Please check that this question paper contains 9 questions and 3 printed pages within first ten minutes.

[Total No. of Questions:09]

[Total No. of Pages:03]

Uni. Roll No. ....

Program: B.Tech. (Batch 2018 onward)

Semester: 3rd

Name of Subject: Engineering Mathematics-III(Prob& Stats)

Subject Code: BSEE-101

Paper ID: 16062

Time Allowed: 03 Hours

Max. Marks: 60

NOTE:

1) Parts A and B are compulsory
2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice.
3) Use of Scientific, non programmable calculator is allowed.
4) Any missing data may be assumed appropriately

<h3 style="text-align:center">Part – A   [Marks: 02 each]</h3>

Q1.

a) Let A and B be two events of an experiment such that P(A)=0.4,P(B) = p and P(AUB) =0.7 , then find p if A and B are independent.

b) A town has two doctors A and B operating independently. If the probability that doctor A is available is 0.9 and for doctor B is 0.8, what is the probability that at least one doctor is available when needed?

c) The probability density function of a random variable X is given by

$$f(x) = \begin{cases} 2(1-x), 0 < x < 1 \\ 0, elsewhere \end{cases}$$ Then find $E(X) and E(X^2)$

d) Define Type I and Type II errors.

e) Define skewness and its types.

f) There are two different choices to simulate a certain chemical process. To test whether the variance of the yield is same no matter which catalyst is used, a sample of 10 batches is produced using the first catalyst and 12 using second catalyst. If the resulting data is $S_1^2 = 0.14$ and $S_2^2 = 0.28$, test the hypothesis of equal variance at 5% level of significance , Given that $F_{0.05}(11,9)=3.16$

Part – B   [Marks: 04 each]

Q2. Fit a linear curve into the data $\{(x,y) : (1,2.4),(2,3),(3,3.6),(4,4),(6,5)(8,6)\}$

Q3. Let f(x) be the p.d.f. of a discrete random variable X, which assumes the values x_1, x_2, x_3, x_4 such that $2f(x_1) = 3f(x_2) = f(x_3) = 5f(x_4)$. Find p.d.f and $P(X < x_4)$.

Q4. Give the relations for finding moments about mean in terms of moments about assumed mean up to moments of fourth order. Hence find second and third moment about mean if first three moments about the value 5 are given by 2, 20 and 40.

Q5. A sample of 100 dry battery cells tested to find the mean length of life equal to 12 hours with standard deviation of 3 hrs. Assuming the data to be normally distributed, what percentage of battery cells are expected to have life between 10 and 14 hrs?

Q6. A random variable x assumes the values -1,0,1 with probabilities $\frac{1}{3}, \frac{1}{2}, \frac{1}{6}$ respectively. Find distribution function of X.

Q7. 1) What happens to the two lines of regression when coefficient of correlation is r=±1

2) What happens when the angle between two regression lines is (i) zero (ii) 90°

Part – C   [Marks: 12 each]

Q8. (a) Let the bivariate probability distribution of X and Y be given by

X \ Y	1	2	3	4	5	6
0	0	0	1/32	2/32	2/32	3/32
1	1/16	1/16	1/8	1/8	1/8	1/8
2	1/32	1/32	1/64	1/64	0	2/64

Find (i) marginal probabilities of X and Y   (ii) P(X=1,Y<3)   (iii)   P(Y≤5)

(iv) Conditional prob of X given Y=4   (v) Conditional prob of Y given X=1

OR

(b) (i) The probabilities of X,Y,Z becoming managers are 4/9,2/9 & 1/3 respectively. The possibilities that the bonus scheme will be introduced if X,Y and Z become managers are 3/10,1/2 and 4/5 respectively. If the bonus scheme has been introduced then what is the probability that the manager appointed was X?

Page 2 of 3

P.T.O

(ii) State and prove Addition theorem for probability for the sets A and B.

Q9. (a) Calculate Karl Pearson's coefficient of correlation between X and Y:

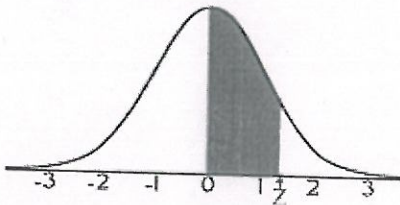| x	780	890	990	600	590	790	680	610	650	700
y	125	137	158	100	107	136	125	108	100	115

(taking assumed mean A=730 for variable X and B=120 for variable Y)

OR

(b) A set of five similar coins is tossed 320 times and the result is given below

No. of heads	0	1	2	3	4	5
Frequency	6	27	72	112	71	32

Test whether the distribution is Binomial or not. Given that $\chi_{0.05}^2$ (5 d.o.f.) =11.07

STANDARD NORMAL TABLE (Z)

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0190	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2969	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133

****

Page 3 of 3