KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS
DEPARTMENT OF MATHEMATICS AND STATISTICS
MATH 131 FINAL EXAM
Duration: 150 mn
Instructor: Dr. Bilal Chanane
NAME:.....ID:.....

Note: 50 pts for the exercise on the use of the simplex method, all the other exercises have a 25 pts weight. The total is 400 pts.

Exercise 1 *If X is a normal random variable with mean $\mu = 16$ and standard deviation $\sigma = 2$, determine the value of the standard normal random variable Z that corresponds to $X = 23$.*

Exercise 2 *If Z has a standard normal distribution, find $P(-0.65 < Z < 1.92)$. Hint: $A(0.65) = 0.2422$, $A(1.92) = 0.4726$*

Exercise 3 *The time (in minutes) that a person arriving at a bus stop must wait for a bus is uniformly distributed with density $f(x) = \frac{1}{15}$ where $0 \leq x \leq 15$. Find the mean waiting time μ and the standard deviation σ.*

Exercise 4 *Suppose the cumulative distribution function of the random variable X is given by*

$$F(x) = \begin{cases} 0, & \text{if } x < 0 \\ \frac{x^2}{25}, & \text{if } 0 \leq x \leq 5 \\ 1, & \text{if } x > 5 \end{cases}$$

Find $P(2 < X < 3)$.

Exercise 5 *A biased coin is tossed 8 times. If the probability of heads appearing on any toss is $\frac{1}{3}$, what is the probability that exactly six heads appear.*

Exercise 6 *A random variable X has a distribution given by $f(0) = 0.3$, $f(1) = 0.6$, $f(2) = k$. Find the mean μ and the standard deviation σ.*

Exercise 7 *A sample space is partitioned by events E and F, where $P(E) = \frac{1}{3}$. Suppose S is an event such that $P(S|E) = \frac{1}{4}$ and $P(S|F) = \frac{4}{5}$. Find $P(F|S)$.*

Exercise 8 *The probability that Bob survives ten more years is $\frac{4}{5}$, and the probability that Mary survives ten more years is $\frac{5}{6}$. Find the probability that exactly one of them survives ten more years. (Assume independence). Hint: Draw a diagram.*

Exercise 9 *After a production run, it was found that 10% of the units produced had a faulty weld and 5% had both a defective paint job and a faulty weld. If a unit is randomly selected from this run and it has a faulty weld, what is the probability that it also has a defective paint job?*

Exercise 10 *If a pair of dice are rolled, what is the probability that the sum of the numbers appearing is 5?*

Exercise 11 *if a die is rolled and then a coin is tossed, and the results are observed, determine the sample space of this experiment.*

Exercise 12 *An* \$800 *loan is amortized by equal quaterly payments over two years. If interest is at the rate of* 16% *compounded quarterly, what is the quaterly payment ?*

Exercise 13 *Determine the present value of* \$4000 *due in* 5 *years if the interest rate is* 10% *compounded semiannually.*

Exercise 14 *Use the simplex method to solve the linear programming problem*

$$\textit{Maximize } Z = 30x + 50y$$

subject to

$$\begin{aligned} 2x + y &\leq 16 \\ x + 2y &\leq 11 \\ x + 3y &\leq 15 \\ x, y &\geq 0 \end{aligned}$$

Exercise 15 *Find the dual of*

$$\textit{Maximize } U = x + 2y + 4z$$

subject to

$$\begin{aligned} 3x + y - z &\leq 4 \\ 4x - y + 2z &\leq 9 \\ x + 3y - z &\leq 15 \\ x, y, z &\geq 0 \end{aligned}$$