STRUCTURED (100 marks)

Instruction: This paper consists of **SIX (6)** structured questions.

Answer **FOUR (4)** questions only.

QUESTION 1 (CLO 1)

a) Table Q1(a) shows the number of tourists (in thousand units) visiting Malaysia within 12 months in year 2010.

Month	Number of tourists (in thousand units)
January	12.6
February	14.3
March	13.2
April	18
May	17
June	15.7
July	16
August	20
September	17
October	18.2
November	19
December	18

Table Q1(a)

From the above data, sketch;

i) a vertical bar chart. (6 marks)

ii) a line graph. (6 marks)

POLITEKNIK
Jabatan Pengajian Politeknik

EXAMINATION AND EVALUATION DIVISION
DEPARTMENT OF POLYTECHNIC EDUCATION
(MINISTRY OF HIGHER EDUCATION)

MATHEMATICS, SCIENCE & COMPUTER DEPARTMENT

FINAL EXAMINATION

DECEMBER 2011 SESSION

BA301 : ENGINEERING MATHEMATICS 3

DATE : 25 APRIL 2012 (WEDNESDAY)
DURATION : 2 HOURS (2.30 PM – 4.30 PM)

This paper consists of **NINE (9)** pages including the front page and appendix.

This paper consists of **SIX (6)** questions. Answer **FOUR (4)** questions only

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DO NOT OPEN THIS QUESTION PAPER UNTIL INSTRUCTED BY THE CHIEF INVIGILATOR

(CLO stated at the end of each question is referring to the learning outcome of the topic assessed. The CLO stated is only for lectures' references.)

b) Table Q1(b) shows the frequency distribution of the mass, in kg of a group of 80 polytechnic students.

Mass(kg)	Frequency
30 - 34	5
35 - 39	8
40 - 44	11
45 - 49	21
50 - 54	22
55 - 59	10
60 - 64	3

Table Q1(b)

From the above table, prepare and draw:

i) an accumulated "less than" frequency table. (5 marks)

ii) a histogram. (3 marks)

iii) an ogive. (3 marks)

iv) from the ogive, find the 1^{st} and 3^{rd} quartile. (2 marks)

QUESTION 2 (CLO 1)

(a) The number of fish caught by 30 contestants in a fishing competition at the Lake Garden is given in Table 2(a).

No. of fish	0	1	2	3	4	5
No. of contestants	2	4	10	6	5	3

Table 2 (a)

Calculate:

(i) the mode. (2 marks)

(ii) the median. (3 marks)

(iii) the mean. (6 marks)

b. The height in cm of 100 workers in a factory is shown in Table 2(b) :

Height	No. of workers
151 – 155	9
156 – 160	15
161 – 165	28
166 – 170	34
171 – 175	10
176 - 180	4

Table 2(b)

From the data in the Table 2(b), calculate,

i. the median of the height. (8 marks)

ii. the variance of the height. (6 marks)

QUESTION 3 (CLO 2)

a) Based on the table below:

i. complete the table : (6 marks)

x	0	0.25	0.5		1
$(1-x^2)$					

ii. estimate the value of $\int_0^1 (1-x^2)dx$, using Trapezoidal Rule.

(7 marks)

b) Based on the table below.

i) Complete the table. (6 marks)

x	-1		-0.5		0	0.25		0.75	1
e^{-x^2}									

ii) Evaluate the following definite integral by using Simpson's Rule.

$$\int_{-1}^{1} e^{-x^2}\,dx$$

(6 marks)

QUESTION 4 (CLO 2)

a) An arithmetic progression is given as 9, 4, -1, -6, -11, … .Find the :

i) common difference of the progression. (2 marks)

ii) sum of the first 40 terms. (3 marks)

b) An architect designs an amphitheater with 30 seats in the first row, 32 in the second, 34 in the third, and so on. If the amphitheater is to have a seating capacity of 3950, how many rows must the architect use in his design?

(6 marks)

c) The sum of the first three terms of a geometric progression is 63 and its common ratio is 4. Find the :

i) first term of the progression. (5 marks)

ii) third and the fourth term of the progression. (4 marks)

iii) sum of the fourth term to the sixth term. (5 marks)

QUESTION 6 (CLO 3)

(a) Determine the values of x_1, x_2 *and* x_3 by using Crout's Method. Give your answers in 4 decimal places.

$$2x_1 + x_2 + x_3 = 4$$
$$2x_2 + x_1 + x_3 = 4$$
$$2x_3 + x_1 + x_2 = 4$$

(12 marks)

(b) Given $f(x) = x^3 - 7x + 2$ and $x_0 = 1.5$.

i) Find all possible iterative functions for the equation above. (5 marks)

ii) From your answers in (b) i), determine the suitable iterative function. Explain your answer. (8 marks)

QUESTION 5 (CLO 3)

(a) Determine the matrix order of the following matrices.

i. $\begin{pmatrix} 4 \\ -6 \\ 5 \end{pmatrix}$ (1 mark)

ii. $\begin{pmatrix} 12 & -9 & 18 \\ 6 & 10 & -7 \end{pmatrix}$ (1 mark)

(b) Given that E= $\begin{pmatrix} 4 \\ -6 \\ 5 \end{pmatrix}$ and F= $\begin{pmatrix} 20 \\ -5 \\ 6 \end{pmatrix}$. Find E+F. (3 marks)

(c) If A= $\begin{pmatrix} 0 & -1 & 2 \\ 4 & 11 & 2 \end{pmatrix}$ and B= $\begin{pmatrix} 3 & -1 \\ 1 & 2 \\ 6 & 1 \end{pmatrix}$ find AB. (4 marks)

(d) Determine the values of x and y if :

$$2\begin{pmatrix} x & 4 \\ 8 & -y \end{pmatrix} + 3\begin{pmatrix} y & 6 \\ 12 & -x \end{pmatrix} = \begin{pmatrix} 17 & 26 \\ 52 & -13 \end{pmatrix}$$ (4 marks)

(e) Given that A= $\begin{pmatrix} 3 & -2 & 1 \\ -5 & 0 & 0 \\ 4 & -1 & 2 \end{pmatrix}$. Find

i. The determinant of matrix A. (2 marks)

ii. Minor m_{22} and m_{31}. (4 marks)

(f) The linear simultaneous equations is given below.

$$x - y - z = 2$$
$$4x + 2y + 3z = 7$$
$$3x - 5y + 6z = -5$$

i. Write in the matrix form. (1 mark)

ii. Find the determinant of the matrix. (2 marks)

iii. Find the value of z using Cramer's rule. (3 marks)

PEMBETULAN RUMUS B3001/BA301

7. **VARIANCE:**

i. $S^2 = \dfrac{\sum (x-\bar{x})^2}{n-1}$

ii. $S^2 = \dfrac{\sum x^2 - n(\bar{x})^2}{n-1}$

iii. $S^2 = \dfrac{\sum (x-\bar{x})^2 f}{n-1}$

iv. $S^2 = \dfrac{\sum x^2 f - n(\bar{x})^2}{n-1}$

ARITHMETIC PROGRESSION

10. i. $S_n = \dfrac{n}{2}\left[2a+(n-1)d\right]$

ii. $S_n = \dfrac{n}{2}\left[a+l\right]$

16. **TRAPEZOIDAL RULE**

$$\int_a^b f(x)dx = \frac{h}{2}\left[y_{first} + y_{last} + 2(y_{others})\right]$$

17. **SIMPSON'S RULE**

$$\int_a^b f(x)dx = \frac{h}{3}\left[y_{first} + y_{last} + 2(y_{odd}) + 4(y_{even})\right]$$

FORMULA OF ENGINEERING MATHEMATICS 3 (BA301)

1. Mean

$$\bar{x} = \frac{\sum x}{N} = \frac{\sum fx}{\sum f}$$

Median = $L + \left[\dfrac{\frac{N}{2} - F}{f_m}\right]c$

2. Mod e= $L + \left[\dfrac{d_1}{d_1 + d_2}\right]c$

3. Quartile , $Q_k = L + \left[\dfrac{\frac{k}{4}N - F}{f_{QK}}\right]c$

4. Decil , $D_k = L + \left[\dfrac{\frac{k}{10}N - F}{f_{DK}}\right]c$

5. Percentile, $P_K = L + \left[\dfrac{\frac{k}{100}N - F}{f_{PK}}\right]c$

6. Mean Deviation

i. $E = \dfrac{\sum |x-\bar{x}|}{n}$

ii. $E = \dfrac{\sum |x-\bar{x}| f}{n}$

7. Variance.

i. $s^2 = \dfrac{\sum (x-\bar{x})^2}{n}$

ii. $s^2 = \dfrac{\sum_{i=1}^{n} x_i^2 - n\bar{x}^2}{n}$

iii. $s^2 = \dfrac{\sum (x-\bar{x})^2 f}{n}$

iv. $s^2 = \dfrac{\sum fx^2}{\sum f} - \left[\dfrac{\sum fx}{\sum f}\right]^2$

8. Standard Deviation

$$s = \sqrt{\text{var}\,iance}$$

Arithmetic Progression

9. $T_n = a + (n-1)d$

10. $S_n = \dfrac{n}{2}\left[2a + (n-1)d\right]$

11. $T_n = \dfrac{T_{n-1} + T_{n+1}}{2}$

Geometric Progression

12. $T_n = ar^{n-1}$

13. $S_n = \dfrac{a(1-r^n)}{1-r} @ \dfrac{a(r^n-1)}{r-1}$

14. $T_n = \sqrt{T_{n-1} \times T_{n+1}}$

Matrix

15. Inverse of Matrix

i. $A^{-1} = \dfrac{Adjoin(A)}{|A|} = \dfrac{C_a^t}{|A|}$

ii. Cofactor , $C = (-1)^{i-j} M_{ij}$

Area of Irregular Shape

16. Trapezoidal Rule

i. $\int_a^b f(x)dx = \dfrac{h}{2}\left(y_0 + 2y_1 + 2y_2 + \ldots\ldots + 2y_{n-1} + y_n\right)$

ii. $\int_a^b f(x)dx = h\left(\dfrac{1}{2}f(a) + f(x_1) + \ldots\ldots + f(x_{n-1}) + \dfrac{1}{2}f(b)\right)$

17. Simpson's Rule

i. $\int_a^b ydx = \dfrac{h}{3}(f_0 + 4f_1 + 2f_2 + 4f_3 + \ldots.. + 4f_{n-1} + f_n)$

ii. $\int_a^b f(x)dx = \dfrac{h}{3}\left(f(a) + 4\Sigma f(odd\ number) + 2\Sigma f(even\ number) + f(b)\right)$