

II B.Tech II Semester Supplementary Examinations, April/May 2005
PROBABILITY AND STATISTICS
 (Common to Civil Engineering, Mechanical Engineering, Computer Science
 & Engineering, Chemical Engineering, Information Technology,
 Mechatronics and Production Engineering)

Time: 3 hours

Max Marks: 70

Answer any FIVE Questions
All Questions carry equal marks

- If A is independent of B, $B \cup C$ and $B \cap C$, show that it is also independent of C .
 - In a group of employed persons, 28% are women; 60% of the men and 40% of the women pay income tax . Find the probability that a randomly selected person does not pay income tax.
- If is known from past experience that the daily demand for a perishable product is as shown in the following table

Number of orders	3	4	5	6	7	8	9
Probability	0.05	0.12	0.20	0.24	0.17	0.14	0.08

If each item costs Rs.35 (including the cost of carrying it in stock), it sells for Rs.50 provided that it is in stock, and it represents a total loss if it remains in stock at the end of a day, how many items should be stocked each day so as to minimize the expected profit.

- A random variable x has the following probability function:

x :	-2	-1	0	1	2	3
p(x) :	0.1	k	0.2	2k	0.3	k

Find the value of k and the mean and variance of x.

- Show that for the normal distribution $\mu_{2r+1} = 0$, ($r = 0,1,2,\dots$).
 - $\mu_{2r} = 1.3.5\dots(2r-1)\sigma^{2r}$, ($r = 0,1,2,\dots$).
- A random sample of size 100 is taken from an infinite population having the mean $\mu = 76$ and the variance of $\sigma^2 = 256$. What is the probability that \bar{X} will be between 75 and 78?
 - If two independent random samples of size $n_1 = 9$ and $n_2 = 16$ are taken from a normal populations, what is the probability that the variance of the first sample will be at least four times as large as the variance of the second sample?
- A coin is tossed 960 times and it falls with head upwards 184 times. Is the coin biased?

- (b) A die is thrown 9000 times and a throw of 3 or 4 observed 3240 times. Show that the die cannot be regarded as an unbiased one.
6. (a) It is desired to test the hypothesis $\mu_0 = 40$ against the alternative hypothesis $\mu_1 = 42$ on the basis of a random sample from a normal population with the standard deviation $\sigma = 4$. If the probability of a Type I error is to be 0.05 and the probability of a Type II error is to be 0.24, find the required size of the sample.
- (b) The diameter of rotor shafts in a lot has a mean of 0.249 inch and a standard deviation of 0.003 inch. The inner diameters of bearings in another lot have a mean of 0.255 inch and a standard deviation of 0.002 inch. (i) What are the mean and the standard deviation of the clearances between shafts and bearings selected from these lots? (ii) If a shaft and a bearing are selected at random, what is the probability that the shaft will not fit inside the bearing? (Assume that both dimensions are normally distributed)
7. (a) Using least square method, fit a second degree polynomial. Estimate y at x=0.65.

x	0	1	2	3	4	5	6	7	8
y	12.0	10.5	10.0	8.0	7.0	8.0	7.5	8.5	9.0

- (b) A chemical company, wishing to study the effect of extraction time on the efficiency of an extraction, obtained the data shown in the following table

Extracting time x	27	45	41	19	35	39	19	49	15	31
Extraction Efficiency y	57	64	80	46	62	72	52	77	57	68

Fit a straight line to the form $y = a + b x$

8. Find the correlation coefficient for the following bivariate frequency distribution.

		X			
		18	19	20	21
Y	10-20	4	2	2	
	20-30	5	4	6	4
	30-40	6	8	10	11
	40-50	4	4	6	8
	50-60		2	4	4
	60-70		2	3	1
