

Question No. 3 (20 Marks)

- (i) A team of three is to be chosen from 4 boys and 5 girls. If X is the random variable of the number of girls in the team, find the following.
- (a) The probability distribution of X . **(8 Marks)**
 - (b) The expected value of X . **(3 Marks)**
 - (c) The variance of X . **(4 Marks)**
- (ii) A student had grades of 82, 86, 75, 90 and 81 respectively, for the first exam, second exam, third exam, assignments and attendance.

An instructor grades exam marks as follows:

Scheme	First Exam	Second Exam	Third Exam	Assignments	Attendance
Percentage	20	25	30	15	10

Find the students weighted average mark.

(5 Marks)
(Total 20 Marks)

Question No. 4 (20 Marks)

- (i) The random variable x has a normal distribution with standard deviation 25. It is known that the probability of a value x exceeds 140 is 0.8925. Find the mean of the probability distribution. **(10 Marks)**
- (ii) The random variable x is uniformly distributed with mean 4 and standard deviation $\sqrt{3}$.
- (a) Find the probability distribution function of x and sketch its graph. **(6 Marks)**
 - (b) Find the probability that a value of x is within one standard deviation of the mean. **(4 Marks)**

(4 Marks)
(Total 20 Marks)

Question No. 5 (20 Marks)

The Dean of the science faculty of a university claims that 20% of the university graduates are women. In a graduating class of 150 students, there were 39 females.

- (a) State the hypothesis and identify the claim. **(2 Marks)**
- (b) Compute the test statistic. **(9 Marks)**
- (c) Test the claim at $\alpha = 0.05$ significance level. **(7 Marks)**
- (d) Does the result suggest that the Dean's claim is acceptable? **(2 Marks)**

(Total 20 Marks)

Question No. 6 (20 Marks)

- (i) A company has an annual demand for 1000 units, ordering cost of Rs.100 per order, and carrying cost of Rs.100 per unit per year. Stock costs are estimated to be Rs.400 each time the company has an exposure to stock out.
- (a) Find the economic order quantity. **(10 Marks)**
 - (b) Find how much safety stock is justified by the carrying costs. **(3 Marks)**
- (ii) Derive a set of inequalities to describe the region of the triangle with vertices $A(2,4)$, $B(4,6)$ and $C(2,10)$. **(7 Marks)**

(Total 20 Marks)

Question No. 7 (20 Marks)

The marks of fifty candidates in a statistics test for which the maximum mark was 100 are as follow:

70	70	70	10	100	100	80	90	30	60
70	60	80	30	70	20	90	80	60	50
80	30	40	80	60	60	60	50	50	80
50	40	70	90	90	50	60	100	40	20
40	50	60	100	70	90	50	30	60	40

- (a) Using tally marks, present this information as a frequency distribution table. **(3 Marks)**
- (b) Draw a histogram. Hence construct a frequency polygon. **(5 Marks)**
- (c) State the mode of the distribution **(1 Marks)**
- (d) From the frequency distribution table calculate the mean mark. **(4 Marks)**
- (e) Draw a cumulative frequency curve. **(4 Marks)**
- (f) From the cumulative frequency table calculate the median mark. **(3 Marks)**
- (Total 20 Marks)**

Question No. 8 (20 Marks)

- (i) The activity times and precedent relations are given below for a project.

Activity	A	B	C	D	E	F	G	H	I
Immediate Predecessor	-	A	B	B	D	C,E	E	F	G,H
Activity time	4	3	6	5	4	3	6	2	5

- (a) Draw a network for the project. **(10 Marks)**
- (b) Which is the critical path for the project? **(2 Marks)**
- (ii) Following are the quarterly sales and its' time series.

Quarter	Sales (Year)	
	2006	2007
I	40	64
II	22	14
III	18	-
IV	16	-

- (a) Using 4-moving average determine the trend and cyclical components of the time series for the quarters III and IV of 2007. **(4 Marks)**
- (b) Determine the seasonal and irregular components for the quarters III and IV of 2007. **(4 Marks)**
- (Total 20 Marks)**

Question No. 9 (20 Marks)

- (i) Explain briefly the characteristics of "A binomial experiment". **(10 Marks)**
- (ii) If an employee is given a cut in pay of 5%, find the percent raise that would return the salary to the original amount. **(5 Marks)**
- (ii) An institute conducts a survey of its employees in an attempt to determine their typical annual salary. Would employees with very low salaries be likely to respond? How would this affect the result? Identify one other factor that might affect the result. **(5 Marks)**
- (Total 20 Marks)**

List of Formulae

1. **Consumer surplus:**

This is a measure of the amount of money that consumers would have been willing to pay above what they actually paid.

2. **Compound interest formula:**

$A = P(1+r)^{mn}$, where P = principal, $r = \frac{i}{100m}$, i = annual interest rate, m = number of compounding periods per year, n = number of years, and A = amount accumulated after n years.

3. **Expected value and variance:**

$$E(x) = \sum xp(x)$$

$$V(x) = E(x^2) - [E(x)]^2$$

with the usual notations.

4. **Mean and standard deviation of a uniform distribution:**

$$\text{Mean} = \frac{a+b}{2}$$

$$\text{S.D.} = \frac{b-a}{\sqrt{12}}$$

Where a and b are the parameters of the distribution.

5. **Test statistic for a large sample population proportions:**

$$Z = \frac{p - p_0}{\sigma_p} \text{ where } \sigma_p = \sqrt{\frac{p_0 q_0}{n}}, q_0 = 1 - p_0 \text{ with the usual notations.}$$

6. **Economic order quantity:**

$$Q = \sqrt{\frac{2D(C_0 + C_s)}{C_c}}$$

Where D = Annual demand

C_0 = Ordering cost

C_s = Stock costs

C_c = Carrying cost

Q = Economic order quantity

Present value table

Present value of 1.00 unit of currency, that is $(1 + r)^{-n}$ where r = interest rate; n = number of periods until payment or receipt.

Periods (n)	Interest rates (r)									
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751
4	0.961	0.924	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621
6	0.942	0.888	0.837	0.790	0.746	0.705	0.666	0.630	0.596	0.564
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239
16	0.853	0.728	0.623	0.534	0.458	0.394	0.339	0.292	0.252	0.218
17	0.844	0.714	0.605	0.513	0.436	0.371	0.317	0.270	0.231	0.198
18	0.836	0.700	0.587	0.494	0.416	0.350	0.296	0.250	0.212	0.180
19	0.828	0.686	0.570	0.475	0.396	0.331	0.277	0.232	0.194	0.164
20	0.820	0.673	0.554	0.456	0.377	0.312	0.258	0.215	0.178	0.149

Periods (n)	Interest rates (r)									
	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	0.812	0.797	0.783	0.769	0.756	0.743	0.731	0.718	0.706	0.694
3	0.731	0.712	0.693	0.675	0.658	0.641	0.624	0.609	0.593	0.579
4	0.659	0.636	0.613	0.592	0.572	0.552	0.534	0.516	0.499	0.482
5	0.593	0.567	0.543	0.519	0.497	0.476	0.456	0.437	0.419	0.402
6	0.535	0.507	0.480	0.456	0.432	0.410	0.390	0.370	0.352	0.335
7	0.482	0.452	0.425	0.400	0.376	0.354	0.333	0.314	0.296	0.279
8	0.434	0.404	0.376	0.351	0.327	0.305	0.285	0.266	0.249	0.233
9	0.391	0.361	0.333	0.308	0.284	0.263	0.243	0.225	0.209	0.194
10	0.352	0.322	0.295	0.270	0.247	0.227	0.208	0.191	0.176	0.162
11	0.317	0.287	0.261	0.237	0.215	0.195	0.178	0.162	0.148	0.135
12	0.286	0.257	0.231	0.208	0.187	0.168	0.152	0.137	0.124	0.112
13	0.258	0.229	0.204	0.182	0.163	0.145	0.130	0.116	0.104	0.093
14	0.232	0.205	0.181	0.160	0.141	0.125	0.111	0.099	0.088	0.078
15	0.209	0.183	0.160	0.140	0.123	0.108	0.095	0.084	0.079	0.065
16	0.188	0.163	0.141	0.123	0.107	0.093	0.081	0.071	0.062	0.054
17	0.170	0.146	0.125	0.108	0.093	0.080	0.069	0.060	0.052	0.045
18	0.153	0.130	0.111	0.095	0.081	0.069	0.059	0.051	0.044	0.038
19	0.138	0.116	0.098	0.083	0.070	0.060	0.051	0.043	0.037	0.031
20	0.124	0.104	0.087	0.073	0.061	0.051	0.043	0.037	0.031	0.026

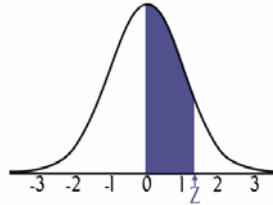
Cumulative present value of 1.00 unit of currency per annum, Receivable or

Payable at the end of each year for n years $\left[\frac{1-(1+r)^{-n}}{r} \right]$

Periods (n)	Interest rates (r)									
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487
4	3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791
6	5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355
7	6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868
8	7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335
9	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759
10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145
11	10.368	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495
12	11.255	10.575	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814
13	12.134	11.348	10.635	9.986	9.394	8.853	8.358	7.904	7.487	7.103
14	13.004	12.106	11.296	10.563	9.899	9.295	8.745	8.244	7.786	7.367
15	13.865	12.849	11.938	11.118	10.380	9.712	9.108	8.559	8.061	7.606
16	14.718	13.578	12.561	11.652	10.838	10.106	9.447	8.851	8.313	7.824
17	15.562	14.292	13.166	12.166	11.274	10.477	9.763	9.122	8.544	8.022
18	16.398	14.992	13.754	12.659	11.690	10.828	10.059	9.372	8.756	8.201
19	17.226	15.679	14.324	13.134	12.085	11.158	10.336	9.604	8.950	8.365
20	18.046	16.351	14.878	13.590	12.462	11.470	10.594	9.818	9.129	8.514

Periods (n)	Interest rates (r)									
	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	1.713	1.690	1.668	1.647	1.626	1.605	1.585	1.566	1.547	1.528
3	2.444	2.402	2.361	2.322	2.283	2.246	2.210	2.174	2.140	2.106
4	3.102	3.037	2.974	2.914	2.855	2.798	2.743	2.690	2.639	2.589
5	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127	3.058	2.991
6	4.231	4.111	3.998	3.889	3.784	3.685	3.589	3.498	3.410	3.326
7	4.712	4.564	4.423	4.288	4.160	4.039	3.922	3.812	3.706	3.605
8	5.146	4.968	4.799	4.639	4.487	4.344	4.207	4.078	3.954	3.837
9	5.537	5.328	5.132	4.946	4.772	4.607	4.451	4.303	4.163	4.031
10	5.889	5.650	5.426	5.216	5.019	4.833	4.659	4.494	4.339	4.192
11	6.207	5.938	5.687	5.453	5.234	5.029	4.836	4.656	4.486	4.327
12	6.492	6.194	5.918	5.660	5.421	5.197	4.988	4.793	4.611	4.439
13	6.750	6.424	6.122	5.842	5.583	5.342	5.118	4.910	4.715	4.533
14	6.982	6.628	6.302	6.002	5.724	5.468	5.229	5.008	4.802	4.611
15	7.191	6.811	6.462	6.142	5.847	5.575	5.324	5.092	4.876	4.675
16	7.379	6.974	6.604	6.265	5.954	5.668	5.405	5.162	4.938	4.730
17	7.549	7.120	6.729	6.373	6.047	5.749	5.475	5.222	4.990	4.775
18	7.702	7.250	6.840	6.467	6.128	5.818	5.534	5.273	5.033	4.812
19	7.839	7.366	6.938	6.550	6.198	5.877	5.584	5.316	5.070	4.843
20	7.963	7.469	7.025	6.623	6.259	5.929	5.628	5.353	5.101	4.870

Normal Distribution Table



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

End of Question Paper