Philadelphia University
Faculty of Engineering

Marking Scheme

Examination Paper

Department of Communication & Electronics Engineering

Probability and Random Variables

Second Quiz First semester Date: 09/12/2019

Section 1

Weighting 6% of the module total

Lecturer:	Dr. Qadri Hamarsheh
Coordinator:	Dr. Qadri Hamarsheh
Internal Examiner:	Dr. Omar Daoud

Marking Scheme

Probability and Random Variables (650364)

The presented quiz questions are organized to overcome course material through 1 question.

Marking Assignments

Question 1: This question is attributed with 6 marks if answered properly,

Solution

a) The **total probability** is given by ***(1.5 marks)***

$$\int_{x=2}^{6}\int_{y=0}^{5} c(2x+y)\,dx\,dy = \int_{x=2}^{6} c\left(2xy+\frac{y^2}{2}\right)\Big|_0^5 dx$$

$$= \int_{x=2}^{6} c\left(10x+\frac{25}{2}\right)dx = 210c$$

For this to equal 1, we must have $\boldsymbol{c = 1/210}$.

b) The marginal distribution function for $\boldsymbol{X}$ is ***(1.5 marks)***

$$F_1(x) = P(X \le x) = \int_{u=-\infty}^{x}\int_{v=-\infty}^{\infty} f(u,v)\,du\,dv$$

$$= \begin{cases} \int_{u=-\infty}^{x}\int_{v=-\infty}^{\infty} 0\,du\,dv = 0 & x < 2 \\ \int_{u=2}^{x}\int_{v=0}^{5} \frac{2u+v}{210}\,du\,dv = \frac{2x^2+5x-18}{84} & 2 \le x < 6 \\ \int_{u=2}^{6}\int_{v=0}^{5} \frac{2u+v}{210}\,du\,dv = 1 & x \ge 6 \end{cases}$$

c) The marginal density function for $\boldsymbol{X}$ is, from part **(b)** ***(1.5 marks)***

$$f_1(x) = \frac{d}{dx}F_1(x) = \begin{cases} (4x+5)/84 & 2 < x < 6 \\ 0 & \text{otherwise} \end{cases}$$

d) ***(1.5 marks)***

$$P(3 < X < 4,\ Y > 2) = \frac{1}{210}\int_{x=3}^{4}\int_{y=2}^{5}(2x+y)\,dx\,dy = \frac{3}{20}$$