II B. Tech I Semester Supplementary Examinations, October/November - 2020
PROBABILITY AND STATISTICS
(Com. to CSE, IT)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1 a) The chances of X,Y,Z becoming managers of a certain company are 4:2:3.The probabilities that bonus scheme will be introduced if X,Y,Z become managers, are 0.3.0.5 and 0.8 respectively. Using Baye's theorem find out [7M]
i) The probability that the bonus scheme will be introduced.
ii) If the bonus scheme has been introduced, What is the probability that X is appointed as a manager?

b) The odds against A solving a certain problem are 4:3 and odds in favour of B solving the same problem are 7:5.What is the probability that i) the problem will be solved. ii) the problem cannot be solved. iii) Atleast one of them will be solved. iv) Only one of them will be solved.. [8M]

2 a) A random variable X has the following probability function: [8M]

X	-2	-1	0	1	2	3
$P(X)$	0.1	k	0.2	2k	0.3	k

Find i) value of k, ii) $F(X=2)$, iii) $P(X \le 0)$ and iv) $P(0 < X < 3)$.

b) A random variable X has the density function $f(x) = \begin{Bmatrix} 2x, & 0<x<1 \\ 0, & \text{elsewhere} \end{Bmatrix}$. Find [7M]
i) $P\left(X < \frac{1}{2}\right)$, ii) $P\left(\frac{1}{4} < X < \frac{1}{2}\right)$ and iii) $P\left(X > \frac{3}{4} | X > \frac{1}{2}\right)$.

3 a) In a distribution exactly normal, 7% of the items are under 35 and 89% are under 63.What are the mean and standard deviation of the distribution? Given that $P(0 \le Z \le 1.23) = 0.39$ and $P(0 \le Z \le 1.48) = 0.43$. [7M]

b) i)The mean and variance of a binomial distribution are 16 and 8 respectively. Find $P(X=0)$, $P(X=1)$ and $P(X \ge 2)$ [8M]
ii) Prove that the sum of two independent Poisson variates is also a Poisson variate.

4 a) Of n_1 randomly selected male smokers, x_1 smoked filter cigarettes, whereas of n_2 randomly selected female smokers, x_2 smoked filter cigarettes. Let p_1 and p_2 denote the probabilities that a randomly selected male and female, respectively, smoke filter cigarettes. [7M]
i).Show that $(x_1/n_1)-(x_2/n_2)$ is an unbiased estimator for $p_1 - p_2$.
ii). If $n_1 = n_2$=200, x_1= 127, and x_2=176, use the estimator in part (i) to obtain an estimate of $p_1 - p_2$.

b) i) Define Central limit theorem. [8M]
ii) A sample of 900 members has a mean 3.4 cms ,and S.D. 2.61 cms.
If the population is normal and its mean is unknown, find 95% fiducial limits of true mean. Given that $P(0 \le Z \le 1.96) = 0.4750$.
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5 a) Random samples drawn from two countries gave the following data relating to the heights of adults of males : [8M]

	Country A	Country B
Sample size	1000	1200
Mean height	67.42 inches	67.25 inches
Sample S.D's.	2.58 inches	2.50 inches

Is the difference between the means significant at 5% level? Given that $P(0 \le Z \le 1.96) = 0.4750$.

b) In a sample of 1,000 people in Maharashtra, 540 are rice eaters and the rest are wheat eaters. Can we assume that both rice and wheat eaters are equally popular in this state at 1% level of significant? Given that $P(0 \le Z \le 2.58) = 0.4950$. [7M]

6 a) Samples of two types of electric light bulbs were tested for length of life and following data were obtained : [7M]

	Type I	Type II
Sample No.	8	7
Sample means	1,234 hrs	1,036 hrs
Sample S.D's.	36 hrs	40 hrs

Is the difference in the means sufficient to warrant that Type I is superior to Type II regarding length of life? Given that $t_{0.10}$ for 13 d.f is 1.77 .

b) The theory predicts the proportion of beans in the four groups A, B,C, and D should be 9:3:3:1. In an experiment among 1600 beans, the numbers in the four groups were 882, 313, 287 and 118. Does the experimental result support the theory? Given that $\chi^2_{0.05}$ with 3 degrees of freedom is 7.815. [8M]

7 a) The following data show the values of sample means and ranges of ten samples of size 5 each. Construct $\overline{X}$ and R charts and check whether the process is under statistical control or not. [7M]

Sample No.	1	2	3	4	5	6	7	8	9	10
Mean($\overline{X}$)	11.2	11.8	10.8	11.6	11	9.6	10.4	9.6	10.6	10
Range(R)	7	4	8	5	7	4	8	4	7	9

b) Fit a regression equation of Yon X for the following data: [8M]

X :	2	4	6	8	10
Y :	5	8	12	18	20

Estimate the value of Y when X=12

8 a) Derive the steady state difference equation of $(M/M/1):(FIFO/\infty)$ [8M]

b) Customers arriving at a bank wait in a single line for the next available teller. Customer arrivals can be modeled by a poisson distribution that has a mean of 70 per hour during the mid morning hours. A teller can process an average of 100 customers per hour, which can be modeled by an exponential distribution. If there is one teller on duty, determine: [7M]

i) The average time a customer wait in line for the next teller.

ii) The average service time

iii) The average number of customers waiting in the line.

iv) the probability of no customers waiting in line.