RNS INSTITUTE OF TECHNOLOGY, BENGALURU - 98
DEPARTMENT OF MATHEMATICS

ESTD : 2001
An Institute with a Difference

18MAT41: Complex Analysis, Probability and Statistical Methods

Assignment - I

Submission Last Date: 01.06.2021

<table>
<tr><th>Q. No</th><th>Questions</th><th>Blooms Level</th><th>CO'S</th></tr>
<tr><td>1.</td><td>Fit a best fitting parabola $y = ax^2 + bx + c$ for the following data:
<table>
<tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr>
<tr><td>y</td><td>2</td><td>6</td><td>7</td><td>8</td><td>10</td><td>11</td><td>11</td><td>10</td><td>9</td></tr>
</table></td><td>L1 , L2</td><td>CO4</td></tr>
<tr><td>2.</td><td>Fit a best fitting equation in the form $y = ax^b$ for the following data:
<table>
<tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>y</td><td>2.98</td><td>4.26</td><td>5.21</td><td>6.1</td><td>6.8</td><td>7.5</td></tr>
</table></td><td>L1 , L2</td><td>CO4</td></tr>
<tr><td>3.</td><td>Fit a best fitting equation in the form $y = ax + b$ for the following data:
<table>
<tr><td>x</td><td>5</td><td>10</td><td>15</td><td>20</td><td>25</td></tr>
<tr><td>y</td><td>2.98</td><td>4.26</td><td>5.21</td><td>6.1</td><td>6.8</td></tr>
</table></td><td>L1 , L2</td><td>CO4</td></tr>
<tr><td>4.</td><td>With usual notation, compute $\bar{x}, \bar{y}$ and r from the following lines of regression: $y = 0.516x + 33.73 \; and \; x - 32.52 = 0.512y + 32.52$</td><td>L1 , L2</td><td>CO4</td></tr>
<tr><td>5.</td><td>If $\theta$is the acute angle between the lines of regression, then show that $tan\theta = \frac{\sigma_x \sigma_y}{\sigma_x{}^2 + \sigma_y{}^2}\left(\frac{1-r^2}{r}\right)$. Explain the significance when $r = 0 \; and \; r = \pm 1$.</td><td>L1 , L2</td><td>CO4</td></tr>
<tr><td>6.</td><td>Find the co-efficient of correlation and lines of regression for the following data
<table>
<tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>y</td><td>2</td><td>5</td><td>3</td><td>8</td><td>7</td></tr>
</table></td><td>L1 , L2</td><td>CO4</td></tr>
<tr><td>7.</td><td>While calculating correlation coefficient between two variables x and y from 25 pairs of observations, the following results were obtained: n=25, $\sum x = 125, \sum y = 100, \; \sum x^2 = 650, \sum y^2 = 460, \sum xy = 508$. Later it was discovered at the time checking that the pairs of values $(8,12) \; and \; (6,8)$ were copied down as $(6,14) and \; (8,6)$. Obtain the correct value of correlation coefficient.</td><td>L1 , L2</td><td>CO4</td></tr>
<tr><td>8.</td><td>If $2x - 3y = 0$ and $3x - 2y = 5$ are the lines of regression of the variables x and y. Find the following
1) Mean of x and y
2) Coefficient of correlation between x and y</td><td>L1 , L2</td><td>CO4</td></tr>
<tr><td>9.</td><td>If the correlation coefficient between two variables x and y is 0.5 and the acute angle between their lines of regression is $\tan^{-1}\left(\frac{3}{5}\right)$, show that $\sigma_x = \frac{1}{2}\sigma_y$.</td><td>L1 , L2</td><td>CO4</td></tr>
<tr><td>10.</td><td>The scores for 9 students in Physics and Maths are as follows:
<table>
<tr><td>Physics</td><td>35</td><td>23</td><td>47</td><td>17</td><td>10</td><td>43</td><td>9</td><td>6</td><td>28</td></tr>
<tr><td>Maths</td><td>30</td><td>33</td><td>45</td><td>23</td><td>8</td><td>49</td><td>12</td><td>4</td><td>31</td></tr>
</table></td><td>L1 , L2</td><td>CO4</td></tr>
</table>

Bloom's Taxonomy Levels: L1: Remembering / L2: Understanding / L3: Applying / L4: Analyzing / L5: Evaluating / L6: Creating

	Compute the ranks of students in the two subjects and compute the Spearman's rank correlation.		
11.	A random variable X has the following probability function. i) Find the value of k ii) Evaluate P(X<6) iii) P(X>6) iv) P(0<X<5) X: 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 P(x): 0 | k | 2k | 2k | 3k | k^2 | $2k^2$ | $7k^2+k$	L1 , L2	CO3
12.	The probability distribution of a random variable X is given by the following table: X: 0 | 1 | 2 | 3 | 4 | 5 P(x): K | 5k | 10k | 10k | 5k | K Find i) k ii) $P(X \leq 1)$ iii) $P(0 \leq X \leq 3)$iv) Mean and Variance	L1 , L2	CO3
13.	The probability of germination of a seed in a packet of seeds is found to be 0.7. If 10 seeds are taken for experimenting on germination in a laboratory, find the probability that (i) 8 seeds germinate (ii) at least 8 seeds germinate (iii) at most 8 seeds germinate.	L1 , L2	CO3
14.	In Sampling a large number of parts manufactured by a machine, the mean number of defective in a sample of 20 is 2. Out of 1000 such samples, how many would be expected to contain at least three defective parts.	L1 , L2	CO3
15.	In a certain factory turning out razor blades, there is a small chance of 0.002 for a blade to be defective. The blades are supplied in packets of 10. Use Poisson distribution to calculate the approximate number of packets containing i) no defective ii) one defective iii) two defective blades, in a consignment of 10,000 packets.	L1 , L2	CO3

Multiple choice questions

1. The normal equations to fit the straight line $y = mx + c$ are
   (a) $\Sigma y = n\,\Sigma x + \Sigma cm,\ \Sigma xy = c\,\Sigma x^2 + c\,\Sigma n$
   (b) $\Sigma y = m\,\Sigma x + \text{nc},\ \Sigma xy = m\,\Sigma x^2 + c\,\Sigma x$
   (c) $\Sigma y = c\,\Sigma x + \Sigma cm,\ \Sigma xy = c\,\Sigma x^2 + c\,\Sigma n$
   (d) $\Sigma y = n\,\Sigma x + m\Sigma n,\ \Sigma xy = c\,\Sigma x^2 + m\,\Sigma x$
2. The equation $v = at^b$ can be reduced to $y = a + bx$ where x is
   (a) $\log_{10} a$ (b) $\log_{10} t$ (c) $\log_{10} v$ (d) None
3. To fit $y = ax^b$ by least square method, normal equations are
   (a) $\Sigma\, Y = na + b\,\Sigma x\,,\ \Sigma\, xY = a\,\Sigma x + b\,\Sigma x^2$
   (b) $\Sigma\, y = nA + b\,\Sigma x\,,\ \Sigma\, xy = A\,\Sigma x + b\,\Sigma x^2$
   (c) $\Sigma\, Y = nA + B\,\Sigma X\,,\ \Sigma\, XY = A\,\Sigma X + B\,\Sigma X^2$
   (d) $\Sigma\, Y = nA + B\,\Sigma x\,,\ \Sigma\, xY = A\,\Sigma x + B\,\Sigma x^2$
4. In $y = a + bx,\ \Sigma x = 50,\ \Sigma y = 80,\ \Sigma xy = 1030, \Sigma x^2 = 750$ and $n = 10$ then a is
   (a) 1.26 (b) 1.28 (c) 1.7 (d) 1.8
5. A parabolic curve is of the form

(a) $y = ax^2 + bx + c$ (b) $y = ax^b$ (c) Both of them (d) Neither of them

6. The equations of regression lines are $y = 0.5x + a$ and $x = 0.4y + b$. The correlation coefficient is
   (a) $-\sqrt{0.2}$ (b)0.45 (c) -0.45 (d) $\sqrt{0.2}$

7. If the correlation coefficient is zero, the two regression lines are
   (a) Parallel (b) Perpendicular (c) Coincident (d) Inclined at 45^0 to each other.
8. If r_1 and r_2 are two regression coefficients, then signs of r_1 and r_2 depends on …
   (a) standard deviation (b) Constant terms of the regression lines
   (c) slopes of regression lines (d) correlation coefficient.
9. If the two regression coefficients are perpendicular to each other then the coefficient of correlation is
   (a) ± 1 (b) 0 (c) 1 (d) -1
10. The value of coefficient of correlation lies between …. And ….
    (a) 0 and 1 (b) -1 and 0 (c) -1 and 1 (d) *none*
11. If the regression coefficients are -0.4 and -0.9 then the correlation coefficient is
    (a) inconsistent (b) consistent (c) Positive (d) Negative
12. If two regression lines coincide then the correlation coefficient is
    (a) ± 1 (b) 1 (c) 0 d) Negative

13. Which of the following mentioned standard Probability density functions is applicable to discrete Random Variables?
    a) Gaussian Distribution b) Poisson Distribution c) Rayleigh Distribution d) Exponential Distribution
14. What would be the probability of an event 'G' if H denotes its complement, according to the axioms of probability?
    a) P(G) = 1 / P (H) b) P(G) = 1 – P(H) c) P(G) = 1 + P(H) d) P(G) = P (H)
15. A variable that can assume any value between two given points is called _____
    a) Continuous random variable b) Discrete random variable c) Irregular random variable
    d) Uncertain random variable
16. If a variable can certain integer values between two given points is called _____
    a) Continuous random variable b) Discrete random variable c) Irregular random variable
    d) Uncertain random variable
17. If 'X' is a continuous random variable, then the expected value is given by _____
    a) P(X) b) $\sum$ x P(x) c) $\int$ X P(X) d) No value such as expected value
18. If Σ P(x) = $k^2 - 8$ then, the value of k is?
    a) 0 b) 1 c) 3 d) Insufficient data
19. If P(x) = 0.5 and x = 4, then (Mean)E(x) =?
    a) 1 b) 0.5 c) 4 d) 2
20. In a discrete probability distribution, the sum of all probabilities is always?
    a) 0 b) Infinite c) 1 d) Undefined