ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION

SUMMER SEMESTER, 2015-2016

DURATION: 1 Hour 30 Minutes

FULL MARKS: 75

Math 4407: Statistical and Mathematical Analysis

Programmable calculators are not allowed. Do not write anything on the question paper.
There are **4 (four)** questions. Answer any **3 (three)** of them.
Figures in the right margin indicate marks.

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1. a) The least square regression line for set of n data points is given by $y = ax + b$ where the value of 'a' and 'b' follow the regression formula.

   i. Find the least square regression line for the following set of data- $\{(0,2), (1,3), (2,5), (3,4), (4,6)\}$. Plot the given points and the regression line in the same rectangular system of axes.   10

   ii. Following is the total number of goals scored by Christiano Ronaldo in last 5 years from 2011 to 2015 for Portugal along with the corresponding appearances   10

   Table 1

Scored Goals (y)	7	5	10	5	3
Appearances (x)	8	13	9	9	5

   Find the least square regression line, $y = ax + b$, and also predict what will be his total scored goals in 2016 if number his appearances is 10?

   b) From the information given in Table 1, compute the mean, median and standard deviation of Ronaldo's score.   5

2. a) What is linear dependence and independence of vectors? Find out whether the following vectors are linearly dependent or independent?   10

   i. $v_1=(3,9,0)$; $v_2=(6,-9,12)$; $v_3=(9,0,12)$
   ii. $v_1=(2,4,2,8)$; $v_2=(0,2,2,2)$; $v_3=(4,0,2,14)$

   b) Three supporters from each of the team Italy, France and Portugal are watching the Euro 2016 final match in IUT student center sitting in a row. To reduce chaos during the match IUT authority has decided that all three supporters of the same team should not sit together. If the supporters take their seat randomly, what is the probability that all three supporters of the same team do not sit together?   10

   c) Repeat the scenario on 2.b) considering the supporters sit in a round table instead of sitting in a row. Then what is the probability that all three supporters of any two teams sit together?   5

3. a) Find the divergence and curl of the following vector fields: (where $\hat{\imath}, \hat{\jmath}, \hat{k}$ are the unit vectors along x, y, z axis respectively)   12

   i. $F_1= 2yz^3\hat{\imath} - 9x^2z\hat{\jmath} + 3xyz\hat{k}$
   ii. $F_2= 5xy^2z\hat{k} - 4x^3z\hat{\jmath} - 6xy\hat{\imath}$
   iii. $F_3= 7xy^3\hat{\jmath} - 8x^2y^3\hat{k} + 4yz^2\hat{\imath}$

b) Mustafiz the cutter master of Bangladesh has recently suffered a ligament injury while 10 playing for Sussex cricket team in England. The injury results in ligament tear with probability 0.75. An MRI test that determines the injury gives accurate result with probability 0.95. If the test results positive then the team doctor gives him bed rest for next 1 month with probability 0.80. Given that, Mustafiz was given 1 month bed rest what is the probability that he has really got ligament injury?

c) In IUT cafeteria, a dinner menu offers 2 starters, 3 main courses, and 2 desserts. How Many 3 different sets of dinner can be made? (A dinner must contain a starter, a main course, and a desert)

4. As a statistician you are asked to conduct a research on the ages of the players playing in EURO 2016. The following data were obtained for the ages of a sample of 30 players:

32, 24, 28, 31, 40, 32, 26, 25, 23, 30, 67, 31, 22, 27, 33, 19, 26, 36, 21, 26, 23, 29, 36, 42, 18, 16, 22, 28, 31, 19

a) Find the stem-leaf plot of the above data. 5
b) Construct a box-plot using the necessary values. 8
c) Find out the potential outliers, if any. 2
d) If the age of players should be in between 15 and 35, then find out the actual outliers, if any. 2
e) Find out the skewness of the above data and comment on skew ness type. 8

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