Ceng 272 Statistical Computations
Final
June 04, 2010 11:00 – 13:00
Good Luck!

You are allowed to use CALCULATOR.

No any other electronic equipment is allowed.

Write the solutions explicitly and use the statistical terminology

Answer all the questions.

1. (10 pts)

   i Dice roll: $S = \{1, 2, 3, 4, 5, 6\}$. Two events
   A : *dice rool is even* and
   B : *dice rool is greater than* 2.

   a) $P(A|B) =?$

   b) Are these two events (A, B) independent?

   ii An electrical engineering lab has 20 probes of which 3 are bad. A student selects 2 probes randomly, what is the probability that both are bad?

2. (15 pts) Consider the density function

$$f(x) = \left\{ \begin{array}{ll} kx - 1 & 0 < x < 1 \\ 0, & elsewhere \end{array} \right\}$$

i Evaluate k

ii Find $F(x)$ and use it to evaluate $P(0.2 < X < 0.4)$

3. (10 pts) The random variable X, representing the number of errors per 100 lines of software code, has the following probability distribution:

x	2	3	4	5	6
$f(x)$	0.01	0.25	0.4	0.3	0.04

Find the expected value and the variance of X.

4. (15 pts) A foreign student club lists as its members 3 Canadians, 4 Japanese, 6 Italians, and 3 Germans. If a committee of 4 is selected at random, find the probability that

   i all nationalities are represented;

   ii all nationalities except the Italians are represented.

5. (15 pts) The average life of a certain type of small motor is 12 years with a standard deviation of 3 years. The manufacturer replaces free all motors that fail while under guarantee. If he is willing to replace only 6% of the motors that fail, how long a guarantee should he offer? Assume that the lifetime of a motor follows a normal distribution.

6. (15 pts) Evaluate $P(2 \leq X \leq 5)$ for a binomial variable with n = 12 and p = 0.2 by using

   i From corresponding Table.

   ii From normal-curve approximation.

7. (15 pts) In a certain city, the daily consumption of water (in millions of liters) follows approximately a gamma distribution with $\alpha = 2$ and $\beta = 3$. If the daily capacity of that city is 9 million liters of water, what is the probability that on any given day the water supply is inadequate?

8. (15 pts) The heights of 1000 students are approximately normally distributed with a mean of 174.5 centimetres and a standard deviation of 6.9 centimetres. If 200 random samples of size 25 are drawn from this population and the means recorded to the nearest tenth of a centimetre, determine

   i the mean and standard deviation of the sampling distribution of $\bar{X}$;

   ii the number of sample means that fall between 172.5 and 175.8 centimetres inclusive;

   iii the number of sample means falling below 172.0 centimetres.