BRAC University
CSE230 : Discrete Mathematics
Finalterm Examination

Duration : 80 minutes (4:30 pm – 5:50 pm)

Total Marks : 60 Set: B

[Answer all the questions from 1,2,3. Answer any 1 question from 4,5.]

ID: **Name:** **Sec:**

Q01: [CO4] [15 Points]

a) Find the coefficient of x^4 in $\left(3x^2 - \frac{1}{2x^3}\right)^7$ **[5 points]**

b) How many terms are there in the expansion of $(a - b - c)^{23}$ **[3 points]**

c) Find the constant term in the expansion of $\left(4x - \frac{6}{x} + 9\right)^6$ **[7 points]**

Q02: [CO2] [15 Points]

a) An NID card number consists of six digits followed by four letters (lowercase). Both letters and digits are allowed to repeat. Find the number of different NID card numbers under this condition. **[5 points]**

b) Suppose you have to create a number using the digits 1,2,3,4,5,6,7,8,9. You must **use all** digits **without repetition.**

i) How many numbers can be made if all the even digits (2,4,6,8) must always be together? **[5 points]**

ii) If "at most" three of the even digits can be together, how many numbers can be made? [For example, 123456789, 124356789, 124635789 are okay, but 124683579 isn't.] **[5 points]**

Q03: [CO2] [15 Points]

a) Out of a total of 70 students, 45 are girls. A team of 9 students needs to be formed. However, at least four members must be female. How many teams can be formed under these conditions? **[6 points]**

b) In how many different ways can 11 be expressed as the sum of four positive integers? [For example, 1+3+3+4, 2+4+3+2, 4+5+1+1 etc.] **[4 points]**

c) What is the minimum number of employees required in a company to guarantee that at least six employees share the same birth month? **[5 points]**

Q04: [CO3] [15 Points]

a) If six dice are rolled simultaneously, what is the probability of obtaining at most four 4s?

[6 points]

b) There are two red balls, seven green balls and four yellow balls in an urn. Four balls are drawn from the urn at the same time. Find the probability of obtaining one green, one red and two yellow balls. **[4 points]**

c) If a `fair` coin is flipped till we get the first head, what is the probability that we'll have to flip it more than twice? **[5 points]**

Or,

Q05: [CO3] [15 Points]

a) In Brac University, 30% of the students are girls, while the rest are boys. Among the girls, 40% are not from Dhaka. And among the boys, 20% are not from Dhaka.

   i) If we randomly pick a student, what's the probability that this student is from Dhaka?

   [5 points]

   ii) Given that the student is not from Dhaka, what's the probability that the student is a girl?

   [5 points]

b) Let's consider a coin in your possession. It has two possibilities: it could be a normal fair coin, or it might be a biased one. The probability of either scenario is 50-50. However, if the coin is biased, it's more inclined to land tails– the chance of tails is thrice that of heads. Now let's say we toss this coin twice. What's the probability of getting one head and one tail?

[5 points]