

- Note:**
1. Attempt any 4 Questions
 2. All questions carry equal (20) marks
 3. Figures to the right indicate marks
 4. Assume any data, if required, and state them clearly
 5. Attempt sub questions in order

Q1) a) Box 'A' contains 3 red and 32 blue marbles, while Box 'B' contains 2 red and 8 blue marbles. A fair coin is tossed. If the coin turns up heads, a marble is chosen from Box 'A'; if it turns up tails, a marble is chosen from Box 'B'. Find the probability that a red marble is chosen. [5]

b) The distribution function for a random variable X is [5]

$$F(x) = \begin{cases} 1 - e^{-2x} & x \geq 0 \\ 0 & x < 0 \end{cases}$$

- Find i) the density function
 ii) the probability that $x > 2$
 iii) the probability that $-3 < x \leq 4$

c) Define Gamma distribution. Show that the mean and variance of the gamma distribution are given by

$$\text{i) } \mu = \alpha\beta \quad \text{ii) } \sigma^2 = \alpha\beta^2 \quad [10]$$

Q2) a) A population consists of the five numbers 2, 3, 6, 8, 11. Consider all possible samples of size two which can be drawn with replacement from this population. [10]

- Find i) The mean of the population.
 ii) the standard deviation of the population.
 iii) the mean of the sampling distribution of the means.
 iv) the standard deviation of the sampling distribution of means; i.e. the standard error of means.

b) The average prices of stocks and bonds listed on the New York stock exchange during the years 1950-1959 are given in the table. [10]

- i) Find the correlation coefficient
 ii) Interpret the results.

Year	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Average price of stocks	35.22	39.87	41.85	43.23	40.06	53.29	54.14	49.12	40.17	55.15
Average price of Bonds (dollars)	102.43	100.93	97.43	97.81	98.32	100.07	97.08	91.59	94.85	94.65

[TURN OVER

Q3) You are the materials manager of a very reputed construction company. On a prestigious construction project, your company requires 2 lakh cement bags annually. Cement bag cost including taxes and transportation is Rs. 375/- per bag. Ordering cost is Rs. 5,000/- per order. Inventory carrying cost is 15% of average annual inventory. Overstocking cost may be computed as follows: [20]

Duration of overstock in months	% of Basic unit price
upto 3, inclusive	2
3.1 to 6	2.5
beyond six	4.5

Under-stocking cost may be considered as 3% of the cost of the total cement bags causing the under-stocking.

The monthly consumption of cement is as follows:

Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
8000	12000	16000	20000	24000	32000	26000	22000	16000	12000	8000	4000

Decide suitable order Quantity.

Q4) a) The density function of a random variable X is $f(x) = \begin{cases} e^{-x} & x \geq 0 \\ 0 & \text{otherwise} \end{cases}$

Find a) $E(X)$ b) $E(X^2)$ c) $E[(X - 1)^2]$ [5]

b) An urn holds 5 white & 3 black marbles. If two marbles are drawn at random without replacement & X denote the number of white marbles, Find the probability distribution for X. [5]

c) Table shows the weights z to the nearest half kilogram, heights x to the nearest centimeter, and ages y to the nearest year, of 12 boys. [10]

- Find the least square regression equation of z on x and y.
- Determine the estimated values for z from the given values of x and y.
- Estimate the weight of a boy who is 9 years old and 137cm tall.

Weight(z)	29	32	24	30.5	25	26.5	35	26	25.5	23	34.5	31
Height(x)	145	150	124	157	130	127	140	122	132	107	155	145
Age(y)	8	10	5	11	8	7	10	9	10	6	12	9

Q5) a) Define simulation, what are the various characteristics necessary for simulation? Explain any two of them. [10]

b) The mean inside diameter of a sample of 200 washers produced by a machine is 12mm & the standard deviation is 0.02 mm. The purpose for which these washers are intended allows a maximum tolerance in the diameter of 11.97mm to 12.03mm, otherwise the washers are considered defective. Determine the percentage of defective washers produced by the machine, assuming the diameters are normally distributed. [10]

[TURN OVER

- Q6) a) Prepare a simulation model based on Monte-Carlo simulation to generate a range of random numbers, for the mean for the actual cost of 20 projects of similar nature as given below. (Random number table is not required as you are not to run/operate the simulation) Select suitable range for each. [10]

Project No.	Project cost in Lakh Rs.
1	35
2	20
3	25
4	37.2
5	55.3
6	43
7	23.8
8	62.3
9	18.0
10	15.0
11	24.0
12	28.0
13	33.9
14	43.9
15	21.9
16	39.9
17	44.3
18	31.2
19	11.5
20	13.5

- b) Calculate the standard error of estimate, s_{yx} for the data given below [10]

Grades on 1 st quiz (x)	6	5	8	8	7	6	10	4	9	7
Grades on 2 nd quiz (y)	8	7	7	10	5	8	10	6	8	6

**Course: M.E. (CIVIL) (CONSRUCTION ENGG. &
MANAGMENT) (CBSGS) (SEM I) (Prog-644)**

Q.P Code: 5229

Correction:

**Q1 a) Read as 2 blue marbles instead of 32
blue marbles.**

Query Update time: 12/05/2015 12:21PM