VIT UNIVERSITY
(Estd. u/s 3 of UGC Act 1956)

MAT 2001-STATISTICS FOR ENGINEERS

DIGITAL ASSIGNMENT - II

1. It is conjectured that an impurity exists in 30% of all drinking wells in a certain rural community. In order to gain some insight into the true extent of the problem, it is determined that some testing is necessary. It is too expensive to test all of the wells in the area, so 10 are randomly selected for testing.
(a) Using the binomial distribution, what is the probability that exactly 5 wells have the impurity, assuming that the conjecture is correct?
(b) What is the probability that more than 5 wells are impure?

2. In testing a certain kind of truck tire over rugged terrain, it is found that 25% of the trucks fail to complete the test run without a blowout. Of the next 15 trucks tested, find the probability that
(a) from 3 to 6 have blowouts;
(b) fewer than 4 have blowouts;
(c) more than 5 have blowouts.

3. The number of customers arriving per hour at a certain automobile service facility is assumed to follow a Poisson distribution with mean $\lambda = 7$.
(a) Compute the probability that more than 10 customers will arrive in a 2-hour period.
(b) What is the mean number of arrivals during a 2-hour period?

4.The average number of customers who appear at a counter of a certain Bank per minute is two. Using Poisson distribution, find the probability that during a given minute, there are no customers appear?

5.. The heights of 1000 students are normally distributed with a mean of 174.5 centimetres and a standard deviation of 6.9 centimetres. Assuming that the heights are recorded to the nearest half-centimetre, how many of these students would you expect to have heights
(a) less than 160.0 centimetres?
(b) between 171.5 and 182.0 centimetres inclusive?
(c) equal to 175.0 centimetres?
(d) greater than or equal to 188.0 centimetres

7. The weights of a large number of miniature poodles are approximately normally distributed with a mean of 8 kilograms and a standard deviation of 0.9 kilogram. If measurements are recorded to the nearest tenth of a kilogram, find the fraction of these poodles with weights
(a) over 9.5 kilograms;

(b) of at most 8.6 kilograms;
(c) between 7.3 and 9.1 kilograms inclusive.

8. The life in years of a certain type of electrical switches has an exponential distribution with an average life 2. If 100 of these switches are installed in different systems, what is the probability that at most 30 fail during the first year.

9. In a certain city the daily consumption of electric power is a random variable X having a gamma distribution with mean 6 and variance 12. Find (i) α and β (ii) Probability that on a given day the daily consumption will exceed 12 mkw/hr.

10. In a biomedical research study, it was determined that the survival time, in weeks, of an animal subjected to a certain exposure of gamma radiation has a gamma distribution with $\alpha = 5$ and $\beta = 10$.
(a) What is the mean survival time of a randomly selected animal of the type used in the experiment?
(b) What is the probability that an animal survives more than 30 weeks?

11. If the service life, in hours, of a semiconductor is a random variable having a Weibull distribution with the parameters $\alpha = 0.025$ and $\beta = 0.5$ (i) How long can such a semiconductor be expected to last? (ii) What is the probability that such a semiconductor will still be in operating condition after 4000 hours?

12. Random samples drawn from two places gave the following data relating to the heights of adults males.

	Place A	Place B
Mean height(inches)	68.50	68.58
S.D of heights	2.5	3.0
Sample size	1200	1500

Test at 5% level of significance that the mean height is the same for adults in the two places.

13. A sample of 900 items found to have a mean of 3.47 cm. Can it be reasonably regarded as a simple sample from a population mean height is 3.23 cm and the S.D 2.31 cm?

14. In a random sample of 500 persons from Maharashtra, 200 are found to be consumers of vegetable oil and in another sample of 400 persons from Gujarat, 200 are found to be consumers of vegetable oil. Test at 5% level of significance whether the data reveal a significant difference between Maharashtra and Gujarat so far as the proportion of vegetable oil consumers concerned?

15. In a certain factory there are two independent processes for manufacturing the same item. The mean weight in a sample of 250 items produced from one process is found to be 120 gms with a standard deviation of 12 gms, while from another process are 124 and 14 in a sample of 400 items. Is the difference between the mean weights significant at 1% level of significance?