

The Open University of Sri Lanka
Department of Mathematics and Computer Science
B.Sc/ B.Ed Degree Programme
No Book Test (NBT) - 2015/2016
Pure Mathematics– Level 05
PUU3242/ PUE5242– Combinatorics



Duration: - One and half hours

Date: - 09 – 05 – 2016

Time: - 4.00 p.m – 5.30 p.m

Answer All Questions. It is not necessary to simplify the expressions to the final answer.

01. (a) Four washing machines, five computers and six air conditioners are in a store room.
Five items are selected at random. What is the probability that
- (i) two of the items selected is a washing machine and the others are computers? [5 mark]
 - (ii) at least two items are washing machines? [5 mark]
- (b) The standard deck of cards has 52 cards of 4 equal suites (Hearts, Spades, Diamonds, and Clubs) in two colors (Black and Red). A hand of 6 cards is selected randomly from the deck.
Find the probability of each of the following events:
- (i) obtaining five of Diamond suites, [5 mark]
 - (ii) obtaining at least two Spades suites, [5 mark]
 - (iii) obtaining all Red cards. [5 mark]
02. (a) Expand $(1 + x)^3$ using the binomial expansion and give a combinatorial reasoning to obtain the corresponding coefficient by writing as $(1 + x)^3 = (1 + x)(1 + x)(1 + x)$. [15 mark]
- (b) Find the sum of the coefficients of the polynomial $\left(2\sqrt{2} + 4\sqrt{2}x + \frac{5}{\sqrt{2}}x^2 - \frac{7}{\sqrt{2}}x^3\right)^4$ [10 mark]
- (c) Find the multinomial coefficient of x^3 in the expansion $(y + zx + wx^2)^4$. [20 mark]

03. A boy wants to purchase an item costing n rupees. He has n number of coins of 1-rupee and n number of coins of 2-rupee at his pocket. Suppose he pays through an automatic machine and has to insert the coins one at a time, without needing change (the order in which he inserts the coins matters).

Let S_n be the number of ways of paying 1-rupee and 2-rupee coins with sum n rupees.

- (i) Write down first four terms S_1, S_2, S_3 and S_4 . [10 mark]
- (ii) Formulate a difference equation satisfied by S_n . [10 mark]
- (iii) Hence, find the number of ways he can pay for the item costing 9 rupees. [10 mark]