

**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY,
LONERE**

Regular End Semester Examination – Summer 2022

Course: B. Tech.

Branch : IT

Subject Code & Name: BTITC402 (Probability and Statistics)

Semester : IV

Max Marks: 60

Date: 24/08/2022

Duration: 3.45 Hr.

Instructions to the Students:

1. All the questions are compulsory.
2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question.
3. Use of non-programmable scientific calculators is allowed.
4. Assume suitable data wherever necessary and mention it clearly.

(Level/
CO) Mark

Solve Any Two of the following.

Q.1 State and Prove Addition theorem of probability.

CO1 6

A) From a pack of 52 cards, two cards are drawn at random. What is the probability that (i) both cards are kings. (ii) both cards are red.

CO2 6

B) If two fair dice is rolled, find the probability of getting (i) the sum more than or equal to 10 (ii) the sum equal to 6.

CO2 6

Solve Any Two of the following.

Q.2 Find Mean, variance and standard deviation of the probability distribution given below:

CO3 6

x	0	1	2	3
P(x)	1/8	3/8	3/8	1/8

B) A binomial variate X satisfies the relation $9P(X=4) = P(X=2)$ when $n=6$. Find the parameter P of the binomial distribution.

CO2 6

C) A normal distribution has mean 20 and standard deviation 5. Find $P(15 < X < 35)$. (Given standard normal area from $z = 0$ to $z = 1$ is 0.3413 and that from $z = 0$ to $z = 3$ is 0.4987)

CO2 6

Solve Any Two of the following.

Q.3 Calculate Karl Pearson's coefficient of correlation between expenditure on advertising and sales from given data.

CO3 6

Expenditure (x)	39	65	62	90	82	75	25	98	36	78
Sales (y)	47	53	58	86	62	68	60	91	51	84

B) Suppose we have ranks of 8 students of B.Sc. in Statistics and

CO3 6

Mathematics. On the basis of rank we would like to know that to what extent the knowledge of the student in Statistics and Mathematics is related.

Ranks in Statistics	1	2	3	4	5	6	7	8
Ranks in Mathematics	2	4	1	5	3	8	7	6

C)

Obtain the lines of regression 'y on x' for the following data

X	1	2	3	4	5	6	7
Y	9	8	10	12	11	13	14

CO3

6

Q.4

Solve Any Two of the following.

A)

What is Hypothesis? Explain errors in testing of hypothesis.

CO1

6

B)

In a sample of 600 men from a certain large city 75% are found smokers. In another sample of 900 men from another large city 50% are smokers. Do the data indicate that the cities are significantly different with respect to the prevalence of smoking among men?

CO3

6

C)

A coin was tossed 200 times and the head turned up 108 times. Test the hypothesis that the coin is unbiased at 5% level of significance.

CO3

6

ENGG SOLUTION

Q. 5

Solve Any Two of the following.

A)

Define Markov process and stochastic process. Explain transition probability matrix and its Diagrammatic representation.

CO1

6

B)

By the method of least squares, fit a straight line of the form $y = a + bx$ to the following data. Also estimate value of 'y' for $x = 6$.

CO4

6

x	1	2	3	4	5
y	14	27	40	55	68

C)

Fit a second degree parabola of the form $y = a + bx + cx^2$ to the following data. Also estimate value of y for $x = 5$.

CO4

6

x	1	2	3	4	5
y	1	1.3	1.8	2.5	6.3

*** End ***

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY,
LONERE-RAIGAD-402103

Summer Semester Examination, 2022

B.Tech. Computer Engineering /CSE/ CSE(AI&ML).
Semester: IV Max. Marks: 60

Subject: Probability Theory & Random Processes/Probability
and Statistics [BTBS404]

Date: 24/08/2022

Time: 3.45 Hrs

Instructions to the Student:

1. Each question carries 12 marks
2. All Questions are compulsory
3. Illustrate your answers with neat sketches diagram etc. wherever necessary.
4. If some pare or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly.

Que: 1 Attempt any TWO of the following questions. Marks [12]

A] i) What is the chance that a non-leap year should have fifty three Sundays?

ii) Urn A contains 5 red and 3 white memory chips; the urn B contains 2 red and 6 white memory chips. If a chip is drawn from each box what is the probability that they are both of the same colour?

B] A committee of 4 persons is to be appointed from 3 officers of the production department, 4 officers of the purchase department, 2 officers of the sales department and 1 chartered accountant. Find the probability of the committee in the following manner:

i) There must be one from each category.

ii) It should have at least one from the purchase department.

iii) The chartered accountant must be in the committee

C] In a certain college 25% of boys and 10% of girls are studying mathematics. The girls constitute 60% of the students. If a student is selected at random and is found to be studying mathematics, find the probability that the student is a (i) girl and (ii) a boy. [12]

Que: 2 Attempt any TWO of the following questions.

A] i) A continuous random variable has the probability density function $f(x)f(x)$ as

$$f(x) = \begin{cases} ke^{-x}, & x > 0 \\ 0, & \text{elsewhere} \end{cases}$$

Determine the constant k .

ii) Obtain the probability distribution of X , the number of heads in three tosses of a coin. Also find the expected number of heads appearing when a fair coin is tossed three times.

B) Fit a Binomial distribution to the following observation:

x	0	1	2	3	4	5
f	2	14	20	34	22	8

C) Sacks of sugar packed by an atomic loader having an average weight of 100 kg with standard deviation 0.250 kg. Assuming normal distribution find chance of sack get weighing less than 99.5 kg. (Given: $A(2) = 0.4772$)

[12]

Que: 3 Attempt the following questions.

A) From the following data, calculate the rank correlation coefficient by Karl Pearson's method

x	6	2	10	4	8
y	9	11	?	8	7

Arithmetic means of X and Y series are 6 and 8 respectively.

B) From the following table, calculate the coefficient of correlation by Karl Pearson's method

x	48	33	40	9	16	16	65	24	16	57
y	13	13	24	6	15	4	20	9	6	19

Que: 4 Attempt the following questions.

[12]

A) Obtain the least square regression line of y on x for the following data.

x_i	6	2	10	4	8
y_i	9	11	5	8	7

Also, obtain an estimate of y which should correspond on the average to $x = 5$.

B) The equation of two lines are $2x = 8 - 3y$ and $2y = 5 - x$. Find the mean values of x and y . Find the value of correlation coefficient.

Que: 5 Attempt the following questions.

[12]

A) i) A die was thrown 6000 times and a throw of 5 or 6 was obtained 3240 times. On the assumption of random throwing, do the data indicate an unbiased die?

ii) There are 30% and 25% respectively of haired people in the two large populations. Is this difference likely to be hidden in samples of 1200 and 900 respectively from the two populations?

B) A full-time Ph.D. students received an average salary of \$12,837 according to U.S. Department of Education. The dean of graduate studies at a large state University feels that Ph.D. students in his state earn more than this. He surveys 44 randomly selected students and finds their average salary is \$14,445 with a standard deviation of \$150. With $\alpha = 0.05$, $\alpha = 0.05$, is the dean correct?

ENGG SOLUTION

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

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

Subject with Subject Code: Probability and Statistics [BTCOC402]

Semester: IV

Marks: 60

Date: 16 / 05 / 2019

Time: 3 Hrs.

- 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.

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 4/9th 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?

undefined

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

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]

ENGG SOLUTION

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

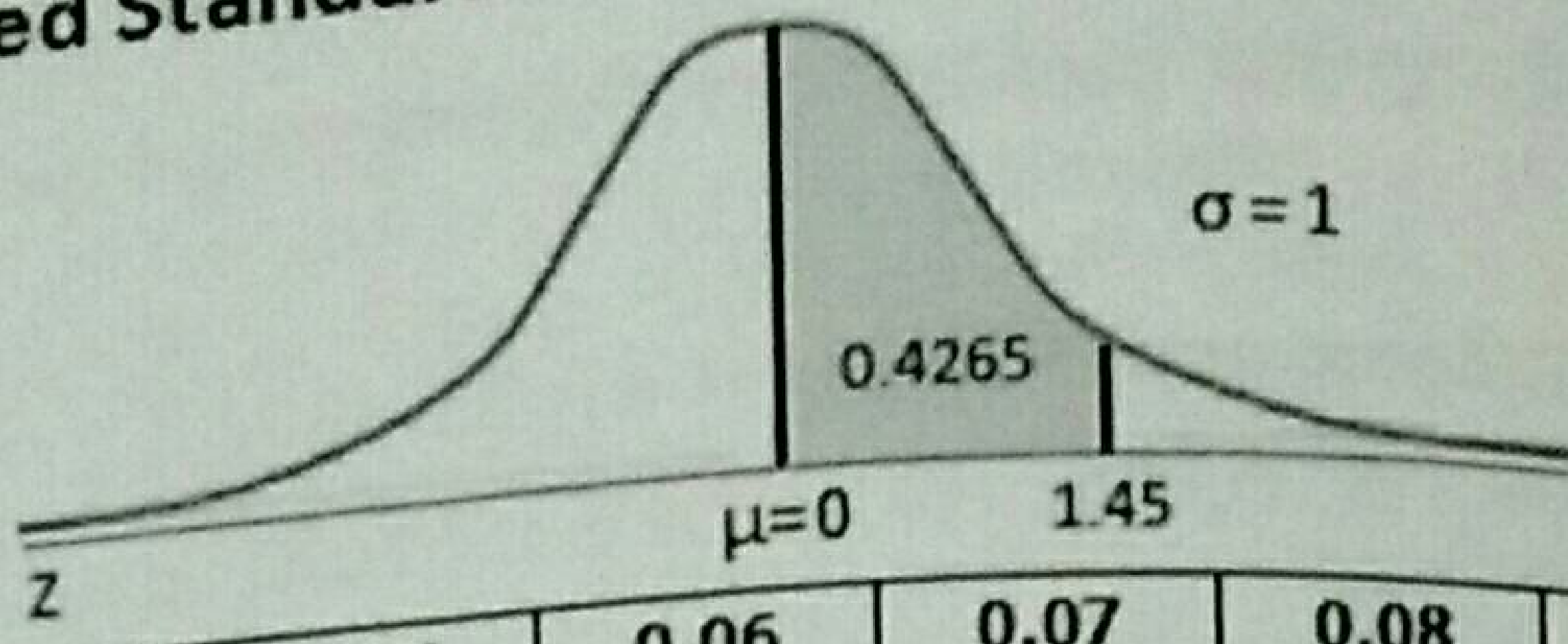
D) (i) The school principal wants to test if it is true what teachers say - that high school juniors use the computer an average 3.2 hours a day. What are our null and alternative hypotheses? [4]

(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