2. If a Poisson distribution is such that

(a) $P(x = 2) = P(x = 3)$ find m and $P(x = 0)$, $P(x = 4)$

(b) $P(x = 0) = 0{\cdot}1$ find m and $P(x = 1)$ [**Ans. : (a)** 3, 0·0498, 0·168, **(b)** 2·3026, 0·23]

(B) 1. Accidents occur on a particular stretch of highway at an average rate 3 per week. What is the probability that there will be exactly two accidents in a given week ? [**Ans. :** 0·224]

2. Find the probability that at most 4 defective bulbs will be found in a box of 400 bulbs, if it is known that 1 per cent of the bulbs are defective. [**Ans. :** 0·6282]

3. It is 1 in 1000 that an article is defective. There are in a box 100 articles of this type. Assuming Poisson distribution find the probability that the box contains (i) no detective, (ii) two or more detectives. **(S.U. 1998)** [**Ans. :** 0·3679, 0·2642]

4. If the probability that an individual suffers a bad reaction from a particular injection is 0·001, determine the probability that out of 2,000 individuals (i) exactly four, (ii) more than two individuals will suffer a bad reaction. [**Ans. : (i)** 0·0902, **(ii)** 0·3233]

5. The number of accidents on a particular highway in a month is a Poisson variate with parameter 5. Find the probability that more than 2 accidents have occurred on the road in a given month. [**Ans. :** 0·8754]

6. A book contains 100 misprints distributed randomly throughout 100 pages. What is the probability that a page observed at random contains at least two misprints ? **(S.U. 1988)**
[**Ans. :** 0·2642]

7. It is known that in a certain plant, there are on an average 4 industrial accidents per month. Find the probability that in a given month there will be less than 4 accidents. [**Ans. :** 0·4335]

8. An insurance company found that only 0·01 per cent of the population is involved in a certain type of accident each year. If its 1000 policy-holders were randomly selected from the population, what is the probability that more than two of its clients are involved in such an accident next year ? **(S.U. 1990)** [**Ans. :** 0·0002]

9. The number of telephone calls received by an operator in a ten-minute interval follows a Poisson distribution with mean 1. What is the probability of receiving (i) no call, (ii) less than four calls, in the interval. What is the most likely number of calls ? **(S.U. 1986)**
[**Ans. : (i)** 0·3679, **(ii)** 0·981, **(iii)** 1, the mean]

10. If the chance of being killed by flood during a year is 1/300, using Poisson distribution find the probability that out of 3000 persons living in the area at least one would die in flood in that year. **(S.U. 1989)** [**Ans. :** 0·9999]

11. In a screw making machine there are on the average two defective screws out of 100. The screws are packed in boxes of 100. Find the probability that a box contains (i) no defective, (ii) 5 defective screws. **(S.U. 1997)** [**Ans. :** $m = 2$, (i) 0·1353, (ii) 0·036]

12. If 3% of bulbs manufactured by a company are defective, assuming Poisson distribution find the probability that in a pack of 100 bulbs (i) zero bulbs, (ii) two bulbs are defective.
(S.U. 1988, 99) [**Ans. : (i)** 0·0498, **(ii)** 0·2240]

13. In a town 10 accidents took place in a period of 50 days. Assuming Poisson distribution find the probability that there will be 3 or more accidents per day. **(S.U. 1987)** [**Ans. :** 0·0012]

14. Assume that the probability of an a coal minor being killed in a mine accident during a year is 1/2400. Use Poisson's distribution to find the probability that in a mine exploying 200 workers there will be at least one fatal accident in a year. **(S.U. 2003)** [**Ans. :** 0·08]

(C) **1.** A manufacturer of pins knows that on an average 5% of his product is defective. He sells pins in boxes of 100 and guarantees that no more than 4 pins will be defective. In how many boxes out of 1000, he will meet the guaranteed quality ? [**Ans. :** 440]

2. In a certain factory turning out blades, there is a small chance 1/250 for any blade to be defective. The blades are supplied in packets of 10. Use the Poisson distribution to calculate the approximate number of packets containing no defective, one defective, two defective blades in a consignment of 10,000 packets. [**Ans. : (i)** 9608, **(ii)** 384, **(iii)** 8]

3. In a certain factory producing certain articles the probability that an article is defective is 1/500. The articles are supplied in packets of 10. Find approximately the number of packets containing no defective, one defective, two defectives in a consignment of 20,000 packets.

[**Ans. :** 19604, 392, 4]

4. A manufacturer finds that the average demand per day for the mechanic to repair his new production is 1·5. Over a period of one year the demand per day is distributed as Poisson distribution. He employs two mechanics. On how many days in one year (a) both mechanics would be free, (b) some demand is refused. [**Ans. : (i)** 84·4, **(ii)** 69·8]

5. In a certain factory turning out blades, there is a small chance of 0·002 for any blade to be defective. The blades are supplied in packets of 10. Use Poisson's distribution to calculate the approximate number of packets containing no defective, one defective and two defective blades in a consignment of 10,000 packets. **(S.U. 1985, 87, 90, 91, 2004)**

[**Ans. : (i)** 9802, **(ii)** 196, **(iii)** 2]

(D) **1.** Fit a Poisson's distribution to the following data : **(S.U. 1995)**

x :	0,	1,	2,	3,	4,	**Total**
f :	192,	100,	24,	3,	1,	320.

[**Ans. :** $m = 0.5$ approx. Freq. $320\dfrac{e^{-0\cdot5}(0\cdot5)^x}{x!}$ *i.e.* 194, 97, 24, 4, 1]

2. Fit a Poisson's distribution to the following data

x :	0,	1,	2,	3,	4,	**Total**
f :	112,	63,	20,	4,	1,	200.

[**Ans. :** $m = 0{\cdot}595$, Frequency 110, 66, 19, 4, 1]

3. The following mistakes per page were observed in a book

No. of mistakes :	0,	1,	2,	3,	4,	**Total**
No. of pages :	211,	90,	19,	5,	0,	325.

Fit a Poisson distribution. **(S.U. 1999)** [**Ans. :** $m = 0{\cdot}44$, Frequency : 209, 92, 20, 3, 1]