



PAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

QUALIFICATION: Bachelor of Science ; Bachelor of Science in Applied Mathematics and Statistics	
QUALIFICATION CODE: 07BOCS	LEVEL: 5
COURSE CODE: PBT501S	COURSE NAME: PROBABILITY THEORY 1
SESSION: NOVEMBER 2019	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 90

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
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MODERATOR:	Dr NTIRAMPEBA, D

INSTRUCTIONS
<ol style="list-style-type: none">1. Answer ALL the questions in the booklet provided.2. Show clearly all the steps used in the calculations.3. All written work must be done in blue or black ink and sketches must be done in pencil.

PERMISSIBLE MATERIALS

1. Non-programmable calculator without a cover.

ATTACHMENTS

1. Standard Normal Probability Distribution Table

THIS QUESTION PAPER CONSISTS OF 3 PAGES (Including this front page)

QUESTION 1 [15 Marks]

Consider the contingency table below.

	Production	Sales	Management	Others	Total
Undergraduate	92	76	24	65	257
Graduate	19	15	62	41	137
Postgraduate	15	26	37	28	106
Total	126	117	123	134	500

If one employee is randomly selected, what is the probability that he or she:

- (1.1) is either a postgraduate or belongs to sales department? [3]
- (1.2) is an undergraduate given that belongs to production department? [3]
- (1.3) is neither a postgraduate nor belongs to management department? [4]
- (1.4) does not belong to sales department given that is not a graduate? [5]

QUESTION 2 [16 Marks]

Research has shown that, for a certain company, 7% of plant A products are defective, 92% of plant B products are non-defective, 10% of plant C products are defective, and 95% of plant D products are non-defective. Of all the products manufactured by this company, 25% come from plant A, 15% from plant B, and 12% from plant C and the rest from plant D. An inspector has just randomly selected one product from the warehouse of this company.

- (2.1) What is the probability that it is non-defective? [8]
- (2.2) If it is non-defective, what is the probability that it came from plant B? [3]
- (2.3) If it is defective, what is the probability that it came from plant D? [5]

QUESTION 3 [14 Marks]

The probability mass function of a discrete random variable X is given by

$$p(x) = \begin{cases} \frac{k}{6-x}, & x = 2, 3, 4, 5 \\ 0, & \text{elsewhere} \end{cases}$$

- (3.1) Find the value of a constant k [4]
- (3.2) Construct a probability mass table for X [2]
- (3.3) Find the mean of X [3]

(3.4) Find the variance of X [5]

QUESTION 4 [10 Marks]

Research has shown that about 2% of all products produced by BVH Company are defective. A quality inspector has just sampled 300 products from this company.

Using the Poisson distribution, what is the probability that:

(4.1) exactly 12 of them are defective? [4]

(4.2) at least 8 of them are defective? [6]

QUESTION 5 [15 Marks]

The marks of 600 students in Statistics test are normally distributed with mean 60 and variance 25.

(5.1) If one student is randomly selected, what is the probability that scored between 55 and 70? [4]

(5.2) If pass mark is 50, how many students passed the test? [5]

(5.3) If only 6 students passed with distinction, what is the distinction mark? [6]

QUESTION 6 [20 Marks]

The probability density function of a continuous random variable X is given by

$$f(x) = \begin{cases} k(x^2 - x), & \text{if } 1 \leq x \leq 3 \\ 0, & \text{otherwise} \end{cases}$$

Please, give all answers as vulgar fractions NOT decimals.

(6.1) Find the value of a constant k [3]

(6.2) Find the mean of X [6]

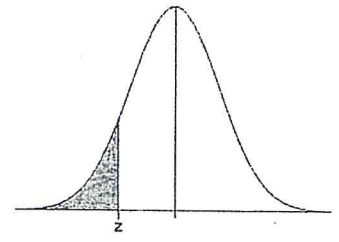
(6.3) Find the variance of X [7]

(6.4) Find the coefficient of variation of X [4]

END OF QUESTION PAPER

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Standard Normal Cumulative Probability Table



Cumulative probabilities for NEGATIVE z-values are shown in the following table:

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
-3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
-3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
-3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
-3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
-2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
-2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
-2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
-2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
-2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
-2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
-2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
-2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
-2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
-2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
-1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
-1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
-1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
-1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
-1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
-1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
-1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
-1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
-1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
-1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
-0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
-0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
-0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
-0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
-0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
-0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
-0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
-0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
-0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641