject with Subject Code: Probability and Statistics [BTCOC402]

Marks: 60

Date: 16 / 05 / 2019

Time: 3 Hrs.

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- Instructions:** 1] Attempt any 5 Questions from Q. No. 1 to Q. No. 6.
2] Figures / structures to the right indicate full marks.
3] Assume suitable data, if necessary and mentioned it clearly.
4] Neat diagrams must be drawn wherever necessary.
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Q. No. 1 Solve the following questions:

- A) A box contains 3 red and 7 white balls. One ball is drawn at random and its place a ball of other color is put in the box. Now the ball is drawn at random from the box. Find the probability it is of red color. [3]
- B) The probability that a management trainee will remain with the company is 0.6. The probability that an employee earn more than Rs. 10,000 per month is 0.50. The probability that an employee is a management trainee who remained with the company or who earns more than Rs. 10,000 per month is 0.70. What is the probability that an employee earns more than Rs. 10,000 per month, given that he is a management trainee who stay with the company? [3]
- C) A piece of equipment will function only when all the three components A, B and C are working. The probability that A failing over one year is 0.15, that of the B failing is 0.05 and that of the C failing is 0.10. What is the probability that equipment will fail before the end of one year? [3]
- D) In a class of 75 students, 15 were considered to be very intelligent, 45 as medium and the rest below average. The probability that a very intelligent student fails in viva-voce examination is 0.005; the medium student failing has probability 0.05; and corresponding probability for a below average student is 0.15. If a student is known to have passed the viva-voce examination, what is the probability that he is below average? [3]

Q. No. 2 Attempt any THREE of the Followings:

- A) For any Three random variables X_1, X_2, X_3 show that: [4]
$$\text{Cov}(X_1 + X_2, X_3) = \text{Cov}(X_1, X_3) + \text{Cov}(X_2, X_3)$$
- B) Find the variance of the number obtained on a throw of an unbiased die. [4]
- C) An urn contains 7 white and 3 red balls. Two balls are drawn together, at random, from this urn. Compute the probability that neither of them is white. Find also the probability of getting one white and one red ball. Hence compute the expected number of white balls drawn. [4]
- D) A die is tossed twice. Getting 'a number greater than 4' is considered a success. Find the mean and variance of the probability distribution of number of successes. [4]

Q. No. 3 Attempt any THREE of the Followings:

- A)** In a multiple choice examination, there are 20 questions. Each question has four alternatives [4]
answers following it and student must select the one correct answer. Four marks are given for
correct answer and one mark is deducted for every wrong answer. A student must secure at
least 50% of maximum possible marks to pass the examination. Suppose that a student has not
studied at all so that he decides to select the answers to questions on a random basis. What is
the probability that he will pass in examination?
- B)** A car hire firm has two cars which it hires out day by day. The number of demands for a car on [4]
each day is distributed as a Poisson variate with mean 1.5. Calculate the proportion of days on
which.
(i) Neither car is used (ii) Some demand will refuse
- C)** (i) In a normal distribution, 31% of the items are under 45 and 8% are over 64. find the [4]
mean and standard deviation of the distribution.
(ii) What % of the items differ from the mean by number not more than 5?
- D)** To avoid accusations of sexism in a college class equally populated by male and female students, [4]
the professor flips a fair coin to decide whether to call upon a male or female student to answer
a question directed to the class. The professor will call upon a female student if a tails occurs.
Suppose the professor does this 1000 times during the semester.
(i) What is the probability that he calls upon a female student at least 530 times?
(ii) What is the probability that he calls upon a female student at most 480 times?

Q. No. 4 Solve the following questions:

- A)** Prove that limits of Correlation Coefficient are lies between $-1 \leq r \leq 1$. [4]
- B)** From the following data, calculate the coefficient of rank correlation between x and y . [4]
- | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|
| $x:$ | 32 | 35 | 49 | 60 | 43 | 37 | 43 | 49 | 10 | 20 |
| $y:$ | 40 | 30 | 70 | 20 | 30 | 50 | 72 | 60 | 45 | 25 |
- C)** Test the significance of the correlation for the following values based on the number of [4]
observations:
(i) 10 and (ii) 100, $r = +0.4$, and $r = +0.9$

Q. No. 5 Solve the following questions:

- A)** For 100 students of a class, the regression equation of marks in Statistics (X) on the marks in [4]
commerce in (Y) is $3Y - 5X + 180 = 0$. The mean mark in Commerce is 50 and variance of
marks in Statistics is $\frac{4}{9}$ th of the variance of marks in Commerce. Find the mean marks in
Statistics and the coefficient of correlation between marks in the two subjects.
- B)** The data about the sales and advertisement expenditure of a firm is given below: [4]
- | | Sales
(In crores of Rs.) | Advertisement expenditure
(In crores of Rs.) |
|---------------------|-----------------------------|---|
| Means | 40 | 6 |
| Standard Deviations | 10 | 1.5 |
- Coefficient of correlation = $r = 0.9$
- (i) Estimate the likely sales for a proposed advertisement expenditure of Rs. 10 crores.
(ii) What should be the advertisement expenditure if the firm proposes a sales target of 60
crores of rupees?

- C) Prove that "Regression coefficients are independent of change of origin but not of scale." [4]

Q. No. 6 Attempt any THREE of the Followings:

- A) Find the equation of line by using Least Square Method: [4]

X	2	3	5	7	9
Y	4	5	7	10	15

- B) Fit the Second Degree Parabola to the following: [4]

X	0	1	2	3	4
Y	1	1.8	1.3	2.5	6.3

- C) In a sample of 1000 people, 540 are rice eaters and the rest are wheat eaters. Can we assume that both rice and wheat are equally popular at 1% level of significance? [4]

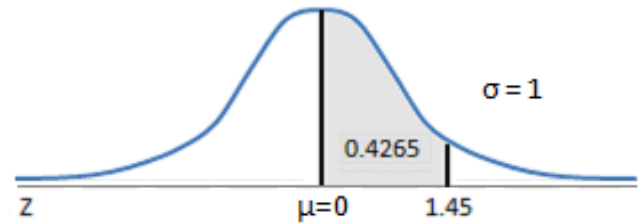
[Z value at 1% level of significance is 2.58]

- D) (i) The school principal wants to test if it is true what teachers say - that high school juniors use the computer an average 3.2 hours a day. What are our null and alternative hypotheses? [4]
- (ii) We have a medicine that is being manufactured and each pill is supposed to have 14 milligrams of the active ingredient. What are our null and alternative hypotheses?

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Areas Under the One-Tailed Standard Normal Curve

This table provides the area between the mean and some Z score.
For example, when Z score = 1.45 the area = 0.4265.



Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998
3.5	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998
3.6	0.4998	0.4998	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.7	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.8	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.9	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000