Assignment 1

Saksham AI22BTECH11024

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Problem 12.13.2.18 : Two events A and B will be independent, if
(A) A and B are mutually exclusive
(B) $\Pr(A'B') = [1 - \Pr(A)][1 - \Pr(B)]$
(C) $\Pr(A) = \Pr(B)$
(D) $\Pr(A) + \Pr(B) = 1$
Answer 12.13.2.18 : (B) $\Pr(A'B') = [1 - \Pr(A)][1 - \Pr(B)]$
$\Pr(A'B') = [1 - \Pr(A)][1 - \Pr(B)]$
$\implies \Pr(A'B') = 1 - \Pr(A) - \Pr(B) + \Pr(A)\Pr(B)$
$\implies 1 - \Pr(A + B) = 1 - \Pr(A) - \Pr(B) + \Pr(A)\Pr(B)$
$\implies -[\Pr(A) + \Pr(B) - \Pr(AB)] = -\Pr(A) - \Pr(B) + \Pr(A)\Pr(B)$
$\implies -\Pr(A) - \Pr(B) + \Pr(AB) = -\Pr(A) - \Pr(B) + \Pr(A)\Pr(B)$
$\implies \Pr(AB) = \Pr(A).\Pr(B)$
Hence it shows A and B are Independent events

*The student is with the Department of Artificial Intelligence, Indian Institute of Technology, Hyderabad 502285 India e-mail: ai22btech11024@iith.ac.in.