Code No: 153BP

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, March - 2021
PROBABILITY AND STATISTICS AND COMPLEX VARIABLES
(Common to ME, MCT, MMT, AE, MIE, PTM)

Time: 3 hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

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1.a) Define distribution function of a random variable. The distribution function of a random variable X is given by $F(x) = \begin{cases} 1 - (1+x)e^{-x}, & for\ x \geq 0 \\ 0, & otherwise \end{cases}$ Find the corresponding density function and mean of the random variable X.

b) State and prove the addition and multiplication theorem of expectation. [8+7]

2.a) State Baye's theorem. In a population of workers, suppose 40% are school graduates, 50% are high school graduates, and 10% are college graduates. Among the school graduates, 10% are unemployed; among the high school graduates, 5% are unemployed, and among the college graduates 2% are unemployed. If a worker is chosen at random and found to be unemployed, what is the probability that he is a college graduate?

b) Explain Poisson distribution. A manufacturer who produces medicine bottles, find that 0.1% of the bottles are defective. The bottles are packed in boxes containing 500 bottles. A drug manufacturer buys 100 boxes from the producer. Using Poisson distribution, find how many bottles will contain (i) no defective, (ii) at least two defectives? [7+8]

3.a) If X is normally distributed with mean 12 and standard deviation 4, find (i) $P(X \geq 20)$ (ii) $P(0 \leq X \leq 12)$ and (iii) $P(X \leq 20)$.

b) Define exponential distribution. Find the mean and variance of exponential distribution. Explain the statement "Exponential distribution lacks memory". [8+7]

4.a) A random sample of 520 apples was taken from a large consignment and 65 were found to be bad. Obtain the 98% confidence limits for the percentage of bad apples in the consignment.

b) The means of two single large samples of 1000 and 2000 members are 67.5 inches and 68.0 inches, respectively. Can the samples be regarded as drawn from the same population of standard deviation 2.5 inches? Test at 5% level of significance? [7+8]

5.a) Two independent groups of 10 children were tested to find how many digits they could repeat from memory after hearing them. The results are as follows:

Group A:	8	6	5	7	6	8	7	4	5	6
Group B:	10	6	7	8	6	9	7	6	7	7

Is the difference between the mean scores of the two groups significant?

b) Show that sin z is analytic. Hence find its derivative. [8+7]

6.a) If $u(x,y) = (x-1)^3 + xy^2 + 3y^2$, determine $v(x,y)$ so that $u + iv$ is a regular function of $x + iy$.

b) State Cauchy integral formula. Use Cauchy's integral formula to evaluate $\oint_C \frac{\sin \pi z + \cos \pi z}{(z-1)(z-2)} dz$ where C is $|z| = 4$. [7+8]

7.a) Expand the function $\frac{z-1}{z^2}$ for $|z-1| > 1$, in Laurant's series.

b) State Cauchy residue theorem.
Evaluate $\oint_C \frac{z-3}{z^2+2z+5} dz$, where C is the circle (i) $|z| = 1$ (ii) $|z+1-i| = 2$. [7+8]

8.a) Explain the terms (i) conditional probability (ii) removable singularity (iii) essential singularity (iv) Type -I and Type-II errors.

b) Find the transformation which maps $1, i, -1$ to $2, i, -2$, respectively. Find the fixed and critical points of the transformation. [7+8]

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