



Birzeit University
Faculty of Engineering and Technology
Department of Electrical and Computer Engineering
Probability and Engineering Statistics – ENEE 2307
Quiz #1 (Form A)

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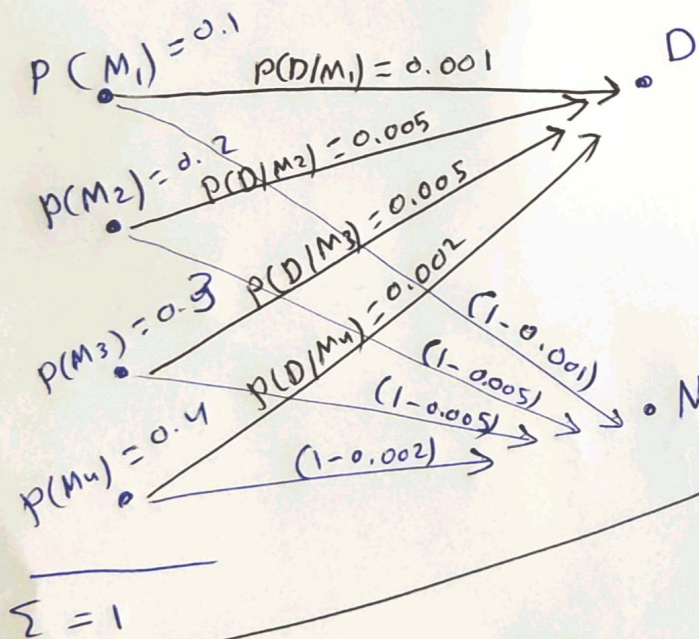
Time: 10 min

Student Name: Key Solution

ID Number:

A factory contains four machines for manufacturing the same product. Machine M1 produces 10% of the product, Machine M2 produces 20%, Machine M3 produces 30%. The proportion of defective items produced by the machines follows: M1: 0.001 ; M2: 0.005 ; M3: 0.005 ; M4: 0.002

An item selected at random is found to be nondefective, what is the probability that the item was produced by machine M1?



$$\begin{aligned}
 P(N) &= P(N/M_1)P(M_1) + P(N/M_2)P(M_2) \\
 &\quad + P(N/M_3)P(M_3) + P(N/M_4)P(M_4) \\
 &= \text{or} \\
 &= (1-0.001)(0.1) + (1-0.005)(0.2) \\
 &\quad + (1-0.005)(0.3) + (1-0.002)(0.4) \\
 &= 0.9966
 \end{aligned}$$

$$\begin{aligned}
 P(D) &= P(D/M_1)P(M_1) + P(D/M_2)P(M_2) + P(D/M_3)P(M_3) + P(D/M_4)P(M_4) \\
 &= (0.001)(0.1) + (0.005)(0.2) + (0.005)(0.3) + (0.002)(0.4) \\
 &= 0.0034
 \end{aligned}$$

$$P(N) = 1 - 0.0034 = 0.9966$$

$$P(M_1|N) = \frac{P(N/M_1)P(M_1)}{P(N)} = \frac{(1-0.001)(0.1)}{0.9966} = 0.10024$$