Tanta University

Artificial Intelligence Engineering Program (AIE)

Faculty of Engineering

Course Title: **Electrical Circuits**	Course Code: **EPE101**	Year: **First_AIE Program**
Date: **22/ 1/ 2025**	Allowed time: **2 hrs**	No. of Pages: **(2)**
	Total Marks: **40 Marks**	

Remarks: (answer the following questions… assume any missing data… answers should be supported by sketches if possible)

Question Number (1) **(7 Marks)**

a) **For the circuit shown in figure (1), Find the unknown quantities** using the information provided.

b) **For the circuit shown in figure (2), determine; I_s, I_4, V_1, V_3** and the total **delivered power.**

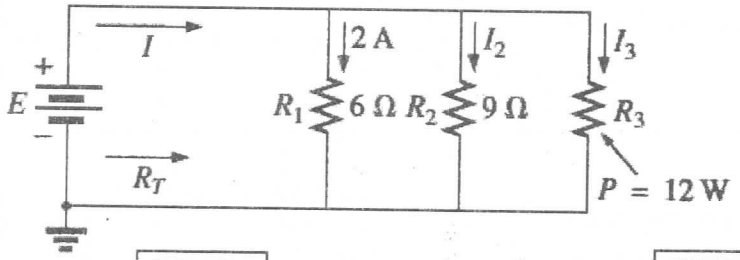


Fig. 1

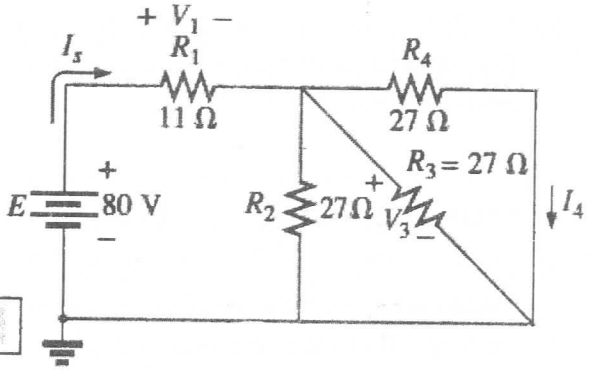


Fig. 2

Question Number (2) **(7 Marks)**

a) **For the circuit shown in figure (3), write down** the **NODAL** equations **(WITHOUT any simplifications or conversions).**

b) **Using NODAL equations of part (a), determine** the **current through 6.2 Ω** resistor.

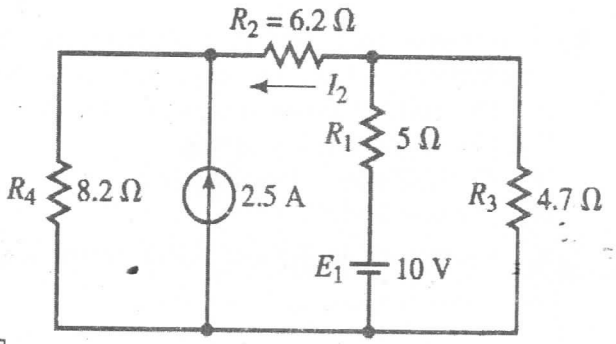


Fig. 3

Question Number (3) **(6 Marks)**

a) **For the circuit shown in figure (4), using superposition theorem, find** the **power** dissipated in **12 Ω** resistor.

b) **Find** the **Thévenin** equivalent circuit external to the **current source.**

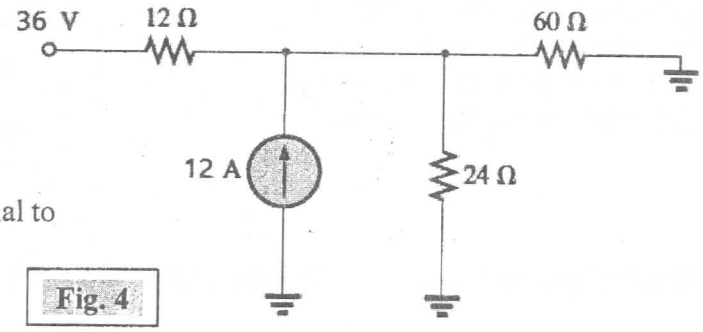


Fig. 4

P.T.O.

Question Number (4) **(8 Marks)**

a) For the circuit shown in **figure (5),**

(i) **find** *vo* and the *capacitor current*

(ii) Sketch the waveform and the phasor diagram of *vo* and the *capacitor current*.

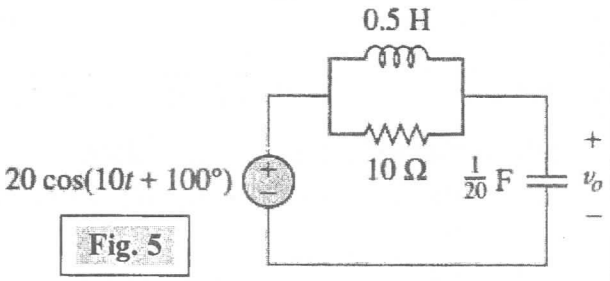


Fig. 5

b) For the circuit shown in **figure (6),** using **superposition** to find the sinusoidal expression of current (I_x). (AC supply frequency equals 50Hz)

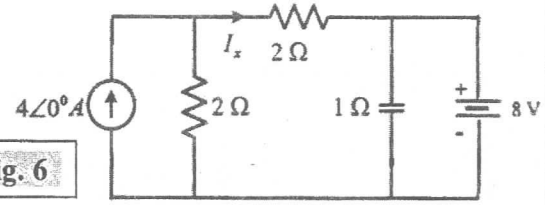


Fig. 6

Question Number (5) **(8 Marks)**

a) For the circuit shown in **figure (7),** find the **load impedance (Z_L)** for **maximum power transfer** to the load, and find the maximum power.

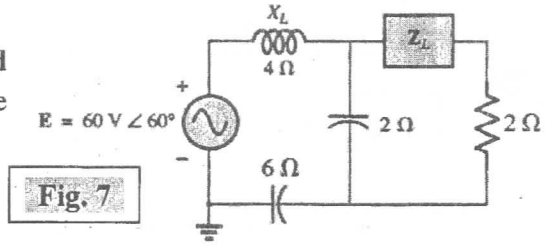


Fig. 7

b) The resistance, inductive and capacitive reactance of the series circuit are 10Ω, 25Ω and 25Ω, respectively at resonant frequency of 10 kHz, **find:**

i) The **voltage drops across resistor and capacitor at resonant frequency**
ii) The circuit **quality factor**
iii) The **half power frequencies**
iv) The **band width**
v) The **power dissipated** at half power frequencies.

Question Number (6) (4 Marks)

For the circuit shown in **figure (8),** the phase sequence of Y-connected generator is ABC,

(i) Define the phase sequence.
(ii) The phase currents.
(iii) The magnitude line currents.
(iv) The total apparent power.

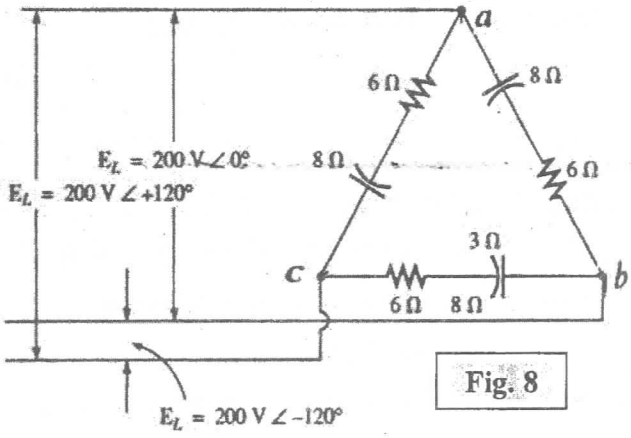


Fig. 8

*End of questions.....*WISH YOU ALL THE BEST

Physics and Engineering Mathematics Department

FINAL EXAM

Tanta University

Date: **Jan 15th, 2025**

(1st term)

Allowed time: **2 hours**

Year: **2nd Level**

Course Title: **Optimization Techniques**

Course Code: **EMP X18**

Faculty of Engineering

Total Marks: **50**

No. of pages: 2

Please answer the following questions:

Question (1) (30 Marks)

A. An organization has three machine shops, A, B, and C, and it produces three products, X, Y, and Z, using these three machine shops. Each product involves the operation of the machine shops. The profit per unit of products X, Y, and Z is \$22, \$6, and \$2, respectively. The following table shows the time required for each operation for the unit amount of each product. **Formulate** the given LPP problem to Maximize the profit.

Products	A	B	C
X	10	7	2
Y	2	3	4
Z	1	2	1
Available Hours	100	72	80

B. **Solve** the given LPP by using **the Two-phase method**.

$$\text{Minimize } Z = 6x_1 + 3x_2$$

S.T.

$$x_1 + x_2 \geq 1$$

$$2x_1 - x_2 \geq 1$$

$$3x_2 \leq 2$$

$$x_1, x_2 \geq 0$$

C. **Find** the solution for the primal problem of the following dual problem using **the Simplex method**.

$$\text{Minimize } Z = 3w_1 + 4w_2$$

S.T.

$$3w_1 + 4w_2 \geq 24$$

$$2w_1 + w_2 \geq 10$$

$$5w_1 + 3w_2 \geq 29$$

$$w_1, w_2 \geq 0$$

Question (2) (20 Marks)

A. Solve using **the Branch and Bound Method (Graphically)** the following IPP

Maximize $Z = -x_1 + 4x_2$

S.T.

$$-10x_1 + 20x_2 \leq 22$$

$$5x_1 + 10x_2 \leq 49$$

x_1, x_2 *non negative integer*

B. Solve using **the Steepest ascent method** the following NLP:

Maximize $Z = 2xy + 2x - x^2 - 2y^2, \quad v_0 = (-1,1)$

With my best wishes *Dr. Eng. Mai Fathy Zidan*

Tanta University

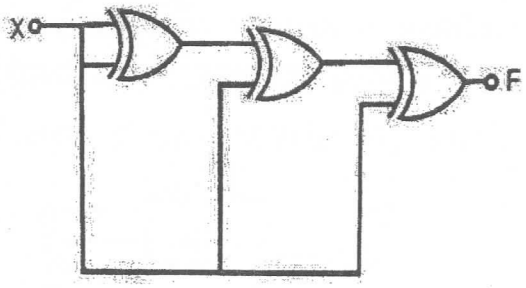
Department: Artificial Intelligence Program
Total Marks: 40 Marks

Faculty of Engineering

Course Title: **Digital Logic Design**	Course Code: **CCE101**	Level: one
Date: **31/12/2024 (Final)**	Allowed time: **2:00 hrs**	No. of Pages: (2)

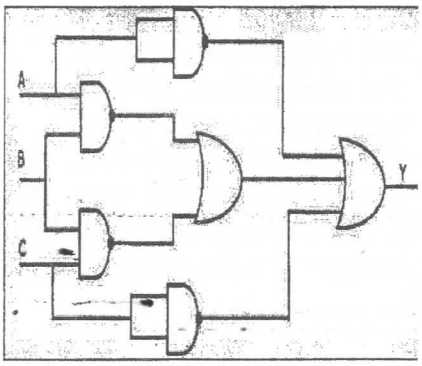
Question (1) (Total : 10 Marks)

1) For the circuit shown below, the output F is given by



a) F=1
b) F=0
c) F=X
d) F=X\

2) For the logic circuit shown in figure, the output Y is equal to



a) Y=A\B\C\
b) Y=A\+B\+C\
c) Y=A\B\+B\C\+A\+C
d) None of these

3) Using the relation between minterm and maxterm, what is the corresponding maxterm for the minterm (A.B.C')?

a) (A'+B'+C)
b) (A'+B'+C')
c) (A+B'+C)
d) None of these

4) Given the function as sum of minterms $F(A,B,C,D) = \sum m\,(0,1,7,10,11)$, what is the product of maxterms form of the function?

a) $\Pi M\,(9,10,12,13,14)$
b) $\Pi M\,(2,3,4,5,6,8,9,12,13,14,15)$
c) $\Pi M\,(4,5,6,7,11,12,13,14)$
d) None of theses

5) Simplify $F = \sum m\,(2,4,5,7)$, using maps.

a) AB\+ AC+ A\BC\
b) AB\+ABC\
c) AC+AB\C
d) None of these

6) A full-adder has a Cin = 0. What are the sum ( ) and the carry (Cout) when A = 1 and B = 1?

a) sum= 0, Cout = 0
b) sum= 0, Cout = 1
c) sum= 1, Cout = 0
d) sum= 1, Cout = 1

7) An n to 2^n decoder outputs are:
a) n minterms of the input variables
b) 2^n minterms of the input variables
c) n product terms of the input variables
d) None of these

8) The problems of encoder are:
a) Its high price and low speed
b) Having all 0's and more than one 1's in the input pattern
c) Its complexity and large space
d) None of these

9) What does connecting together the inputs of NAND and NOR gates do?

a) Help produce multi-input gates
b) Produce and EXNOR gate
c) Produce a NOT gate
d) Damage the gate

10) What is the decimal value of the hexadecimal number 777?
a) 191 b) 1911
c) 19 d)19111

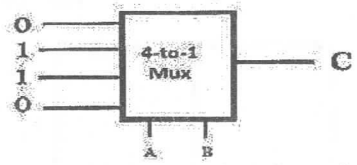
11) Convert the decimal number 151.75 to binary.
a) 10000111.11 b) 11010011.01
c) 00111100.00 d) 10010111.11

12) Which of the following functions is not in the canonical form:
a) F(A,B,C)=(A'+B'+C).(A'+B'+C')
b) F(A,B,C)=(A'+B'+C'). (A'+B')
c) F(A,B,C)= (ABC+A'B'C+A'BC)
d) None of these

13) Which is the major functioning responsibility of the multiplixer circuit?
a) Decoding the binary information.
b) Generation of all minterms in an output function with OR-gate.
c) Generation of selected path between multiple sources and a single destination.
d) All of the above.

14) If a logic gate includes 4 inputs then how many possible combinations can be performed?
a) 4 b) 8 c) 16 d) 32

15) What is the gate represented using the given multiplexer circuit.



a) AND b) OR c) XOR d) XNOR

16) A J-K flip-flop with J = 1 and K = 1 has a 20 kHz clock input. The Q output is 10kHz. a) True b) False

17) The synchronous input only can be used to set the flip-flop to either 1 or 0 state.
a) True b) False

18) A decimal counter has .....
a)3 states b) 10 states
c) 9 states d) 8 states

19) Consider a 4-bit Johnson counter with an initial value of 0000. The counting sequence of this counter is:
a) 0, 1, 3, 7, 15, 14, 12, 8, 0
b) 0, 1, 3, 5, 7, 9, 11, 13, 15, 0
c) 0, 2, 4, 6, 8, 10, 12, 14, 0
d) 0, 8, 12, 14, 15, 7, 3, 1, 0

20) S-R type flip-flop can be converted into D type flip-flop if S is connected to R through:
a) OR gate b) AND gate c) Inverter
d) NOR gate e) None of These

Question (2): (Total : 20 Marks)

1) A combinational circuit has **3** outputs **F1**, **F2** and **F3**
$F1 = \bar{x}\bar{y}\bar{z} + xz$
$F2 = x\bar{y}\bar{z} + \bar{x}y$
$F3 = \bar{x}\bar{y}z + xy$
Design the circuit with a **decoder** and **external gates**.

2) Implement the following Boolean function with an **8-to-1 multiplexer** and a **single inverter** with **variable B** as an input.
$f(A, B, C, D) = \Sigma m(2, 4, 6, 9, 10, 11, 15)$

3) Design synchronous 4-bits binary down counter using clocked T flip-flops.

Examiner: Prof. Dr. Mahmoud Alshewimy & The Committee

Tanta University

Department: Artificial Intellegence Program
Total Marks: 40 Marks

Faculty of Engineering

Course Title: **Digital Image Processing** | Course Code: EEC404 | Level: **3th**
Date: **22.Jan. 2025 (Final)** | Allowed time: **2:00 Hrs** | No. of Pages: (**2**)

Q.1) Choose the most appropriate answer: (Total: 20 Marks)

1) The type of interpolation where the intensity of the 16- neighbouring pixels contributes to obtain intensity of a new location is called……

a) bicubic interpolation b) quadratic interpolation
c) hexagonal interpolation d) bilinear interpolation

2) In washed out image, the components of histogram are concentrated on which side of the grey scale?

a) High b) Medium c) Low d) Evenly distributed

3) In linear spatial filtering, what is the pixel of the image under mask corresponding to the mask coefficient w (-1, 1), assuming a 3*3 mask?

a) f (x - 1, y +1) b)f (-x, y) c) f (x - 1, y) d) f (x, y – 1) e) f (x - 1, y -1)

4) The absence of receptors is in the retinal area called……..

a) blind spot b) ciliary body c) Lens d) fovea

5)The transition between continuous values of the image function and its digital equivalent is called

a) Quantization b) Sampling c) Rasterization d) None of the Mentioned

6)In Geometric Spatial Transformation, points whose locations are known precisely in input and reference images.

a) Key points b) Known points c) Tie points d) End-points e) Reference points

7)In ……. image we notice that the components of histogram are concentrated on the right of intensity scale.

a) High contrast b) dark c) bright d) low contrast e) None of the mentioned

8) The distance measures the path between the pixels based on an 8-connected neighbourhood, is called:

a) Euclidean distance b) City-Block distance
c) Chessboard distance d) None of these

9) In general, which of the following assures of no ringing in the output?

a) Gaussian Lowpass Filter b) Ideal Lowpass Filter
c) Butterworth Lowpass Filter d) All of the mentioned

10) If D0 is the cutoff distance measured from origin of frequency rectangle and D(u, v) is the distance from point(u, v). Then what value does an Ideal Highpass filter will give if $D(u, v) \leq D0$ and if $D(u, v) > D0$?

a) 0 and 1 respectively b) 1 and 0 respectively c) 1 in both case d) 0 in both case

11) What is the function of Iris?

a) control amount of light b) detect color c) varies focal length d) source of nutrition

12) ……. serve to a general, overall picture of the field of view.

a) rods b) cones c) retina d) all of the mentioned

13) The most familiar single sensor used for Image Acquisition is …….

a) microdensitometer b) photodiode c) cmos d) none of the mentioned

14) The distance between pixels p and q, the pixels have a distance less than or equal to some value of radius r, form a square centred at (x,y) is called :

a) Euclidean distance b) city-block distance c) chessboard distance d) none of the mentioned

15) Highlighting a specific range of intensities of an image is called ……..

a) intensity matching b) intensity slicing c) intensity highlighting d) intensity stretching

16) A spatial averaging filter in which all coefficients are equal is called …….

a) square filter b) box filter c) weighted average d) normalized filter

17) The power-law transformation is given as: $s = cr^{\gamma}$, c and γ are positive constants, and r is the gray-level of image before processing and s after processing. What happens if we increase the gamma value from 0.3 to 0.7?

a) The contrast increases and the detail increases b) The contrast decreases and the detail decreases
c) The contrast decreases and the detail increases d) The contrast increases and the detail decreases

18) Response of the gradient to noise and fine detail is …….. the Laplacian's.

a) equal to b) lower than c) greater than d) has no relation with

19) What is the next step in image processing after compression?

a) Wavelets b) Morphological processing c) Representation and description d) Segmentation

20) Images quantized with insufficient brightness levels will lead to the occurrence of ……..

a) Pixilation b) Blurring c) False Contours d) None of the Mentioned

Q.2) Given the following image f(x,y) shown below. Let the input and output gray levels are in the range of [0, 7]. Assume that the expected probabilities of gray levels in the output image are {0: *10%*, 1: *15%*, 2: *20%*, 3: *20%*, 4: *15%*, 5: *10%*, 6: *5%*, 7: *5%*}. Apply histogram specification on this image.

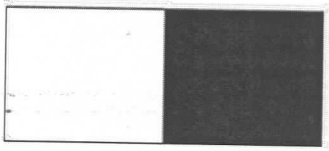
$$\begin{bmatrix} 0 & 0 & 1 & 1 & 2 & 2 & 3 & 3 \\ 0 & 0 & 1 & 1 & 2 & 2 & 3 & 3 \\ 4 & 4 & 5 & 5 & 6 & 6 & 7 & 7 \\ 4 & 4 & 5 & 5 & 6 & 6 & 7 & 7 \\ 0 & 0 & 1 & 1 & 2 & 2 & 3 & 3 \\ 0 & 0 & 1 & 1 & 2 & 2 & 3 & 3 \\ 4 & 4 & 5 & 5 & 6 & 6 & 7 & 7 \\ 4 & 4 & 5 & 5 & 6 & 6 & 7 & 7 \end{bmatrix}$$

(10 Marks)

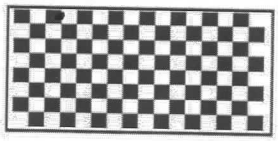
Q.3) The two 256-gray levels images shown in the figure below have the same size and border. Although they are quite different inside, they have the same histogram. Suppose that each image is blurred with a 3x3 averaging mask):

1) Explain why the two images give have the same histogram. **(5 Marks)**

2) Would the histogram of the blurred images still be equal? Explain.



(1)



(2)

C) Given an image segment shown below, find the intensity value of the circuled pixel, **(5 Marks)**

124	48	44	37	140
126	40	31	45	145
131	30	25	52	150
142	42	60	78	163
149	56	38	162	166

1) After applying a 3x3 median filter.

2) After applying the wighted averaging filter.