Format of Task Design

Study Program Name	**Bachelor, Mathematics Department,FMKSD-ITS**
Course Name	**Algorithms And Programming**
Course Code	**KM184202**
Semester	**2**
Credits	**4**
Supporting Lecturer	**Dr. Dwi Ratna, MT**

Assessment Design

Week number- : 4 **Assignment : 2**

1. Assignment Objective :
   Students able to understand algorithm and able to construct algorithm from a real problem to a program flowchart (2,3)

2. Assignment Description
   a. Objects studied :
      Creating flowchart from a real problem.

   b. What needs to be done and its constraints :
      Creating a flowchart according to the given problem

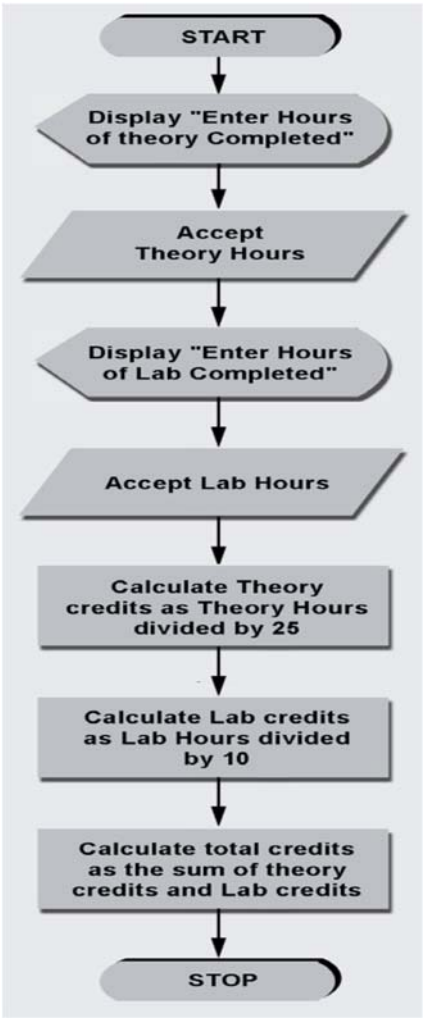
   c. Method to complete the assignment :
      The assignment is written on a paper

   d. Outcome :
      Understand the method to create flowchart

3. Question example:
   A university offers credits for its courses with the following criteria:
   - Theory : one credit for 25 hours
   - Laboratories : one credit for 10 hours

   Create a flowchart that reads the number of hours in theory and the number of hours in laboratory that is taken by a student then compute the total credits

4. Scoring criteria

No.	Aspect / Assessed Concept	Score
1	Able to define the initial conditions and final conditions of the algorithm : Input : Number of theoretical hours and number of laboratory hours Output : Total Credits	20
2	Able to draw the input and output processes	20
3	Able to draw the computation process	20
3	Able to create the complete flowchart completely and correctly 	40

Format of Task Design

Study Program Name	**Bachelor, Mathematics Department,FMKSD-ITS**
Course Name	**Artificial neural networks**
Course Code	**KM184828**
Semester	**8**
Credits	**2**
Supporting Lecturer	**Prof. Dr. Mohammad Isa Irawan, MT**

Weeks : 4, 5 **Task : 1**

1. Purpose of task :
   Students are able to demonstrate through a simple program in Java or MATLAB to implemented Perceptron algorithm to recognized operator logic AND, OR, NAND dan NOR.

2. Task description
   a. Claim object :
      Project programming - Implementation of perceptron algorithm to recoqnized operator logic.
   b. What to do and limitation :
      Create a program that can demonstrate ability of perceptron to memorize input-output data, and recoqnized the pattern
   c. Description of output of work produced / done:
      Report and program that must be presented in front of other students

3. Assessment criteria

No.	Assessed Aspects / Concepts	Score
1	Able to demonstrate ability of perceptron algorithm	30
2	Able to implement in programming language Java / Python, minimum in MATLAB	40
3	Able to demonstrate the program well, user friendly, and beautiful	30
Score Total		100

Format of Task Design

Study Program Name	**Bachelor, Mathematics Department,FMKSD-ITS**
Course Name	**Artificial Neural Networks**
Course Code	**KM184828**
Semester	**8**
Credits	**2**
Supporting Lecturer	**Prof. Dr. Mohammad Isa irawan, MT**

Week - : 15 **Task : 2**

1. Purpose of task :
   Student able to explain others algorithms that have not implemented yet in a project.

2. Task description
   a. Claim object :
      Explain a part of book which contain an algorithm of ANNs
   b. What to do and limitation :
      Make a presentation to explain an algorithm which has not implemented in project programming.
   c. Method/way of done reference used:
      Tasks are typed in a power point that contain algorithm, and example of application.
   d. Description of output of work produced / done:
      A power point and translation in word.

3. Assessment criteria
4.

No.	Assessed Aspects / Concepts	Score
1	Able to explain one or more other algorithm which have not been implemented yet in the programming project	30
2	Able to explain using examples from literature	40
3	Able to explain clearly and systematically	30
Score total		100

Format of Task Design

Course : **Elementary Linear Algebra**

Semester : 2 (Dua)

Code : **KM184203** **sks** : 4

EXAMPLE OF QUIZ QUESTIONS

1. Complete the following system of linear equation with the Gaussian / Gauss Jordan elimination

$$x - 2z + 7u = 11$$
$$2x - y + 3z + 4u = 9$$
$$3x - 3y + z + 5u = 8$$
$$2x + y + 4z + 4u = 10$$

2. Given the following system of linear equation

$$\begin{aligned} x + 2y - \quad 3z &= 4 \\ 3x - y + \quad 5z &= 2 \\ 4x + y + \left(a^2 - 14\right)z &= a + 2 \end{aligned}$$

   a. Determine the value of a for the system of linear equation above to have one solution
   b. Determine the value of a for the system of linear equation above to have many solutions
   c. Determine the value of a for the system of linear equation above to have no one solution

3. Given $A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix}$

   a. Determine A^{-1}
   b. Complete the linear equation $AX = B$ if $B = \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}$

4. Determine $\begin{vmatrix} 0 & 5 & 5 & 5 \\ \frac{1}{7} & \frac{2}{7} & 1 & \frac{5}{7} \\ 100 & 50 & 100 & 0 \\ \frac{1}{3} & 0 & \frac{5}{3} & 0 \end{vmatrix}$

5. If $A = \begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix}$ and det $A = 4$

   a. Determine det $(4A)^{-1}$

   b. Determine $\begin{vmatrix} a+d & a-d & g \\ b+e & b-e & h \\ c+f & c-f & i \end{vmatrix}$

SAMPLE HOW TO ASSESS NO 2

STEPS	STEPS	SKOR
I	Student able to make augmented matrix $\left(\begin{array}{ccc\|c} 1 & 2 & -3 & 4 \\ 3 & -1 & 5 & 2 \\ 4 & 1 & a^2-14 & a+2 \end{array}\right)$	4
II	Students are able to use Elementary Linear Operations to change the augmented matrix into a lower triangle matrix $\left(\begin{array}{ccc\|c} 1 & 2 & -3 & 4 \\ 3 & -1 & 5 & 2 \\ 4 & 1 & a^2-14 & a+2 \end{array}\right) OBE: B_2 - 3B_1 \text{ and } B_4 - 4B_1 \left(\begin{array}{ccc\|c} 1 & 2 & -3 & 4 \\ 0 & -7 & 14 & -10 \\ 0 & -7 & a^2-2 & a-14 \end{array}\right) OBE: B_2 x - \frac{1}{7}$ $\left(\begin{array}{ccc\|c} 1 & 2 & -3 & 4 \\ 0 & 1 & -2 & \frac{10}{7} \\ 0 & -7 & a^2-2 & a-14 \end{array}\right) OBE: B_3 + 7B_2 \left(\begin{array}{ccc\|c} 1 & 2 & -3 & 4 \\ 0 & 1 & -2 & \frac{10}{7} \\ 0 & 0 & a^2-16 & a-4 \end{array}\right)$	4

III	a. Students are able to determine the conditions for the above system of linear equation to have one solution Condition : $a^2 - 16 \neq 0$ Answer : $a \neq -4, 4$	4
IV	b. Students are able to determine the conditions for the system of linear equation above to have many solutions Condition : $a^2 - 16 = 0$ dan $a - 4 = 0$ Answer : $a = 4$	4
v	c. Students are able to determine the conditions for the system of linear equation above to have no solutions Condition : $a^2 - 16 = 0$ dan $a - 4 \neq 0$ Answer : $a = -4$	4

Task Design Format

Study Program Name	**Bachelor, mathematics Department, FMKSD-ITS**
Course Name	**Function of Complex Variables**
Course Code	**KM184602**
Semester	**6**
SKS	**3**
Supporting Lecturer	**Drs. Sentot Didik Surjanto, M.Si**

Weeks : 2 **Tasks : 2**

1. Purpose of Task:
   Students are able to calculate and prove complex roots

2. Description of Task:
   a. Claim object :
      Determines the roots of complex numbers and prove the predetermined roots.

   b. What to do and limitation :
      Determine the complex roots and prove the complexity of the complexity

   c. Method/way of reference work used :
      The task is done on folio paper

   d. Description of output of work produced / done:
      Understand the calculations and properties of the roots of complex numbers

   1. If $z = a + ib$ and $w = x + iy$, show root z that meets equation $w^2 = z$ is

$$\pm\left\{\sqrt{\frac{a}{2}+\frac{1}{2}\sqrt{a^2+b^2}}\left(1-\frac{a-\sqrt{a^2+b^2}}{b}i\right)\right\}$$

3. Assessment criteria

No.	Assessed Aspects / Concepts	Score
1	Prove: $w^2 = z \rightarrow (x+iy)^2 = a+ib$	25

	$x^2 - y^2 + i2xy = a + ib$	
2	Then $\begin{cases} x^2 - y^2 & = a \\ 2xy & = b \end{cases}$	25
3	Assume $b \neq 0 \rightarrow y = \frac{b}{2x}$ substitute to $x^2 - y^2 = a \rightarrow x^2 - \left(\frac{b}{2x}\right)^2 = a$ $4x^4 - b^2 = 4ax^2 \rightarrow x^4 - ax^2 - \frac{b^2}{4} = 0$ $\left(x^2 - \frac{a}{2}\right)^2 = \frac{a^2 + b^2}{4} \geq 0$	25
4	So $x^2 = \frac{a}{2} \pm \sqrt{\frac{a^2 + b^2}{4}} = \frac{a}{2} \pm \frac{1}{2}\sqrt{a^2 + b^2}$	25
5	Since $\frac{1}{2}\sqrt{a^2 + b^2} \geq \frac{a}{2}$, then the fulfillment is $x = \pm\sqrt{\frac{a}{2} + \frac{1}{2}\sqrt{a^2 + b^2}}$	
6	Root from $z = a + ib$ is $\pm\left[\sqrt{\frac{a}{2} + \frac{1}{2}\sqrt{a^2 + b^2}}\left(1 - \frac{a - \sqrt{a^2 + b^2}}{b}i\right)\right]$	
Score total		100

Example of Description Test

Questions :

1. Determine the root of $\left(\sqrt{3}+i\right)^{1/2}$

   Answer:

$$\sqrt{3}+i = 2\,exp\left[i\left(\frac{\pi}{6}+2k\pi\right)\right]; k = 0, \pm 1, \cdots$$

$$c_k = \sqrt{2}\,exp\left[i\left(\frac{\pi}{12}+k\pi\right)\right]; k = 0, 1$$

$$c_0 = \sqrt{2}\,exp\left[i\left(\frac{\pi}{12}\right)\right] = \sqrt{2}\,cis\,\left(\frac{\pi}{12}\right)$$

$$cos^2\left(\frac{\alpha}{2}\right) = \frac{1+\cos\alpha}{2}; \quad sin^2\left(\frac{\alpha}{2}\right) = \frac{1-\cos\alpha}{2}$$

$$cos^2\left(\frac{\pi}{12}\right) = \frac{1+\cos(\pi/6)}{2} = \frac{1}{2}\left(1+\frac{\sqrt{3}}{2}\right) = \frac{2+\sqrt{3}}{4}$$

$$sin^2\left(\frac{\pi}{12}\right) = \frac{1-\cos(\pi/6)}{2} = \frac{1}{2}\left(1-\frac{\sqrt{3}}{2}\right) = \frac{2-\sqrt{3}}{4}$$

$$c_0 = \sqrt{2}\left(\sqrt{\frac{2+\sqrt{3}}{4}}+i\sqrt{\frac{2-\sqrt{3}}{4}}\right) = \frac{1}{\sqrt{2}}\left(\sqrt{2+\sqrt{3}}+i\sqrt{2-\sqrt{3}}\right)$$

   Since $c_1 = -c_0$, the root of $\sqrt{3}+i$ is

$$\pm\frac{1}{\sqrt{2}}\left(\sqrt{2+\sqrt{3}}+i\sqrt{2-\sqrt{3}}\right)$$

Score Guidelines

No.	Assessed Aspects / Concepts	Score
1	Able to calculate modulus and complex number arguments $\sqrt{3}+i = 2\,exp\left[i\left(\frac{\pi}{6}+2k\pi\right)\right]; k = 0, \pm 1, \cdots$ $c_k = \sqrt{2}\,exp\left[i\left(\frac{\pi}{12}+k\pi\right)\right]; k = 0, 1$ $c_0 = \sqrt{2}\,exp\left[i\left(\frac{\pi}{12}\right)\right] = \sqrt{2}\,cis\,\left(\frac{\pi}{12}\right)$	30
2	Able to prove trigonometric equations	

	$cos^2\left(\frac{\alpha}{2}\right) = \frac{1+\cos\alpha}{2}; \quad sin^2\left(\frac{\alpha}{2}\right) = \frac{1-\cos\alpha}{2}$ $cos^2\left(\frac{\pi}{12}\right) = \frac{1+\cos(\pi/6)}{2} = \frac{1}{2}\left(1+\frac{\sqrt{3}}{2}\right) = \frac{2+\sqrt{3}}{4}$ $sin^2\left(\frac{\pi}{12}\right) = \frac{1-\cos(\pi/6)}{2} = \frac{1}{2}\left(1-\frac{\sqrt{3}}{2}\right) = \frac{2-\sqrt{3}}{4}$	40
3	Able to count and substitute complex numbers in exponential form $c_0 = \sqrt{2}\left(\sqrt{\frac{2+\sqrt{3}}{4}} + i\sqrt{\frac{2-\sqrt{3}}{4}}\right) = \frac{1}{\sqrt{2}}\left(\sqrt{2+\sqrt{3}} + i\sqrt{2-\sqrt{3}}\right)$ Since $c_1 = -c_0$, then root from $\sqrt{3}+i$ is $\pm\frac{1}{\sqrt{2}}\left(\sqrt{2+\sqrt{3}} + i\sqrt{2-\sqrt{3}}\right)$	30
100		

Format of Task Design

Course : Introduction to Dynamical Optimization
Semester : VII
Code : KM184716 **sks :** 2
Weeks : 4

1. Purpose of Task :
   Students are able to explain the concept of optimal function and function

2. Task Description
   a. Claim Object :
      Function optimization and simple functional forms

   b. What to do and limitation :
      B1. Determine whether the following functions are maximum or minimum
      $$f = x^4 + y^4 - 2x^2 + 4xy - 2y^2$$
      B2. Find distance between curve $y = x$ and $y = x^2$ on interval $[0,1]$
      B3. Determine extreme conditional from $f = xyz$ with condition
      $$x + y + z = 5$$
      $$xy + yz + zx = 8$$
      B4. Determine change in functional
      $$J[y(x)] = \int_0^1 y(x)\, y'^{(x)} dx$$
      if given $y(x) = e^x$ dan $y_1(x) = 1$.

   c. Method/way reference work used :
      Tasks are typed in A4 paper size 12 letter spacing 1.15 normal margins.

d. Description of output of work produced/ done
Writing about the solutions to several problems given

3. Assessment criteria

No.	Assessed Aspects / Concepts	Score
1	Able to determine optimization (maximum and minimum values) of a function	15
2	Able to determine the distance between two functions	25
3	Able to determine extreme conditionals of functions $f = xyz$ with a constraint	25
4	Able to determine changes in functional J [y (x)] with an constraint	35
Score total		100

Format of Task Design

Course : **Statistical Method**

Semester : III (Tiga)

Code : **KM184305** **sks** : 3

Week- : 3 **Task : 3**

1. Task Goal :
   Students are able to determine the mean, variant distribution of variables and opportunities

2. Task Description
   a. Object :
      Determine the sample space of all occurrences of an experiment, determine the distribution of variable X and calculate the probability of variable X

   b. What to do and limitation :
      Determine sample space and calculate probability of variable X

   c. Method used :
      Task is done in folio paper

   d. Description of task output that has done :
      Completion according to the chapter that has been taught

      1. The success of someone entering the CPNS test is 0.4, if 15 people take the test, how many opportunities:

      a. At least 10 people succeeded

      b. There are 3-8 people who succeed

      c. Right 5 people who succeed

d. With Chebyshev's argument, determine and interpret the interval $\mu \pm 2\sigma$

3. Question and evaluation criteria

No.	Assessed Aspects / Concepts	Score
1	Answer a: At least 10 people succeeded Let X is people that succeeded, than $$P(X \geq 10) = 1 - P(X < 10)$$ $$= 1 - \sum_{x=1}^{9} b\,(x; 15, 0.4)$$ $$= 1 - 0{,}9662 = 0{,}0338$$	25
2	Answer b: There are 3-8 people succeed $$P(3 \leq X \leq 8) = \sum_{x=3}^{8} b\,(x; 15, 0.4)$$ $$= \sum_{x=0}^{8} b\,(x; 15, 0.4) - \sum_{x=0}^{2} b\,(x; 15, 0.4)$$ $$= 0{,}9050 - 0{,}0271 = 0{,}8779$$	25
3	Answer c: Right 5 people who succeed $$P(X = 5) = b(5; 15, 0.4)$$	25

	$$\sum_{x=0}^{5} b\,(x; 15, 0.4) - \sum_{x=0}^{4} b\,(x; 15, 0.4)$$ $$= 0{,}4032 - 0{,}2173 = 0{,}1859$$	
4	Answer d: With Chebyshev's argument, determine and interpret the interval $\mu \pm 2\sigma$ Is a binomial experiment with: $n = 15;\ p = 0{,}4 \rightarrow \mu = 15 \cdot 0{,}4 = 6\ dan\ \sigma^2 = 15 \cdot 0{,}4 \cdot 0{,}6 = 3{,}6 \rightarrow \sigma = \sqrt{3{,}6} = 1{,}897$ So $\mu \pm 2\sigma = 6 \pm 2 \cdot 1{,}897$ or from 2,206 to 9,794. Dari Chebyshev states that the number of successful tests among 15 participants is between 2,206 to 9,794 with at least opportunities ¾.	25
Score Total		100

Test Planning

TIU **:** Students are able to identify natural phenomena which are examples of statistical method problems [C3,A3]

No	Subject and Sub-topic	Question Numbers			Total Questions	Weights (%)
		C2	C3	C4		
1	2	3		4	5	6
1.	Subjet-1		4		4	16
2.	Subject-2		2		2	8
3.	Subject-3			4	4	16
4.	Subject-4		4		4	16
5.	Subject-5			4	4	16
6.	Subject-6			4	4	16
7.	Subject-7			3	3	12
Number of item questions:			10	15	25	
Percentage (%):				100		100

No	Special Learning Objectives (TIK)		Questions Number		

		C3	C4	P3	P4	A3	A4	Question Numbers	Weight %
1	2	3	4	4	5	6	7	8	9
1.	TIK-1	2		1		1		4	16
2.	TIK-2		1			1		2	8
3.	TIK-3		1	1			2	4	16
4.	TIK -4	1	1	1		1		4	16
5.	TIK -5		1	1		1	1	4	16
6.	TIK -6		2		1		1	4	16
7.	TIK -7		1		1		1	3	12
Number of item questions:		3	7	4	2	4	5	25	
Percentage (%):		12	28	16	8	16	20		100

Example Description Test

Question :

1. A balanced dice is thrown twice. If X states how many times the number 4 appears and Y states how many times the number 6 appears from the two throws, specify:

a. Shared distribution for *X* and *Y*
b. Calculate $P[(X,Y) \in A]$ for $A = \{(X,Y)|x + 2y \leq 3\}$

Answer a:

f(X,Y)		X			Total h(y)
		0	1	2	
Y	0	16/36	8/36	1/36	25/36
	1	8/36	2/36	0	10/36
	2	1/36	0	0	1/36
Total g(x)		25/36	10/36	1/36	1

$$g(0) = P(X = 0) = f(0,0) + f(0,1) + f(0,2) += \frac{16}{36} + \frac{8}{36} + \frac{1}{36} = \frac{25}{36}$$

$$g(1) = P(X = 1) = \frac{10}{36}, \quad g(2) = P(X = 2) = \frac{1}{36}$$

$$h(0) = P(Y = 0) = f(0,0) + f(0,1) + f(0,2) = \frac{16}{36} + \frac{8}{36} + \frac{1}{36} = \frac{25}{36}$$

$$h(1) = P(Y = 1) = \frac{10}{36}; \quad h(2) = P(Y = 2) = \frac{1}{36}$$

table the Marginal is:

X	0	1	2
$g(X)$	25/36	10/36	1/36

Y	0	1	2
$h(Y)$	25/36	10/36	1/36

Answer b:

$$P[(X,Y) \in A] = \{(X,Y)|x + 2y \leq 3\}; x = 0,1,2 \; dan \; y = 0,1,2$$

$$= f(0,0) + f(0,1) + f(1,0) + f(1,1) + f(2,0) = \frac{16}{36} + \frac{8}{36} + \frac{8}{36} + \frac{2}{36} + \frac{1}{36} = \frac{35}{36}$$

Scoring Guidelines

No.		Assessed Aspects / Concepts	Skor
1		Able to make a shared distribution table of 2 variables as shown in the answers a. and calculation $g(0) = P(X = 0) = f(0,0) + f(0,1) + f(0,2) = \frac{16}{36} + \frac{8}{36} + \frac{1}{36} = \frac{25}{36}$	30

		$g(1) = P(X = 1) = \frac{10}{36}, \quad g(2) = P(X = 2) = \frac{1}{36}$ $h(0) = P(Y = 0) = f(0,0) + f(0,1) + f(0,2) = \frac{16}{36} + \frac{8}{36} + \frac{1}{36}$ $= \frac{25}{36}$ $h(1) = P(Y = 1) = \frac{10}{36}; \quad h(2) = P(Y = 2) = \frac{1}{36}$	
2		Able to make marginal tables from each variable	
	a	$g(x); \ x = 0, 1, 2$ $g(0) = \frac{25}{36}; \ g(1) = \frac{10}{36}; \ g(2) = \frac{1}{36}$	15
	b	$h(y); \ y = 0, 1, 2$ $h(0) = \frac{25}{36}; \ h(1) = \frac{10}{36}; \ h(2) = \frac{1}{36}$	15
3		Able to calculate opportunities along with the construction of definitions given $P[(X, Y) \in A] = \{(X, Y) \mid x + 2y \leq 3\}; x = 0, 1, 2 \ dan \ y = 0, 1, 2$ $= f(0,0) + f(0,1) + f(1,0) + f(1,1) + f(2,0)$ $= \frac{16}{36} + \frac{8}{36} + \frac{8}{36} + \frac{2}{36} + \frac{1}{36} = \frac{35}{36}$	40
Score total			100