### University of Rajshahi Department of Computer Science and Engineering B.Sc. Engg. Part-1 Even Semester, Examination-2016 Course: STAT-1211 (Statistics for Engineers)

Full Marks: 35

Time: 2 Hours

### Answer any four questions taking two from each group

### PART: A

| (a) I      | Define location and disper<br>Let AM=arithmetic mean,  | sion. Among the mo                                 | easures of   |            | which one  | is best at  | nd why?<br>w that AM | 2                                       | 3.: |
|------------|--|--|--------------|------------|------------|-------------|----------------------|---|-----|
| (c) (      | Given below is the marks marks.  | obtained by student                                | s in a certa | in subject | . Comput   | e AM, GI    | M and HM             | of the                                  | 3   |
|            | 10, 10, 35, 40, 42, 47, 49,  | 50, 51, 63, 63, 77,                                | 78, 78, 80.  |            |            |             |                      |   |     |
| (0)        | Define event and probabil  | ity of an event                                    |              |            |            |             |                      |   | 2   |
| (b)<br>(c) | State and prove Bayes the In a bolt factory machine their output 5, 4, 2 percento be defective. What are | orem. s A, B and C man                             | S. A DOIL IS | s drawn ia | muoniny 1  | OIII the P  | 1000                 | total. Of                               | -   |
| (a)        | Define random variable, j  | oint density functio                               |              |            |            |             |                      | s a and b,                              | 5   |
| (b)        | prove that E(aX+b)=aE(X<br>Define normal distribution  | n. Find its mean and                               | d variance.  |            |            |             |                      |   | 3.  |
|            |  |  | PART:        | В          |            |             |                      |   |     |
|            | Define Spearman's rank of be expressed as $\rho_s = 1 - 1$   | $\frac{6\sum_{i=1}^{n}d_{i}^{2}}{(2\pi)^{2}}$      |              |            |            |             |                      |   | 5   |
| (b)        | The marks achieved by the Statistics and Mathematic  | e 1st year students                                | of CSE dep   | partment i | n 2015 of  | their follo |                      |   | 3.  |
|            | Statistics 28  | 32   26  | - 31         | 34         | 20         | 16          | 21                   | 33                                      |     |
|            | Mathematics 25 Find the rank correlation   |  |              |            | 26         | 29          | 33                   | 32                                      |     |
|            | Define null hypothesis, a<br>Describe different steps f<br>What do you mean by typ                       |  |              |            |            |             |                      | rhy?                                    | 3 3 |
|            | Define contingency table   | $\chi^2 = \frac{1}{(a+1)^2}$                       | b)(a+c)      | (c+d)(     | b+d)       |             |                      |   | 3   |
| (b)        | How would you test the i   | independence of has where $\chi_{0.05}^2 = 3.84$ . |              |            | or of pers | ons from    | Tota                 |   | 7   |
|            | Eye color  |  | Hair co      |            | Black      |             | Tota                 | 111111111111111111111111111111111111111 | 1   |
|            |  | Black<br>40  |              | 1401       | Didok      |             | 100                  |   | 1   |
|            | Black  | 50   |              |            | 50         |             |                      |   |     |
|            |  |  |              |            |            |             |                      |   | -   |
|            | Not Black  | 30   |              |            |            |             | 200                  |   | 1   |

(c) The diameters of steel shafts produced by a certain manufacturing process should have a mean of 0.255 inches. The diameter is known to have a standard deviation of ρ=0.0001 inch. A random sample of 10 shafts has an average diameter of 0.2545 inches. Set up an appropriate hypothesis on the mean and test at 5% level of significance, where Z<sub>0.025</sub>=1.96.

## University of Rajshahi Department of Computer Science and Engineering B. Sc. (Engg.) Part-I, Even Semester, Examination 2015 Course: STAT1211 (Statistics for Engineers) Full Marks: 35 Time: 2 Hours

[Answer any four questions taking two from each group]

### Part A

| c) If $\bar{x}$ and         | to the arithmetic n<br>S denote the mean                         | and stand  | lard deviation $\bar{x}\sqrt{(n-1)}$ | tion of $x_1$ , $\overline{)} > S$ . | , x <sub>2</sub> , , x | n, then she | ow that   | 3    |
|-----------------------------|--|------------|--------------------------------------|--------------------------------------|------------------------|-------------|-----------|------|
| 2 -> 37/1                   | do you mean by dis   | ion? I     | Dafine Co                            | efficient o                          | of variation           | on and exp  | plain why | 4.25 |
|                             | do you mean of the   | to the eta | ndard des                            | viation as                           | a measure              | e of dispe  | rsion.    |      |
|                             | sometimes preferred  | ibution o  | f drug ad                            | dicted pe                            | ople by                | age comi    | ng to the | 4.5  |
| this is s<br>b) The fo      | sometimes preferred<br>llowing is the dist<br>al for treatment:  | ribution o | f drug ad                            | dicted pe                            | cople by               | age comi    | ng to the | 4.5  |
| this is s<br>b) The fo      | llowing is the dist  | ribution o | f drug ad                            | dicted pe                            | 30-34                  | age comi    | ng to the | 4.5  |
| this is s<br>b) The fo      | llowing is the dist  | ribution o | f drug ad                            | dicted pe                            | copie by               | age com     | ng to the | 4.5  |
| this is s b) The fo hospita | llowing is the dist<br>il for treatment:  Class interval Of ages | 18-22<br>7 | 22-26                                | 26-30<br>18                          | 30-34                  | 34-38       | ng to the | 4.5  |

|    |    | Write down variable X fo                 |          | 4 4 44 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 |         | Sanation | of hine  | imiai di | stributio<br>d variar | on. Let            | a random | 4 |
|----|----|--|----------|--|---------|----------|----------|----------|-----------------------|--------------------|----------|---|
|    |    |  |          |  |         | Par      | B        |          |                       |                    |          |   |
|    |    |  | ,        | D-on                                     | on cor  | relation | coeffici | ent?     |                       |                    |          | 2 |
| 4. | b) | What do you<br>Prove that the origin and | he coeff | ficient                                  | of corr | elation  | variabl  | es.      |                       |                    |          |   |
|    | c) | Suppose an pressure (P)                  |          | 4  | 11 - £  | allownn  | a meas   | nremeni  | s on te               | mperatu<br>seous p | reduct.  | 4 |
|    |    | T(K)                                     | 298      | 301                                      | 302     | 310      | 312      | 323      | 337                   | 341                | 349      |   |
|    | ,  | P (atm)                                  | 1.2      | 1.3                                      | 1.5     | 1.7      | 1.8      | 2.0      | 2.1                   | 2.3                | 2.8      |   |
|    |    | 1  |          |  |         |          |          |          |                       |                    |          |   |

Calculate the correlation coefficient between T and P and interpret it.

University of Rajshahi
Department of Computer Science & Engineering
B. Sc. Engineering Part-I Even Semester-2013
Course: STAT-1211 (Statistics for Engineers)
Marks: 35, Time: 2 hours

Answer Four questions taking Two from each part

| 1                   | Vhat do you mon  | n h   |  |  |  | Part-  |  |   |  |   |                         |  |               |
|---------------------|--|---|--|--|--|--|--|---|--|---|-------------------------|--|---------------|
| T                   | Vhat do you mea<br>neasures ofdispe  | rsion?  | ntrai tei  | ndency?  | Why d  | o we st  | udy dis  | persion                                       | ? What   | are the   | absolu                  | te   | 2.7           |
| F                   | or two positive  | heary   | tions  |  |  |  |  |   |  |   | . Par. I                | -140   |               |
| 1                   | or two positive of   | nd  | LIOHS X a  | ind y she  | w that   | AM>=   | GM >=  | HM. W   | hen doe  | s the ed  | quality i               | noid?  | 3             |
|                     | Mid Value (x)  | na varia  |  |  |  | ta.  |  |   |  |   | 1 =0                    | 1  | 3             |
| 2.                  |  | 5   | 10   | 15   | 20   | 25   | 30   | 35  | 40   | 45  | 50                      |  |               |
| A.                  | Frequency (f)  | 1   | 4  | 15   | 31   | 49   | 22   | 25  | 12   | 5   | 3                       |  |               |
|                     | D-6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  |   |  |  |  |  |  |   |  |   |                         |  |               |
| 1)                  | Define probabilit  |   |  |  |  |  |  |   |  |   |                         |  | 2             |
| )                   | State and prove  |   |  |  |  |  |  |   |  |   |                         |  | 3.7           |
| )                   | A card is drawn i  | rom a p   | back of 5  | 2 cards.   | What is  | the pr   | obabili  | ty that i                                     | the card   | is eithe  | er spade                | or king?   | 3             |
|                     |  |   |  |  |  |  |  |   |  | 2.15  |                         |  |               |
| a)                  | Define a random  | variab  | le. A join   | density  | functio  | n of tw  | o rando  | om vari                                       | ables X  | and Y is  | given b                 | elow   | 3             |
|                     | f(x,y) = k   |   |  | ) <y<5< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></y<5<>   |  |  |  |   |  |   |                         |  |               |
|                     |  | ; other   | wise   |  |  |  |  |   |  |   |                         |  |               |
| 61                  | Find the constar<br>Define mathema   |   | noctatio   | n Fortu  | io cons  | tantea   | and h  | nrove t                                       | hat  |   |                         |  | 2.7           |
| b)                  | (i) E (aX + b) = al  |   |  | ii) v (aX+   |  |  | and b,   | prove t                                       | ilat   |   |                         |  | 2.7           |
| c)                  | Define Binomial  | distribu  |  |  |  |  | ce of B  | inomial                                       | distribu   | tion.   |                         |  | 3             |
| -1                  |  |   |  |  |  |  |  |   |  |   |                         |  |               |
|                     |  |   |  |  |  | Part-B   |  |   |  |   |                         |  |               |
| .a)                 | What is a scatte   | r diagra  | m?   |  |  |  |  |   |  |   |                         |  | 2             |
|                     |  |   |  |  |  |  |  | -   |  |   |                         |  |               |
| · b)                | What is coeffici   | ent of co   | orrelatio  | n? Show  | that co  | rrelatio   | n coeff  | icient is                                     | sindepe  | ndent c   | it chang                | es of  | 3.7           |
| b)                  | What is coeffici   | of mea  | suremer  | it.  |  |  |  |   |  |   |                         |  |               |
| b)                  | origin and scale   | of mea  | suremer  | it.  |  |  |  |   |  |   |                         |  |               |
|                     | origin and scale<br>Calculate correl<br>below:   | of mea  | suremer  | t.<br>: betwee   | n the h  | eights   | (in cm)  | and we  | ights (in  | kg) of 1  | .0 stude                |  |               |
|                     | origin and scale Calculate correl below: Height 150  | of mea<br>ation co  | suremer<br>pefficient  | t.<br>betwee   | n the h  | eights   | (in cm)  | and we  | ights (in  | kg) of 1  | 0 stude                 |  |               |
|                     | origin and scale<br>Calculate correl<br>below:   | of mea<br>ation co  | suremer<br>pefficient  | t.<br>betwee   | n the h  | eights   | (in cm)  | and we  | ights (in  | kg) of 1  | .0 stude                |  |               |
| c)                  | origin and scale Calculate correl below: Height 150 Weight 55  | of mea<br>ation co  | surement<br>pefficient<br>5 15<br>3 60   | t. betwee 7   160  | n the h  | eights<br>2 1  | (in cm)  | and we  | ights (in  | kg) of 1  | 0 stude                 |  | 3             |
| c)                  | origin and scale Calculate correl below: Height 150 Weight 55 How do you dis   | of mea<br>ation co<br>15:<br>58<br>tinguish   | suremer<br>pefficient<br>5 15<br>8 60<br>betwee  | t. betwee  | n the h  | eights 2 1 5 d regre   | (in cm) .65 .62 ssion?   | 168<br>74                                     | 172<br>75  | kg) of 1<br>175<br>80   | 180<br>89               | ents given   | 2             |
| c)                  | origin and scale Calculate correl below: Height 150 Weight 55 How do you dis Discuss the con   | of mea<br>ation co<br>1 15:<br>58<br>tinguish<br>cept of  | surement pefficient 5 15 60 60 between rank cor  | t. betwee  | n the h  | eights 2 1 5 d regre   | (in cm) .65 .62 ssion?   | 168<br>74                                     | 172<br>75  | kg) of 1<br>175<br>80   | 180<br>89               | ents given   | 2             |
| c)                  | origin and scale Calculate correl below: Height 150 Weight 55 How do you dis Discuss the con   | of mea<br>ation co<br>1 15:<br>58<br>tinguish<br>cept of  | surement pefficient 5 15 60 60 between rank cor  | t. betwee  | n the h  | eights 2 1 5 d regre   | (in cm) .65 .62 ssion?   | 168<br>74                                     | 172<br>75  | kg) of 1<br>175<br>80   | 180<br>89               | ents given   | 3             |
| c)                  | origin and scale Calculate correl below: Height 150 Weight 55 How do you dis Discuss the con   | of mea<br>ation co<br>1 15:<br>58<br>tinguish<br>cept of  | surement pefficient 5 15 60 60 between rank cor  | t. betwee  | n the h  | eights 2 1 5 d regre   | (in cm) .65 .62 ssion?   | 168<br>74                                     | 172<br>75  | kg) of 1<br>175<br>80   | 180<br>89               | ents given   | 2             |
| c)<br>5.a)<br>b)    | origin and scale Calculate correl below:  Height 150 Weight 55  How do you dis Discuss the con   | of mea ation contains a second secon | suremer<br>pefficient<br>5 15<br>3 60<br>a betwee<br>rank cor  | t. between 7 160 61 n correlation.   | n the hold of the  | eights<br>2 1<br>5 d regre   | (in cm)<br>65<br>62<br>ssion?<br>arman'                                  | and we  | 172<br>75  | kg) of 1<br>175<br>80   | 180<br>89               | ents given   | 2 3.7         |
| c)                  | origin and scale Calculate correl below:  Height 150 Weight 55  How do you dis Discuss the con $ ho=1$ Estimate the re   | of mea<br>ation co<br>1 15:<br>58<br>tinguish<br>cept of<br>$6\sum_{i=1}^{n} d$<br>$n (n^2 - gression)$   | suremer pefficient 5   15' 3   60   60   60   60   60   60   60  | t. between 7 160 61 n correlation.   | n the hold of the  | eights<br>2 1<br>5 d regre   | (in cm)<br>65<br>62<br>ssion?<br>arman'                                  | and we 168 74 s rank c                        | 172 75 correlation   | 175<br>80   | 180<br>89               | ents given   | 2             |
| c)<br>5.a)<br>b)    | origin and scale Calculate correl below:  Height 150 Weight 55  How do you dis Discuss the con $\rho = 1$ Estimate the re  | of mea ation contains a sign of mea ation contains a sign of the  | suremer pefficient 5 15 3 60 a betwee rank correct 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   | t. between 160 61 n correlation.   | n the hold of the  | eights  2 1  5 d regree  hat Spe   | (in cm) 65 62 ssion? arman'  | and we  | 172<br>75  | kg) of 1<br>175<br>80   | 180<br>89               | ents given   | 2 3.7         |
| c)<br>5.a,<br>b)    | origin and scale Calculate correl below:  Height 150 Weight 55  How do you dis Discuss the con $ ho=1$ Estimate the re   | of mea ation contains a sign of mea ation contains a sign of the  | suremer pefficient 5 15 3 60 a betwee rank correct 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1   | t. between 160 61 n correlation.   | tion and X for t   | 2 15 d regree hat Spe  | (in cm)  65  62  ssion? arman'   | and we 168 74 s rank c                        | 172<br>75<br>correlation                                   | 175<br>80<br>on coef  | 180<br>89               | ents given   | 2 3.7         |
| c)<br>5.a)<br>b)    | origin and scale Calculate correl below:  Height 150 Weight 55  How do you dis Discuss the con $\rho=1$ Estimate the re  Expenditu   | of mea ation contains a single strain of the strain of th | suremer pefficient 5 15'8 60' between rank correction of the corre   | 7 160 7 160 7 160 8 61 8 on of You   | n the hold of the  | 2 15 d regree hat Speedhe give 7 80  | (in cm)  .65  .62  ssion? arman' an data: 3 75                           | 168 74 s rank c                               | 172   75   sorrelation   5   140   .                       | 175<br>80<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20 | 180<br>89               | ents given   | 2 3.7         |
| c)<br>5.a<br>b)     | origin and scale Calculate correl below:  Height 150 Weight 55  How do you dis Discuss the con $\rho=1$ Estimate the re  Expenditu  Define (i) Statis  | of mea ation contains a second of mea ation contains a second of the se | suremer pefficient 5 15 8 60 60 betwee rank correct co   | tt. betwee  7 160 61 n correlation. on of You (ii) leve  | n the hold of sign   | d regree hat Spe   | (in cm)  .65 62 ssion? arman' an data: 3 75                              | and we 168 74 s rank c                        | 172 75 correlation 5 140 al region                         | kg) of 1 175 80 on coef   | 180<br>89<br>ficient is | ents given   | 2 3.7         |
| c) 5.a, b) c) 6.a   | origin and scale Calculate correl below:  Height 150 Weight 55  How do you dis Discuss the con $\rho=1$ Estimate the re  Expenditu  Define (i) Statis  | of mea ation color of mea ation color of mea ation color of $\frac{15}{58}$ tinguish cept of $\frac{6}{5} \sum_{i=1}^{n} \frac{d}{n(n^2 - gression)}$ ly mem re on fo   | suremer pefficient 5 15 60 60 betwee rank corn 2 7 1) n equation bers (X) od in Tal pothesis, dom sam  | t. betwee  7 160 61 n correlation. on of Y or (ii) leve  | tion and X for the Administration of Signal From   | d regree hat Spe   | (in cm)  .65 62 ssion? arman' an data: 3 75                              | and we 168 74 s rank c                        | 172 75 correlation 5 140 al region                         | kg) of 1 175 80 on coef   | 180<br>89<br>ficient is | ents given   | 2 3.7         |
| c) 5.a, b) c) 6.a   | origin and scale Calculate correl below:  Height 150 Weight 55  How do you dis Discuss the con $\rho = 1$ Estimate the re  Fam Expenditu  Define (i) Statis  Let $x_1, x_2,, x_n$ describe the te  | of mea ation color of mea ation color of mea ation color of $\frac{155}{58}$ tinguish cept of $\frac{6}{5} \sum_{i=1}^{n} \frac{d}{n}$ ( $n^2 - \frac{1}{6}$ gression ly mem re on fo tical Hylpe a rangest proces  | suremer pefficient 5 15 60 60 betwee rank corn 2 7 1) n equation bers (X) od in Tal pothesis, dom sam  | t. between 161 161 161 161 161 161 161 161 161 16  | n the hold of sign e from thesis   | d regree hat Spe   | ssion?<br>arman'<br>an data:<br>3<br>75                                  | and we 168 74 s rank c                        | 172 75 correlation 5 140 al region                         | kg) of 1 175 80 on coef   | 180<br>89<br>ficient is | ents given   | 2 3.7         |
| c) 5.a, b) c) 6.a   | origin and scale Calculate correl below:  Height 150 Weight 55  How do you dis Discuss the con $\rho = 1$ Estimate the re  Fam Expenditu  Define (i) Statis  Let $x_1, x_2,, x_n$ describe the te  (i) $H_0$ :                               | of mea<br>ation co<br>1 153<br>58<br>tinguish<br>cept of<br>$6\sum_{i=1}^{n} d$<br>$n(n^2 -$<br>gression<br>ly mem<br>re on fo<br>tical Hypoe a rann<br>st proce<br>$\mu = \mu_0 v_0$   | suremer sefficient  5   15   15   15   15   15   15   15   | n correlation.  (ii) leve  | n the hold of sign of sign of the from thesis ere of is  | d regree hat Speed 7 80 ificance normals known   | (in cm)  .65 .62  sssion? arman'  n data: 3 .75  e and (ii distribution) | and we 168 74 s rank c                        | 172 75 correlation 5 140 al region                         | kg) of 1 175 80 on coef   | 180<br>89<br>ficient is | ents given   | 2<br>3.7<br>3 |
| c) 5.a, b) c) 6.a b | origin and scale Calculate correl below:  Height 150 Weight 55  How do you dis Discuss the con $\rho=1$ Estimate the re  Fami Expenditu  Define (i) Statis  Let $x_1, x_2, \dots, x_n$ describe the te (i) $H_6$ : (ii) $H_6$ : (ii) $H_6$ : | of mea<br>ation co<br>15.58<br>tinguish<br>cept of<br>$6\sum_{i=1}^{n} d$<br>$n(n^2 -$<br>gressionally mem<br>re on for<br>tical Hyloge a range<br>st proces<br>$\mu = \mu_0$ vs<br>$\mu = \mu_0$ vs  | suremer pefficient 5 15' 3 60' 3 betwee rank correction of the pothesis, dom same dure of the strict H ≠ strict H = stric   | 7 166 7 161 No correlation. On of You (ii) leve uple com he hypo ho, wh hu, wh   | n the hold of sign of  | d regreemat Speed A sp | (in cm)  .65 62 ssion? arman' an data: 3 75 e and (ii distribute)        | and we 168 74 s rank c 8 90 ii) critication w | ights (in 172 75 75 Forrelation 1740 140 al region ith mea | kg) of 1 175 80  on coeff   | 180<br>89<br>ficient is | ents given by $s$ given by $s$ | 2 3.7         |
| c) 5.a, b) c) 6.a   | origin and scale Calculate correl below:  Height 150 Weight 55  How do you dis Discuss the con $\rho = 1$ — Estimate the re  Fam Expenditu  Define (i) Statis  Let $x_1, x_2, \dots, x_n$ describe the te (i) $H_0$ :  (ii) $H_0$ :          | of mea<br>ation co<br>158<br>tinguish<br>cept of<br>$6\sum_{i=1}^{n}d$<br>$n$ $(n^2-$<br>gression<br>ly mem<br>re on fo<br>tical Hyloe a rank<br>st proce<br>$\mu = \mu_0$ vs   | suremer sefficient 5 15'3 600 a betwee rank corrections of in Tall pothesis, dom samdure of f s H <sub>2</sub> : µ ≠ s H <sub>2</sub> : µ ≠ s H <sub>3</sub> : µ → s H <sub>3</sub> : | 7 166 7 166 7 167 8 61 8 n correlation. 9 n of Y of the thick of the t | n the hold of signs o | alights  22 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1  | (in cm)  .65  .62  .nn data: .75  .e and (ii) .distribling               | and we 168 74 74 8 90 i) critical             | 172 75 correlation 5 140 all region ith mea                | kg) of 1 175 80 con coef- 4 80 n μ and  | 180<br>89<br>ficient is | ents given by given by $e^{\sigma^2}$ , the                        | 2 3.7         |

## University of Rajshahi Department of Computer Science & Engineering B. Sc. Engineering Part-I Even Semester-2013 Course: STAT-1211 (Statistics for Engineers) Marks: 35, Time: 2 hours Answer Four questions taking Two from each part

| What do you mean by central tenden measures of dispersion?     For two positive observations x and y calculate mean and variance using the control of t |             |             | tudy dis     | nersio       | -2 \A/ba    |          |           |            |      |
|---|-------------|-------------|--------------|--------------|-------------|----------|-----------|------------|------|
| b) For two positive observations x and y  |             |             | rudy and     |              |             | are in   | e absol   | ute        | 2.7  |
| c) Calculate mean and variance  |             |             |              |              |             |          |           |            |      |
| c) Calculate mean and variance  | show th     | at AM>=     | GM >=        | HM. W        | hen doe     | es the e | quality   | hold?      | 3    |
| the fire and variance using the   | ne given o  | lata        |              |              |             |          | ,         |            | 3    |
| Mid Value (x) 5 10 15   | 20          | 25          | 30           | 35           | 40          | 1 45     | 50        | 7          |      |
| Frequency (f) 1 4 15  | 31          | 49          | 22           | 25           | 12          | 5        | 3         |            |      |
|   |             |             |              |              |             |          |           |            |      |
| a) Define probability of an event with ex   | xample.     |             |              |              |             |          |           |            | 2    |
| b) State and prove the additive law for t   |             | mutuall     | v exclus     | ive eve      | nts.        |          |           |            | 3.7  |
| c) A card is drawn from a pack of 52 car  |             |             |              |              |             | is eith  | er spad   | e or king? | 3    |
|   |             |             |              | ************ |             |          |           |            |      |
| .a) Define a random variable. A join dens   | sity funct  | ion of tv   | vo rando     | m vari       | ables X     | and Y is | given l   | pelow      | 3    |
| f(x,y) = k (2x+y); 2 <x<6, 0<y<5<="" td=""><td></td><td></td><td></td><td></td><td></td><td></td><td>0</td><td></td><td></td></x<6,>  |             |             |              |              |             |          | 0         |            |      |
| = 0 ; otherwise   |             |             |              |              |             |          |           |            |      |
| Find the constant k.  |             |             |              |              |             |          |           |            |      |
| b) Define mathematical expectation. Fo  |             |             | and b, I     | prove t      | hat         |          |           |            | 2.7  |
|   | aX+b) = a   |             |              |              | 1::         |          |           |            |      |
| c) Define Binomial distribution. Find the   | e mean a    | nd variar   | nce of Bi    | nomial       | distribu    | ition.   |           |            | 3    |
|   |             |             |              |              |             |          |           |            |      |
|   |             | Part-B      |              |              |             |          |           |            |      |
| (a) What is a scatter diagram?  |             |             |              |              |             |          |           |            | 2    |
| b) What is coefficient of correlation? Sh   | now that    | correlation | on coeff     | icient is    | sindepe     | ndent o  | of chang  | ges of     | 3.75 |
| origin and scale of measurement. c) Calculate correlation coefficient betv  |             | haighte     | (in am)      | and wa       | ights /in   | kal of   | 10 ctud   | onte givon |      |
| below:  | ween the    | Heights     | (III CIII) c | and we       | igires (iii | NB) UI . | 10 Studi  | ents given | 3    |
|   | 160         | 162         | 165          | 168          | 172         | 175      | 180       |            |      |
| Weight 55 58 60   | 61          | 65          | 62           | 74           | 75          | 80       | 89        |            |      |
| 110000  |             |             |              |              |             |          |           |            |      |
| 5.a) How do you distinguish between cor   | relation a  | nd regre    | ession?      |              |             |          |           |            | 2    |
| b) Discuss the concept of rank correlation  | on. Show    | that Spe    | earman's     | rank c       | orrelati    | on coef  | ficient i | s given by | 3.75 |
|   |             |             |              |              |             |          |           |            |      |
| $\rho = 1 - \frac{6\sum_{i=1}^{n} d_i^2}{n(n^2 - 1)}$   |             |             |              |              |             |          |           |            |      |
|   |             |             |              |              |             |          |           |            |      |
| c) Estimate the regression equation of  |             |             | en data:     |              |             |          |           |            | 3    |
| Family members (X)  | 4           | -           | 3            | 8            | 5           | 4        | 6         |            |      |
| Expenditure on food in Taka (Y)   | 16          | 0 80        | 75           | 90           | 140         | 80       | 150       |            |      |
|   |             |             |              |              |             |          |           |            |      |
| 6.a) Define (i) Statistical Hypothesis, (ii) le   | evel of sig | nificance   | e and (iii   | ) critica    | al region   | 1.       |           | 3 12-0     | 2.75 |
| b) Let $x_1, x_2, \dots, x_n$ be a random sample of   | ome from    | n normal    | distribu     | ition w      | ith mea     | nµand    | variano   | e o , then | 3    |
| describe the test procedure of the hy   | ypothesis   | ic know     |              |              |             |          |           |            |      |
| m   | Mueie o     | 12 VIIOAAI  |              |              |             |          |           |            |      |
| (i) $H_0$ : $\mu = \mu_0 \text{ vs } H_1$ : $\mu \neq \mu_0$ ,  | where a     | is unkno    | own          |              |             |          |           |            |      |
| (i) $H_0$ : $\mu = \mu_0 \text{ vs } H_1$ : $\mu \neq \mu_0$ ,<br>(ii) $H_0$ : $\mu = \mu_0 \text{ vs } H_1$ : $\mu \neq \mu_0$ ,   | where o     | is unkno    |              |              |             |          |           |            |      |
| (i) $H_0: \mu = \mu_0 \text{ vs } H_1: \mu \neq \mu_0$ ,<br>(ii) $H_0: \mu = \mu_0 \text{ vs } H_1: \mu \neq \mu_0$ ,   | where of    | is unkno    | a mean       | height       | of 67.6     | inches.  | The va    | lue of     | 3    |
| (i) $H_0$ : $\mu = \mu_0 \text{ vs } H_1$ : $\mu \neq \mu_0$ , (ii) $H_0$ : $\mu = \mu_0 \text{ vs } H_1$ : $\mu \neq \mu_0$ ,  | where of    | is unkno    | a mean       | height       | of 67.6     | inches.  | The va    | lue of     | 3    |

# University of Rajshahi Department of Computer Science and Engineering B.Sc.Engg.(CSE) 1st Year Even Semester 2012 Course: STAT1211 (Statistics for Engineers) Full Marks: 35 Time: 03 hours [N. B. Answer any FOUR questions taking at least TWO each part.]

|    |      | Part-A methods of represent   | ting 3.7          |
|----|------|---|-------------------|
| 1. | (a)  |   |                   |
|    | 4.   | statistical data? Discuss any one of them.  | stics 3           |
|    | (b)  | -f - and maggire of central tendency  |                   |
|    | (-)  | P. d. full aving fraguency distribution calculate median with graphicarry.  | 2                 |
|    | (c)  | Class interval 13-15 15-17 17-19 19-21 21   | 1-23              |
|    |      | Frequency 3 7 12 6  | 3                 |
| 2. | (a)  | Define with examples: equally likely outcome and complementary event.   | 3                 |
|    |      | If $P(A) = 0.35$ , $P(B) = 0.75$ and $P(A \cap B) = 0.20$ , find the values of $P(A \cap B)$  |                   |
|    | (b)  | What do you mean by conditional probability? State and prove the multiplication of probability  |                   |
|    | (c)  | - 1 1:1: Il + 1 D will diagnose Concer correctly is have  | had               |
| 3. | (a)  | <ul> <li>Distinguish between discrete and continuous random variables. De<br/>probability density function (pdf) and cumulative distribution function (cdf)<br/>random variable.</li> </ul> | fine 2.75<br>of a |
|    | (1-) | - the Vhee the following probability function:  | 3                 |
|    | (b)  | x 1 2 3 4<br>p(x) 0.1 0.3 0.4 0.2<br>Find P(X) 21 P(X) 31 F(X) and V(X)   | 1 2               |
|    | (c)  | to the stand and variance of this distribution  | and 3             |

|    |     |                              |                 |        |             | P       | art-B   |   |       |      |
|----|-----|------------------------------|-----------------|--------|-------------|---------|---------|---|-------|------|
| 4. | (a) | Define positive c            | orrel           | ation  | , nega      | tive co | rrelati | on and zero correlation.  |       | 3.5  |
|    |     | If $y = -\frac{ax+c}{b}$ the | en pro          | ove th | ne cor      | relatio | n coeff | ficient between x and y is -1 if s  | igns  |      |
|    |     | of a and b are ali           | ke an           | d+1    | if the      | v are d | ifferen | at .  |       |      |
|    | (b) | Show that correl             | ation           | coef   | ficient     | lies b  | etween  | 1 -1 and +1   |       | 3    |
|    | (c) | The height (X) a             | nd w            | eight  | (Y) o       | f a per | son in  | a locality are given below:   |       | 2.25 |
|    |     | X (in inches)<br>Y (in lbs.) | 60              | 55     | 59          | 62      | 70      |   |       |      |
|    |     | Y (in lbs.)                  | 82              | 90     | 95          | 106     | 135     |   |       |      |
|    |     | Find the correlat            | tion c          | oeffic | cient b     | etwee   | n X and | d Y and comment.  |       |      |
| 5. | (a) | What is the mea              |                 |        | regres      | sion li | ne? Wł  | hy are there two regression lines   | ina   | 1.75 |
|    | (b) | Let the linear re            | egress<br>hod o | ion l  | and $\beta$ | . Also  | , show  | $=\alpha+\beta Y_i+\varepsilon_i$ ; $i=1,2,,n$ . Discus w that correlation coefficient is | s the | 4    |
|    | (c  | Fit a straight lin           | ne of           | price  | on suj      | pply to | the fo  | llowing data by applying the me   | thod  | 3    |

6. (a) What do you understand by hypothesis testing of significance? What types of 3 errors may occur in hypothesis testing? Explain.

 85
 89
 90
 93
 96

 127
 115
 98
 100
 95

Also, find the predicted price when supply is 80.

of least squares:

Supply, X: Price (in Tk.), Y

(b) Let  $X_1, X_2, ..., X_n$  be a random sample from a normal population with mean  $\mu$  and 3 variance  $\sigma^2$ . Describe the test procedure to test the hypothesis  $H_0$ :  $\sigma^2 = \sigma_0^2$  against  $H_1$ :  $\sigma^2 \neq \sigma_0^2$ .

(c) From a random sample of 15 values we calculate an estimate 5.2 for the variance of the population. Does the result support the hypothesis that the population variance is 8.5?

[At 5% level of significance the critical values of the test statistic are 5.63 (lower) and 26.12 (upper)]

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# University of Rajshahi Department of Computer Science and Engineering B.Sc. Engg. (CSE) 1st Year 2nd Semester 2011 Course: STAT 1211 (Statistics for Engineers) Time: 3 Hrs. Full Marks: 35 [N.B. Answer FOUR questions taking at least TWO from each part.]

| alculate the mean,   | 1   |  |  |  |   |  | 30-35  | 35-40           |
|--|---|--|--|--|---|--|--|-----------------|
| Class interval   | 0-5   | 5-10   | 10-15  | 15-20  | 20-25   | 25-30  | 8  | 3               |
| Frequency  | 2   | 5  | 7  | 13   | 21  | 10   | 0  |                 |
|  |   |  |  |  | Lability o  | f on event   |  |                 |
| Define with examp  | es (i) sampl  | e space, (   | ii) event, a   | nd (III) pro   | DADIIILY O  | all event  |  |                 |
| If A and B are two of Three events A,  | events then p   | prove that   | P(AUB)=  | P(A)+P(B   | hair unio   | n is the   | sample sr  | pace Ω.         |
| P(A)= $(3/2)P(B)$ , P  | B and C a   | re mutua   | D(A) D(B)  | and P(C)   | nen ame   |  |  |                 |
| P(A)=(3/2)P(B), P  | (B)-2r(C),  | men inia   | r(A), r(D)   | and (C)  |   |  |  |                 |
| ) Define mathematic  | al expectation  | on of a rai  | ndom varia   | ble with e   | xample.   |  |  |                 |
| ) Given the following  | g density fur   | action of t  | he random  | variable 2   | <b>(:</b>   |  |  |                 |
| f(x)=2(1-x); 0<  |   |  |  |  |   | ,  |  |                 |
| Find (i) E(x), (ii) E  | (3+5x), and   | (iii) V(x)   |  |  |   |  |  |                 |
| ) Find the mean and  | variance of l   | binomial o   | distribution   | 1.   |   |  |  |                 |
|  |   |  |  | n . n  |   |  |  |                 |
|  |   |  |  | Part B   | a in und  | beretandin   | o the no   | ature of        |
| a) What is scatte  | r diagram's   | Discus   | s now it   | neips u  | 5 111 11110   | i :  | 5  |                 |
| relationship bet   | ween two v  | variables.   |  |  |   | 2 Prove  | that cou   | rrelation       |
| Define simple of coefficient is in   | correlation   | coefficie  | nt, r. Wr  | of origin  | and scale   | er Flove   | that co  | irciation       |
| coefficient is if  | idependent  | 54 and S   | D(V V)=6   | 55. Find   | rxy and c   | omment.  |  |                 |
| -1 Ciuan SS(V)=75  |   |  |  |  |   |  |  |                 |
|  |   | 154 and 5  | r(x,1)-0   |  |   |  |  |                 |
|  | 0.00  |  |  |  |   |  | ites of th   | e model         |
| c) Given SS(X)=75  (a) What is regressi b) Consider a regre  | 0.00  |  |  |  |   |  | ites of th   | e model         |
| b) Consider a regressi<br>parameters.  | on?<br>ession mod   | el of Y  | on X. der  | ive the le   | east squar  | res estima   | s of obse  | ervations       |
| b) Consider a regression parameters. c) To study the ten   | on?<br>ession mod<br>sile strengt   | el of Y  | on X. der  | ive the le   | the follo   | res estima   | s of obse  | ervations       |
| b) Consider a regression parameters. c) To study the ten   | on?<br>ession mod<br>sile strengt   | el of Y<br>h of a ce<br>the diam<br>1.4 1.6  | on X. der<br>ertain type<br>eter in cm<br>1.8 2.0  | of wire,<br>and Y is<br>2.2 2.   | the follo<br>the mass   | res estima   | s of obse  | ervations       |
| (a) What is regressible Consider a regression parameters. (c) To study the ten were recorded, (X: 0.6 0.8  | on?<br>ession mod<br>sile strengt<br>where X is<br>1.0 1.2  | h of a cethe diam  | ertain type<br>eter in cm<br>1.8 2.0<br>82 88  | of wire,<br>and Y is<br>2.2 2.   | the follo<br>the mass<br>4<br>24  | wing pair<br>supporte  | rs of obse<br>d in kg/c                                      | ervations<br>m. |
| .a) What is regressib Donsider a regreparameters. c) To study the ten were recorded, X: 0.6 0.8 Y: 14 26 Fit the regressi  | on?<br>ession mod<br>sile strengt<br>where X is<br>1.0 1.2  | h of a cethe diam  | ertain type<br>eter in cm<br>1.8 2.0<br>82 88  | of wire,<br>and Y is<br>2.2 2.   | the follo<br>the mass<br>4<br>24  | wing pair<br>supporte  | rs of obse<br>d in kg/c                                      | ervation:<br>m. |
| a.) What is regressibly Consider a regregarameters. c) To study the ten were recorded,     X: 0.6 0.8     Y: 14 26     Fit the regressites X=2.8.  | on?<br>ession mod<br>sile strengt<br>where X is<br>1.0 1.2<br>50 56<br>on model o   | h of a co<br>the diam<br>1.4 1.6<br>42 98<br>of Y on X   | on X. der<br>ertain type<br>eter in cm<br>1.8 2.0<br>82 88<br>( for the a                        | of wire,<br>and Y is<br>2.2 2.<br>134 1<br>above data                    | the follo<br>the mass<br>4<br>24<br>a. Find th                          | wing pair<br>supporte  | s of obsed in kg/c   | ervations<br>m. |
| .a) What is regressible Consider a regressible Consideration Con | on? ession mod sile strengt where X is 1.0 1.2 50 56 on model o   | h of a cothe diam<br>1.4 1.6<br>42 98<br>of Y on X   | on X. der<br>ertain type<br>eter in cm<br>1.8 2.0<br>82 88<br>4 for the a                        | of wire, and Y is 2.2 2. 134 1 above data                                | the follo<br>the mass<br>4<br>24<br>a. Find th                          | wing pair<br>supporte  | es of obset<br>d in kg/c<br>ed value                         | of Y fo         |
| .a) What is regressible Consider a regressible Consideration Consider | on? ession mod sile strengt where X is 1.0 1.2 50 56 on model o s: statistical X is a norr  | h of a cothe diam<br>1.4 1.6<br>42 98<br>of Y on X   | ertain type<br>eter in cm<br>1.8 2.0<br>82 88<br>( for the a                                     | of wire, and Y is 2.2 2. 134 1 above data                                | the follo<br>the mass<br>4<br>24<br>a. Find th                          | wing pair<br>supporte  | es of obset<br>d in kg/c<br>ed value                         | of Y fo         |
| .a) What is regressible Consider a regressible Consider Consider Consideration | on? ession mod sile strengt where X is 1.0 1.2 50 56 on model o s: statistical X is a norr  | h of a cothe diam<br>1.4 1.6<br>42 98<br>of Y on X   | ertain type<br>eter in cm<br>1.8 2.0<br>82 88<br>( for the a                                     | of wire, and Y is 2.2 2. 134 1 above data                                | the follo<br>the mass<br>4<br>24<br>a. Find th                          | wing pair<br>supporte  | es of obset<br>d in kg/c<br>ed value                         | of Y fo         |
| i.a.) What is regressibly Consider a regressibly Consider a regressible consider a regressible consider a regressible consider a regressible consideration were recorded, X: 0.6 0.8 Y: 14 26 Fit the regression X=2.8.  i.a.) Define the term b) Suppose that \(^2\) procedure to test the first first consideration of the conside | on? ession mod sile strengt where X is: 1.0 1.2 50 56 on model o s: statistical X is a norr st the follow $\mu = \mu_0$                                       | h of a cothe diam<br>1.4 1.6<br>42 98<br>of Y on X   | ertain type<br>eter in cm<br>1.8 2.0<br>82 88<br>( for the a                                     | of wire, and Y is 2.2 2. 134 1 above data                                | the follo<br>the mass<br>4<br>24<br>a. Find th                          | wing pair<br>supporte  | es of obset<br>d in kg/c<br>ed value                         | of Y fo         |
| .a) What is regressibly Consider a regressibly Consider a regressible Consideration Considera | on? ession mod sile strengt where X is 1.0 1.2 50 56 on model o s: statistical X is a norr st the follow  | h of a co<br>the diam<br>1.4 1.6<br>42 98<br>f Y on X  | ertain type<br>eter in cm<br>1.8 2.0<br>82 88<br>(for the a<br>esis, criticate with<br>othesis   | to the loss of wire, and Y is 2.2 2. 134 1 labove data al region, mean µ | the follo<br>the mass<br>4<br>24<br>a. Find th<br>Type-I e<br>and varia | wing pain supported to predicted the predicted troops and annee $\sigma^2$ . | es of obset<br>d in kg/c<br>ed value                         | of Y fo         |
| b) Consider a regressibly Consider a regressibly Consider a regressible Consideration Considerati | on? ession mod sile strengt where X is 1.0 1.2 50 56 on model o s: statistical X is a norr st the follow =\mu_0 \mu \pm\mu \mu\mu \mu \mu \mu \mu \mu \mu \mu | h of a co<br>the diam<br>1.4 1.6<br>42 98<br>f Y on X  | ertain type<br>eter in cm<br>1.8 2.0<br>82 88<br>(for the a<br>esis, criticate with<br>othesis   | of wire, and Y is 2.2 2.134 1 libove data al region, mean µ              | the follo<br>the mass<br>4<br>24<br>a. Find th<br>Type-I e<br>and varia | res estimation wing paint supported as predicted arror and $\sigma^2$ .      | es of obset<br>d in kg/c<br>ed value                         | of Y fo         |
| b) Consider a regressibly Consider a regressibly Consider a regressible Consideration Considerati | on? sisile strengt where X is 1.0 1.2 50 56 on model o s: statistical ( is a norr st the follow    ##µ0   ##µ0     0 males in   67.1, 62.5,                   | h of a cette diam<br>1.4 1.6<br>42 98<br>of Y on X<br>I hypothemal variation hypothe | on X. der<br>eter in cm<br>1.8 2.0<br>82 88<br>(for the a<br>esis, critic<br>atc with<br>othesis | e of wire, and Y is 2.2 2. 134 1 libove data al region, mean µ           | the follo<br>the mass<br>4<br>24<br>a. Find th<br>Type-I e<br>and varie | res estima wing pain supporte supporte repredictor and $\sigma^2$ .          | s of obset<br>d in kg/c<br>ed value<br>Type-II e<br>Describe | of Y fo         |