R18

Code No: 153BP

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year I Semester Examinations, September/October - 2023

PROBABILITY AND STATISTICS & COMPLEX VARIABLES

(Common to ME, MCT, MMT, AE, MIE, PTM, TTE)

Time: 3 Hours **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a) Define sample space and sample point. [2]
b) State multiplication theorem of probability for any two events. If the events are independent, what would be the situation? [3]
c) Write the applications of Poisson distribution. [2]
d) Write any three chief characteristics of normal distribution. [3]
e) Define a null hypothesis and alternative hypothesis. [2]
f) Discuss the errors that are likely to be committed in sampling. [3]
g) Define an entire function. [2]
h) Write C-R equations in polar form. [3]
i) State Cauchy's integral theorem. [2]
j) Define a pole and hence find the poles of $f(z)=\frac{z}{z^2+1}$. [3]

PART – B

(50 Marks)

2.a) State and prove Baye's theorem.
b) The chances that Dr. Rao will diagnose cancer disease correctly is 60%. The chance that a patient will die by his treatment after correct diagnosis is 40% and the chance of death by wrong diagnosis is 70%. A patient of Dr. Rao, who had cancer disease died. What is the probability his disease was correctly diagnosed? [5+5]

OR

3.a) A box P contains 3 white, 2 black and 3 green balls
box Q contains 2 white, 4 black and 5 green balls
box R contains 3 white, 5 black and 6 green balls. A man randomly selected a box and draws a ball from it. If he reports that the ball drawn is green, what is the probability that it is from box Q?
b) If X is a continuous random variable and $Y=aX+b$, prove that $E(Y)=a\,E(X)+b$ and $Var(Y)=a^2\,Var(X)$. Where a and b are constants. [5+5]

4.a) If a coin is tossed 12 times, find the probability of getting (i) at least two heads, (ii) at most 3 heads, (iii) between 5 to 8 heads and (iv) all heads.

b) Given a random variable having the normal distribution with mean 16.2 and variance 1.5625, find the probabilities that it will take on a value (i) greater than 16.8, (ii) between 13.6 and 18.8. [5+5]

OR

5.a) 10 coins are thrown simultaneously. Find the probability of getting at least 7 heads and exactly 6 heads.

b) The daily high temperature in a computer server room at the university can modeled by a normal distribution with mean 68.7 ^{0}F and standard deviation 1.2 ^{0}F. Find the probability that, on any given day, the high temperature will be
i) between 68.3 and 70.3 ^{0}F ,
ii) greater than 71.5 ^{0}F. [4+6]

6.a) A sample of weights of 6400 men has a mean of 67.85 kg with a SD of 2.56 kg, while sample of 1600 women has a mean of 68.55 kg with a SD of 2.52 kg. Do the data indicate the men are on the average weightier than the women?

b) A cigarette manufacturing firm claims that its brand A line of cigarettes outsells its brand B by 8%. If it is found that 42 out of a sample of 200 smokers prefer brand A and 18 out of another sample of 100 smokers prefer brand B, test whether the 8% difference is a valid claim. [5+5]

OR

7. The nicotine content in milligrams in two samples of tobacco were found to be as follows:

Sample A	24	27	26	21	25	23	24	28	--
Sample B	27	30	28	31	22	26	27	32	36

Can it be said that two samples came from populations with equal variance? [10]

8.a) Show that $u(x,y)=e^{2x}(x\cos 2y - y\sin 2y)$ is harmonic and hence find its harmonic conjugate.

b) Find all the roots of the equation $\sin z = \cosh 4$. [6+4]

OR

9.a) If $\cosh(u+iv)=x+iy$, prove that $\frac{x^2}{\cosh^2 u}+\frac{y^2}{\sinh^2 u}=1$ and $\frac{x^2}{\cos^2 v}-\frac{y^2}{\sin^2 v}=1$.

b) Find real and imaginary parts of $\log(x+iy)$. [6+4]

10.a) Evaluate using Cauch's integral formula $\oint_C \frac{e^{2z}}{(z-1)(z-2)}dz$ where C is the circle $|z|=3$.

b) Expand $f(z)=\frac{z-1}{z^2}$ in a Taylor's series in powers of $'z-1'$ and determine the region of convergence. [5+5]

OR

11.a) Find the residue at $z=0$ of the function $f(z)=\frac{1+e^z}{\sin z + z\cos z}$.

b) Find the bilinear transformations which maps the points $2, i, -2$ into the points $1, i, -1$. [4+6]

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