INSTITUTE OF AERONAUTICAL ENGINEERING

(AUTONOMOUS)

Dundigal, Hyderabad -500 043

COMPUTER SCIENCE AND ENGINEERING

ASSIGNMENT

Course Name	**PROBABILITY AND STATISTICS**
Course Code	A30008
Class	II B. Tech I Semester
Branch	Computer Science and Engineering
Year	2016 – 2017
Course Faculty	Mr. J Suresh Goud, Associate Professor, Freshman Engineering Ms. L Indira, Assistant Professor, Freshman Engineering Ms. P Srilatha, Assistant Professor, Freshman Engineering

OBJECTIVES:

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner's learning process.

ASSIGNMENT – I

S.No	QUESTION	Blooms Taxonomy Level	Course Outcome
	UNIT – I (SHORT QUESTIONS)		
1	Define Random Variable with suitable examples	Understand	2
2	Explain mathematical expectation	Analyze	3
3	If X & Y is a random variable then Prove E[X+Y] = E[X]+E[Y]	Understand	3
4	If X & Y is a random variable then Prove E[XY] = E[X].E[Y] if X & Y are independent	Understand	3
5	If X is a random variable then Prove E[X-μ]= 0 ,where μ is the Mean of the variable X	Understand	3
6	Define Binomial Distribution and give example	Evaluate	4
7	Derive mean of binomial distribution	Evaluate	4
8	Derive variance of binomial distribution	Evaluate	4
9	Define Poisson distribution and give example	Understand & Create	4
10	Write the conditions of Poisson distribution	Analyze	4

<table>
<tr><th>S.No</th><th>QUESTION</th><th>Blooms Taxonomy Level</th><th>Course Outcome</th></tr>
<tr><td colspan="4">UNIT – I (LONG QUESTIONS)</td></tr>
<tr><td>1</td><td>If a random variable has the probability density $f(x)=2e^{x}$ for $x>0$ and 0 for $x \leq 0$ find probability that it will take on value i) between 1 and3 ii) greater than 0.5</td><td>Apply</td><td>3</td></tr>
<tr><td>2</td><td>A player tosses 3 fair coins. He wins Rs 800 if 3 tails occur, Rs 500 if 2 tails occur, Rs 300 if one tail occurs. On the other hand, he loses Rs 1000 if 3 heads occur. Find the Value of the game to the player. Is it favorable?</td><td>Apply</td><td>3</td></tr>
<tr><td>3</td><td>Determine the discrete probability distribution, expectation, variance, s.d. of a D.R.V X Which denotes the minimum of the two numbers that appear when a pair of fair dice is? Thrown once.</td><td>Evaluate</td><td>3</td></tr>
<tr><td>4</td><td>In a Normal distribution, 31% of the items are under 45 and 8% are over 64 find the Mean and variance of distribution</td><td>Evaluate</td><td>5</td></tr>
<tr><td>5</td><td>A manufacturer of cotter pins knows that 5% of his product is defective. Pins are soldIn boxes of 100. He guarantees that not more than 10 pins will be defective. Determine the probability that a box will fail to meet the guarantee.</td><td>Apply</td><td>4</td></tr>
<tr><td>6</td><td>The mean and variance of a binomial variable X with parameters n and p are 16 and 8. Find $P(X \geq 1)$ and $P(X > 2)$</td><td>Evaluate</td><td>4</td></tr>
<tr><td>7</td><td>Fit binomial distribution for the following data
<table>
<tr><td>X</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>f</td><td>30</td><td>62</td><td>46</td><td>10</td><td>2</td></tr>
</table></td><td>Evaluate</td><td>4</td></tr>
<tr><td>8</td><td>Fit a Poisson distribution to the following data
<table>
<tr><td>X</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>F</td><td>2</td><td>14</td><td>20</td><td>34</td><td>22</td><td>8</td></tr>
</table></td><td>Evaluate</td><td>4</td></tr>
<tr><td>9</td><td>If F[X] = $\left\{ \begin{array}{l} 0, if x \leq 1 \\ k(x-1)^4, if 1 \leq x \leq 3 \\ 1, if x > 3 \end{array} \right\}$ then determine (i) f(x) (ii) k (iii) Mean</td><td>Apply</td><td>3</td></tr>
<tr><td>10</td><td>Obtain the moment generating function of the random variable having probability density function f(x)=$\begin{cases} x, 0 \leq x < 1 \\ 2-x, 1 \leq x < 2 \\ 0, elsewhere \end{cases}$</td><td>Evaluate</td><td>6</td></tr>
<tr><td colspan="4">UNIT – II (SHORT QUESTIONS)</td></tr>
<tr><td>1</td><td>what is meant by joint probability distribution function</td><td>Analyze</td><td>6</td></tr>
<tr><td>2</td><td>Define joint density function</td><td>Remember</td><td>6</td></tr>
<tr><td>3</td><td>State the properties of joint distribution function of two random variable</td><td>Understand</td><td>6</td></tr>
<tr><td>4</td><td>What are marginal distribution function</td><td>Analyze</td><td>6</td></tr>
<tr><td>5</td><td>What are marginal density function</td><td>Analyze</td><td>6</td></tr>
<tr><td>6</td><td>What are the necessary properties to test a valid joint density function</td><td>Analyze</td><td>6</td></tr>
<tr><td>7</td><td>Define correlation</td><td>Understand</td><td>7</td></tr>
<tr><td>8</td><td>Write the different methods of studying correlation</td><td>Create</td><td>7</td></tr>
<tr><td>9</td><td>Show that correlation coefficient lies between -1 and1</td><td>Understand</td><td>7</td></tr>
</table>

<table>
<tr><th>S.No</th><th>QUESTION</th><th>Blooms Taxonomy Level</th><th>Course Outcome</th></tr>
<tr><td>10</td><td>Explain Rank correlation coefficient</td><td>Analyse</td><td>7</td></tr>
<tr><td colspan="4">UNIT – II (LONG QUESTIONS)</td></tr>
<tr><td>1</td><td>If x=2y+3 and y=kx+6are the regression lines of x and y on x respectively show that i)show that $0 \le k \le 1/2$ ii)k=1/8 find r and $(\bar{x}, \bar{y})$</td><td>Understand</td><td>7</td></tr>
<tr><td>2</td><td>If θ is angle between two regression lines of y on x and x on y then prove that
$\tan\theta = \frac{1-r^2}{r}\left[\frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2}\right]$.</td><td>Understand</td><td>7</td></tr>
<tr><td>3</td><td>The joint probability density function is
f(x,y) = $\begin{cases} Ae^{-x-y}, & o < x < y, o < y < \infty \\ 0, & otherwise \end{cases}$
Determine A.</td><td>Apply</td><td>6</td></tr>
<tr><td>4</td><td>Let X and Y random variables have the joint density function f(x,y)=2,0<x<y<1then find marginal density function</td><td>Evaluate</td><td>6</td></tr>
<tr><td>5</td><td>Find the rank correlation coefficient for the following data
<table>
<tr><td>X</td><td>68</td><td>64</td><td>75</td><td>50</td><td>64</td><td>80</td><td>75</td><td>40</td><td>55</td><td>64</td></tr>
<tr><td>Y</td><td>62</td><td>58</td><td>68</td><td>45</td><td>81</td><td>60</td><td>68</td><td>48</td><td>50</td><td>70</td></tr>
</table></td><td>Evaluate</td><td>7</td></tr>
<tr><td>6</td><td>Find the Multiple regression line to the following data
<table>
<tr><td>X</td><td>3</td><td>5</td><td>6</td><td>8</td><td>12</td><td>14</td></tr>
<tr><td>Y</td><td>16</td><td>10</td><td>7</td><td>4</td><td>3</td><td>2</td></tr>
<tr><td>Z</td><td>90</td><td>72</td><td>54</td><td>42</td><td>30</td><td>12</td></tr>
</table></td><td>Evaluate</td><td>7</td></tr>
<tr><td>7</td><td>Find the Regression lines for the following data
<table>
<tr><td>X</td><td>65</td><td>66</td><td>67</td><td>67</td><td>68</td><td>69</td><td>70</td><td>72</td></tr>
<tr><td>Y</td><td>67</td><td>68</td><td>65</td><td>68</td><td>72</td><td>72</td><td>69</td><td>71</td></tr>
</table></td><td>Apply</td><td>7</td></tr>
<tr><td>8</td><td>Find the coefficient of correlation for the following data
<table>
<tr><td>X</td><td>65</td><td>66</td><td>67</td><td>67</td><td>68</td><td>69</td><td>70</td><td>72</td></tr>
<tr><td>Y</td><td>67</td><td>68</td><td>65</td><td>68</td><td>72</td><td>72</td><td>69</td><td>71</td></tr>
</table></td><td>Apply</td><td>7</td></tr>
<tr><td>9</td><td>Derive the rank correlation coefficient formula</td><td>Evaluate</td><td>7</td></tr>
<tr><td>10</td><td>Two independent variable X and Y have means 5 and 10 and variances 4 and 9 respectively. Find the coefficient of correlation between U and V where U=3x+4y, V=3x-y</td><td>Evaluate</td><td>7</td></tr>
<tr><td colspan="4">UNIT – III (SHORT QUESTIONS)</td></tr>
<tr><td>1</td><td>Write a short note on Sampling</td><td>Understand</td><td>8</td></tr>
<tr><td>2</td><td>Explain about Level of Significance, critical region.</td><td>Analyze</td><td>9</td></tr>
<tr><td>3</td><td>Explain about Estimation,</td><td>Analyze</td><td>9</td></tr>
<tr><td>4</td><td>Prove that sample Mean is Unbiased Estimation of Population Mean</td><td>Understand</td><td>9</td></tr>
<tr><td>5</td><td>Write the working procedure for the testing of Hypothesis</td><td>Evaluate</td><td>10</td></tr>
<tr><td colspan="4">UNIT – III (LONG QUESTIONS)</td></tr>
<tr><td>1</td><td>A sample of 100 electric bulbs produced by manufacturer ‘A’ showed a mean life timeOf 1190 hrs and an s .d. of 90 hrs A sample of 75 bulbs produced by manufacturer ‘B’ Showed a mean life time of 1230 hrs with s.d. of 120 hrs. Is</td><td>Apply</td><td>10</td></tr>
</table>

<table>
<tr><th>S.No</th><th>QUESTION</th><th>Blooms Taxonomy Level</th><th>Course Outcome</th></tr>
<tr><td></td><td>there difference between the mean life times of the two brands at a significance level of 0.05</td><td></td><td></td></tr>
<tr><td>2</td><td>In a random sample of 60 workers, the average time taken by them to get to work is 33.8 minutes with a standard deviation of 6.1 minutes .Can we reject the null hypothesis $\mu = 32.6$ minutes in favor of alternative null hypothesis $\mu > 32.6$ at $\alpha = 0.025$ level of significance</td><td>Apply</td><td>10</td></tr>
<tr><td>3</td><td>On the basis of their total scores, 200 candidates of a civil service examination are divided into two groups, the upper 30% and the remaining 70%. Consider the first question of the examination. Among the first group, 40 had the correct answer, whereas among the second group, 80 had the correct answer. On the basis of these results, can one conclude that the first question is not good at discriminating ability of the type being examined here</td><td>Apply</td><td>10</td></tr>
<tr><td>4</td><td>A cigarette manufacturing firm claims that 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 8% difference is a valid claim.</td><td>Apply</td><td>10</td></tr>
<tr><td>5</td><td>If 48 out of 400 persons in rural area possessed ‘cell’ phones while 120 out of 500 in urban Area. Can it be accepted that the proportion of ‘cell’ phones in the rural area and Urban area is same or not. Use 5% of l .o .s</td><td>Apply</td><td>9</td></tr>
<tr><td colspan="4">ASSIGNMENT – II
UNIT – III (SHORT QUESTIONS)</td></tr>
<tr><td>1</td><td>Explain about two tailed and single tailed tests</td><td>Remember</td><td>10</td></tr>
<tr><td>2</td><td>Explain about t-Distribution</td><td>Remember</td><td>10</td></tr>
<tr><td>3</td><td>Explain about F-Statistic</td><td>Remember</td><td>10</td></tr>
<tr><td>4</td><td>Write Properties of F-Statistic distribution</td><td>Analyze</td><td>10</td></tr>
<tr><td>5</td><td>Write Properties of Chi- Square distribution</td><td>Analyze</td><td>10</td></tr>
<tr><td colspan="4">UNIT – III (LONG QUESTIONS)</td></tr>
<tr><td>1</td><td>In an investigation on machine performance the following results are obtained
<table>
<tr><th></th><th>No. of units inspected</th><th>No. of defectives</th></tr>
<tr><td>Machine I</td><td>375</td><td>17</td></tr>
<tr><td>Machine II</td><td>450</td><td>22</td></tr>
</table>
Test whether there is any significance performance of two machines at $\alpha = 0.05$.</td><td>Apply</td><td>10</td></tr>
<tr><td>2</td><td>Producer of ‘gutkha’ claims that the nicotine content in his ‘gutkha’ on the average is83 mg. can this claim be accepted if a random sample of 8 ‘gutkhas’ of this typehave the nicotine contents of 2.0,1.7,2.1,1.9,2.2,2.1,2.0,1.6 mg.</td><td>Apply</td><td>10</td></tr>
<tr><td>3</td><td>A sample of 26 bulbs gives a mean life of 990 hrs with S.D of 20hrs. The manufacturer claims that the mean life of bulbs 1000 hrs. Is the sample not upto the standard?</td><td>Apply</td><td>10</td></tr>
<tr><td>4</td><td>A random of 10 boys had the following I.Q’s 70,120,110,101,88,83,95,98,107,100. Do the data support the assumption of population means I.Q of 100 . Test at 5% level of significance?</td><td>Apply</td><td>10</td></tr>
<tr><td>5</td><td>In one sample of 8 observations the sum of squares of deviations of the sample</td><td>Apply</td><td>10</td></tr>
</table>

S.No	QUESTION	Blooms Taxonomy Level	Course Outcome
	is 84.4 and other sample of 10 observations was 102.6 .test the difference is significant at 5% level		
	UNIT – IV (SHORT QUESTIONS)		
1	What is queuing problem	Analyse	11
2	Explain representation of queuing models	Remember	11
3	Give examples of different types of queuing models	Create	11
4	Derive expected number of queue	Evaluate	11
5	Derive average waiting time in system	Evaluate	12
6	Define service discipline	Understand	12
7	Define idle and busy time	Understand	12
8	Explain M/M/1 model	Analyse	12
9	Explain M/M/1 with infinite population	Analyse	12
10	Derive probability of having n customers P_n in a queue M/M/1, having poisson arrival	Evaluate	12
	UNIT-IV (LONG QUESTIONS)		
1	Telephone users arrive at a booth following a Poisson distribution with average time of 5 minute between two successive arrivals. The time taken for a telephone call is on an average 3 min. what probability that the booth is busy is. It is proposed to reduce the average waiting time to less than or half the present waiting time for completion of the call by establishing a new booth. What has to be arrival rate so as to warrant the establishment of new booth.	Apply	12
2	Assume that the both arrival rate service rate following Poisson distribution .the arrival rate and service rate are 25 and 35 customers/hour respectively then find the following L_s ,L_q, w_s, w_q	Evaluate	12
3	Consider a self service store with one cashier. Assume Poisson arrivals and exponential service time. Suppose that a customer's arrive on average of every 5 minutes and the cashier can serve in 5 minutes. Find The average number of customers queuing for service, The probability of having more than 10 customers in the system, The probability that the customer has to queue for more than 2 minutes	Apply	12
4	At a one man barber shop, customers arrive according to Poisson distribution with a mean arrival rate of 5 per hour and the hair cutting time is exponentially distributed, with an average hair cut taking 10 minutes. It is assumed that because of his excellent reputation, customers are always willing to wait. Calculate Average number of customers in the shop, Average number of customers waiting for hair cut, The percent of time on arrival can walk right in without waiting. The percent of customers who have to wait prior to getting into the barber's chair	Apply	12
5	A TV repair man finds that the time spent on his jobs has an exponential distribution with mean 30 minutes. He repairs sets in the order in which they arrive. The arrival of the sets is approximately Poisson with an average of 10 per eight hour day. Find the repairman's idle time each day. How many jobs are ahead of the average set just brought in?	Apply	12
6	Workers come to a tool store room to enquiry about the special tools (required by	Evaluate	12

S.No	QUESTION	Blooms Taxonomy Level	Course Outcome
	them) for a particular job. The average time between the arrivals is 60 seconds and the arrivals are assumed to be in Poisson distribution. The average service time is 40 seconds. Find Average queue length Average length of non-empty queue		
7	Arrival rate of telephone calls at a telephone booth are according to Poisson distribution With an average time of 12 minutes between two consecutive call arrivals. The Length of telephone calls is assumed to be exponentially distributed with mean 4 minutes. Find the probability that a caller arriving at the booth will have to wait Find the average queue length that forms from time to time Find the fraction of a day that the phone will be in use When convinced that an arrival would expect to have to wait at least five minutes for making the call.	Apply	12
8	Consider a self-service store with one cashier. Assume Poisson arrivals and exponential service time. Suppose that a customer's arrive on average of every 5 minutes and the cashier can serve in 5 minutes. Find :(a) The average number of customers queuing for service.(b) The probability of having more than 10 customers in the system.(c) The probability that the customer has to queue for more than 2 minutes	Apply	12
9	A computer shop has a laser printer. The jobs for laser printing are randomly distributed approximately a Poisson distribution with mean service rate of 10 jobs per hour, since pages vary in length (pages to be printed). The jobs arrive at a rate of 6 per hour during the entire 8 hours work day. If the laser printer is valued Rs 30/- per hour, determine (a) the percent time an arriving jobs has to wait (b) Average system time (c) Average dle time cost of the printer per day	Apply	12
10	Customers arrive at a sales counter manned by a single person according to a poisson process with a mean rate of 20 per hour. The time required to serve a customer has an exponential distribution with a mean of 100 seconds. Find the average waiting time of the customer.	Apply	12
	UNIT – V (SHORT QUESTIONS)		
1	Define ergodic chain	Understand	13
2	Define regular chain	Understand	13
3	Define transient state	Understand	13
4	Define return state	Understand	13
5	Define absorbing state	Understand	13
6	Define periodic and aperiodic states	Understand	13
7	Explain about reducable and irreducible matrices	Understand	13
8	Define persistent state	Understand	13
9	Find the transition diagram for the transition probability matrix $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 1/2 & 1/2 \\ 1/3 & 0 & 2/3 \end{bmatrix}$	Evaluate	13
10	Define stochastic process	Understand	13
	UNIT-V (LONG QUESTIONS)		
1	Show that the probability that the game never ends is zero.	Understand	14
2	Find the probabilities of gambler ruin.	Evaluate	14
3	a) If $p = \frac{1}{2}, q = \frac{1}{2}, z = 1, a = 500$ Then find the expected duration of the	Apply	14

S.No	QUESTION	Blooms Taxonomy Level	Course Outcome
	game. b) If $p=\frac{1}{2}, q=\frac{1}{2}, z=1, a=1000$ Then find the expected duration of the game		
4	Is the Matrix $\begin{bmatrix} 0.4 & 0.6 & 0 & 0 \\ 0.3 & 0.7 & 0 & 0 \\ 0.2 & 0.4 & 0.1 & 0.3 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ irreducible?	Analyse	13
5	Is the Matrix p=$\begin{bmatrix} 0 & 1 & 0 \\ 1/2 & 1/6 & 1/3 \\ 1/3 & 2/3 & 0 \end{bmatrix}$ Stochastic?	Analyse	13
6	Which of the following Matrices are Regular i)$\begin{bmatrix} 1/2 & 1/2 \\ 0 & 1 \end{bmatrix}$ ii) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ iii)$\begin{bmatrix} 1/2 & 1/4 & 1/4 \\ 0 & 1 & 0 \\ 1/2 & 1/2 & 0 \end{bmatrix}$	Evaluate	13
7	Find periodic and aperiodic states in each of the following transition probability matrices. i)$\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ ii)$\begin{bmatrix} 1/4 & 3/4 \\ 1/2 & 1/2 \end{bmatrix}$	Evaluate	13
8	Consider a two state Markov chain with the transition probability matrix P=$\begin{bmatrix} 3/4 & 1/4 \\ 1/2 & 1/2 \end{bmatrix}$, find P^n when $n\to\infty$	Evaluate	13
9	Consider a two state Markov chain with the transition probability matrix P=$\begin{bmatrix} 1-a & a \\ b & 1-b \end{bmatrix}$, $0<a<1$, $0<b<1$find P^n when $n\to\infty$	Evaluate	13
10	A fair die is tossed repeatedly if X_n denotes the maximum of the numbers occurring in the first n tosses. Find the transition probability matrix P of the markov chain	Apply	13

Prepared By : Mr. J Suresh Goud, Associate Professor

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