FINAL EXAMINATION (ANSWER SCHEME)

Course: STATISTICS & PROBABILITY
Course Code: DUM2413
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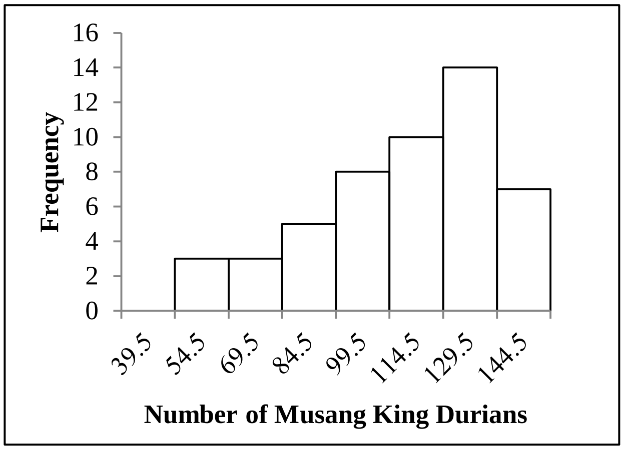
QUESTION 1	
Answer	**Remarks**
(i) 20 retail stores in Kuantan **(ii)** Primary data. **(iii)** Variable : The monthly income of the retail stores in Kuantan Type of variable : Quantitative/Continuous **(iv)** Level of measurement : Ratio-level **(v)** Sampling technique used: Systematic sampling technique $k = \frac{20}{5} = 4$ Staring point: 03 Hafifi Centre 07 Eshan Supply; 11 Jusoh Enterprise; 15 Happy Day; 19 MummyDaddy	

QUESTION 2

Answer	Remarks
(i) Mode = 125 durians	
(ii) Shape of distribution = Left-skewed distribution	
(iii)	

Class limits	Class boundaries	Frequency
40-54	39.5-54.5	3
55-69	54.5-69.5	3
70-84	69.5-84.5	5
85-99	84.5-99.5	8
100-114	99.5-114.5	10
115-129	114.5-129.5	14
130-144	129.5-144.5	7



(iii) Supported. This is due to both stem-and leaf plot and histogram show the similar distribution, namely left-skewed distribution.

QUESTION 3

Answer	Remarks

(a)(i)

Let A= Committee with one male and three female staffs

$$P(\mathrm{A}) = \frac{{}^{10}\mathrm{C}_1 \cdot {}^{12}\mathrm{C}_3}{{}^{22}\mathrm{C}_4} = \frac{40}{133} \,/\, 0.3008$$

(a)(ii)

Let B= Committee with two male and two female staffs

$$P(\mathrm{B}) = \frac{{}^{10}\mathrm{C}_2 \cdot {}^{12}\mathrm{C}_2}{{}^{22}\mathrm{C}_4} = \frac{54}{133} \,/\, 0.4060$$

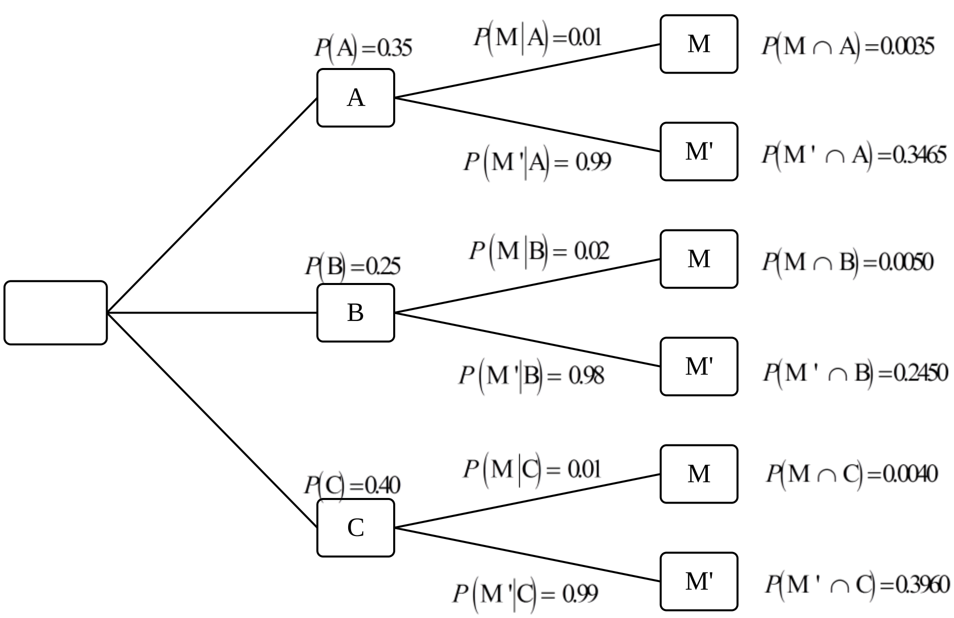
(a)(iii)

Let C= Committee with all are male staffs

$$P(\mathrm{C}) = \frac{{}^{10}\mathrm{C}_4 \cdot {}^{12}\mathrm{C}_0}{{}^{22}\mathrm{C}_4} = \frac{6}{209} \,/\, 0.0287$$

(b)(i)

Let A-factories A; B-factories B; C-factories C; M-Malfunction; M'-functions



(b)(ii) $P(\mathrm{M}) = P(\mathrm{M} \cap \mathrm{A}) + P(\mathrm{M} \cap \mathrm{B}) + P(\mathrm{M} \cap \mathrm{C}) = 0.0035 + 0.0050 + 0.0040$ $= 0.0125$ **(b)(iii)** $P(\mathrm{B} \mid \mathrm{M}) = \frac{P(\mathrm{B} \cap \mathrm{M})}{P(\mathrm{M})} = \frac{P(\mathrm{M} \cap \mathrm{B})}{P(\mathrm{M})} = \frac{0.0050}{0.0125}$ $= 0.4000$	

QUESTION 4	
Answer	**Remarks**
(a)(i) $E(X) = np = 14\left(\frac{45}{100}\right)$ $= 6.3000$ $\mathrm{Var}(X) = np(1-p) = 14\left(\frac{45}{100}\right)\left(1 - \frac{45}{100}\right)$ $= 3.4650$ **(a)(ii)** $P(X < 8) = P(X \le 7)$ By using the table of the cumulative binomial distribution, $P(X < 8) = P(X \le 7) = 0.7414$ **(a)(iii)** $P(X > 6) = P(X \ge 7)$ By using the table of the cumulative binomial distribution, $P(X > 6) = P(X \ge 7) = 1 - P(X \le 6) = 1 - 0.5461$ $= 0.4539$ **(b)(i)** Let random variable of X represents the number of patients will be suffered on side effect from an anti-medication	

$\lambda \approx np \approx 1000(0.0050)$ ≈ 5 By using the table of the cumulative Poisson distribution, $P(X \le 1) = 0.0404$ **(b)(ii)** $P(4 \le X \le 6) = P(X \le 6) - P(X \le 3)$ By using the table of the cumulative Poisson distribution, $P(4 \le X \le 6) = 0.7622 - 0.2650$ $= 0.4972$	

QUESTION 5	
Answer	**Remarks**
(a)(i) $P(X \ge 16.00) = P\left(Z \ge \frac{16.00 - 15.40}{0.48}\right)$ $= P(Z \ge 1.2500)$ By using the function in calculator, $P(Z \ge 1.2500) = 0.1057$ **(a)(ii)** $P(X \le 14.00) = P\left(Z \le \frac{14.00 - 15.40}{0.48}\right)$ $= P(Z \le -2.9167)$ By using the function in calculator, $P(Z \le -2.9167) = 0.0018$ **(a)(iii)** $P(15.00 \le X \le 15.80) = P\left(\frac{15.00 - 15.40}{0.48} \le Z \le \frac{15.80 - 15.40}{0.48}\right)$ $= P(-0.8333 \le Z \le 0.8333)$ By using the function in calculator, $P(-0.8333 \le Z \le 0.8333) = 0.5953$	

(b)

$$\mu \approx n\lambda \approx 100(60)$$
$$\approx 6000$$
$$\sigma \approx \sqrt{n\lambda} \approx \sqrt{100(60)} = 77.4597$$

$$P(5960 \le X \le 6100) \approx P\left(\frac{(5950+0.5)-6000}{77.4597} \le Z \le \frac{(6100+0.5)-6000}{77.4597}\right)$$
$$\approx P(-0.6390 \le Z \le 1.2974)$$

By using the function in calculator,

$$P(-0.6390 \le Z \le 1.2974) \approx 0.6413$$

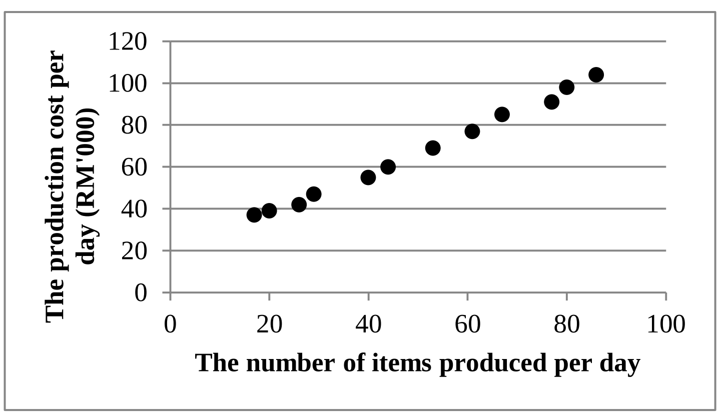
QUESTION 6

Answer

(i)

Depedent variable : The production cost per day (RM'000).
Independent variable : The number of items produced per day.

(ii)



D1-Axis
D1-Scatters

There is a positive linear relationship between the number of items produced per day and the production cost per day (RM'000).

(iii)

$$S_{xy} = \sum x_i y_i - \frac{\sum x_i \sum y_i}{n} = 46544 - \frac{(600)(804)}{12} = 6344.0000$$

$$S_{xx} = \sum x_i^2 - \frac{\left(\sum x_i\right)^2}{n} = 36486 - \frac{(600)^2}{12} = 6486.0000$$

$$S_{yy} = \sum y_i^2 - \frac{\left(\sum y_i\right)^2}{n} = 60104 - \frac{(804)^2}{12} = 6236.0000$$

$$r = \frac{S_{xy}}{\sqrt{S_{xx} S_{yy}}} = \frac{6344.0000}{\sqrt{6486.0000}\sqrt{6236.0000}} = 0.9975$$

Interpretation:

There is a strong positive linear relationship between the number of items produced per day and the production cost per day (RM'000).

(iv)

Supported. This is due to the scatter diagram and correlation coefficient showed a parallel/similar result.

(v)

$$r^2 = (0.9975)^2 = 0.9950$$

Intrepretation:

99.50% total variation of the production cost per day (RM'000) can be explained by the number of items produced per day.

(vi)

$$\hat{\beta}_1 = \frac{S_{xy}}{S_{xx}} = \frac{6344.0000}{6486.0000} = 0.9781$$

$$\bar{x} = \frac{\sum x_i}{n} = \frac{600}{12} = 50.0000$$

$$\bar{y} = \frac{\sum y_i}{n} = \frac{804}{12} = 67.0000$$

$$\hat{\beta}_0 = \bar{y} - \hat{\beta}_1 \bar{x} = 67.0000 - (0.9781)(50.0000) = 18.0950$$

$\therefore \hat{y} = \hat{\beta}_0 + \hat{\beta}_1 x = 18.0950 + 0.9781x$ **Interpretation** $\hat{\beta}_0 = 18.0950$ When there is no items produced per day, the expectation of the production cost per day is RM18095.00. $\hat{\beta}_1 = 0.9781$ The expectation of the production cost per day is increased by RM978.10 for every increase 1 item produced per day. **(vii)** When $x = 55$ units; $y = ?$ $\hat{y} = 18.0950 + 0.9781(55)$ $\hat{y} = \text{RM } 71890.50$	