UNIVERSITI TEKNOLOGI MALAYSIA

TEST 2

SEMESTER I - 2017/2018

SUBJECT CODE	:	**SCSI1013**
SUBJECT	:	**DISCRETE STRUCTURE**
TIME	:	**2 HOURS (8.00 P.M - 10.00 P.M)**
DATE	:	**20th NOVEMBER 2017**

INSTRUCTIONS TO THE STUDENTS:

Please answer all questions in the answer booklet.

QUESTION 1   **[15 MARKS]**

a) Three coins are tossed and the outcomes are placed in a row.

    (i)   How many outcomes are there?   (1 mark)

    (ii)   How many outcomes contain at least two consecutive heads?   (3 marks)

    (iii) How many outcomes do not contain at least two consecutive heads?   (1 mark)

    (iv) How many outcomes do not contain exactly two heads?   (2 marks)

b) In a sightseeing group, there are 8 Singaporeans, 5 Indonesians and 6 Malaysians.

    (i)   In how many ways to select a pair of individuals of distinct nationalities from this group of tourist?   (4 marks)

    (ii)   In how many ways to select a team of 3 tourists of distinct nationalities from this group of tourist?   (2 marks)

    (iii) In how many ways to select a representative for this group of tourist? (2 marks)

QUESTION 2   **[10 MARKS]**

a) How many integers, greater than 999 but not greater than 4000, can be formed with the digits 0, 1, 2, 3 and 4, if repetition of digits is allowed?   (2 marks)

b) There are 2 brothers among a group of 10 persons. They are going to be arranged around a circle so that there is exactly one person between the two brothers.

    (i)   In how many ways to select a person to be seated in between the brothers?

                                                                             (1 mark)

    (ii)   In how many ways to arranged all of them around the circle?   (1 mark)

    (iii) In how many ways to arrange the group around a circle so that there is exactly one person between the two brothers?   (2 marks)

(c) Suppose 7 students are staying in a hall in a hostel and they are allotted 7 beds. Among them, Arvin does not want a bed next to Anju because Anju snores. Then, in how many ways can you allot the beds to all the students?   (4 marks)

QUESTION 3 [15 MARKS]

a) A cashier uses cash from the cash drawer to return balance to customer if any when they pay for their items bought. There are RM 1, RM 5, RM 10, RM 20, RM 50, and RM 100 cash notes in the drawer at all time.

   (i) How many ways are there to select 5 different cash note from the cash drawer?

   (1 mark)

   (ii) How many ways are there to select 5 cash note from the cash drawer if repetition is allowed? (1 mark)

   (iii) A customer bought items with total amount of RM 35 and paid with RM 100 note. How many ways can the cashier return the balance if there are only 15 notes of RM 5, 5 notes of RM 20 and 2 notes of RM 50 in the cash drawer?

   (5 marks)

b) In a class of 20 students, different tasks are assigned to complete a class project. 5 of them will be assigned with task A, 10 of them with task B, 3 of them with task C, and 2 with task D. How many task distributions are possible among 20 students?

   (2 marks)

c) In a foreign language class, students need to write 3 sentences using a total of 10 vocabulary words. The order of the vocabulary words in the sentence is not important and the meaning of the sentence does not matter.

   (i) If each sentence must use two words and no words can be used more than once, then how many different ways can a student use the words? (2 marks)

   (ii) If the student can use up to 4 vocabulary words and no less than 2 words in each sentence, how many ways can the students use the words to write a sentence if any word can be used more than once? (4 marks)

QUESTION 4 **[10 MARKS]**

a) A bag contains exactly 5 red, 8 blue, 10 white, 12 green and 7 yellow marbles. Given that each colour represents a pigeonhole, find the least number of marbles to be chosen which will guarantee that there will be at least 4 marbles are of the same colour.

(2 marks)

b) How many students must be in a class to guarantee that at least two students receive the same score on the final examination, is the examination is graded on a scale from 0 to 100. Explain your answer. (3 marks)

c) What is the minimum number of students required in a discrete mathematics class to be sure that at least six will receive the same grade, if there are five possible grades – A, B, C, D and E. (2 marks)

d) A computer network consists of six computers. Each computer is directly connected to zero or more of the other computers. Show that there are at least two computers that are directly connected to the same number of other computers. (3 marks)

-- END OF QUESTIONS –

GOOD LUCK!!