Tanta University	Department of Electronics and Electrical Communication Engineering	Faculty of Engineering

Course Title: **Digital Signal Processing**
Date: **Wed.,31-May-2023,**
Course Code: EEC302,
Time Allowed: **3 hours,**
Total Marks: **40**
Students: **Mechatronics**
No. of Pages: **2**

Final Exam

Remarks: (answer the following questions… assume any missing data … arrange your answer booklet … Use graphs and examples whenever you have a chance during your answer). **Use only black or blue pens or pencils in your answer.**

Question 1: (8 Marks)

a) Find the Fourier transform, and sketch the spectrum of a signal $x(t)$, where:

$$x(t) = u(t + \tau_0/2) - u(t - \tau_0/2)$$

and *u(t)* is the unit step function

b) An analog signal $x(t) = cos(1000\pi t) - 2cos(3000\pi t) + 3cos(5000\pi t)$ is sampled at a rate of $8000Hz$.

i. Sketch the spectrum of $x(t)$
ii. Sketch the spectrum of the sampled signal.
iii. Sketch the spectrum of the recovered analog signal if an ideal low pass filter with cutoff frequency equals to the folding frequency is used.
iv. Determine the aliasing noise frequencies.

Question 2: (8 Marks)

a) A DSP system that has sampling rate of $22050Hz$. The DAC is followed by a hold circuit. Find the percentage distortion due to the hold circuit at the half of the folding frequency.

b) A 5-bit ADC circuit can accept analog signals that ranges from $-5V$ to $5V$. Determine:

i. The number of quantization levels
ii. The step size of the quantizer
iii. The quantization error and quantization noise
iv. The quantization level number and value that represents an input of *3.3 V*.

Question 3: (12 Marks)

a) Check the linearity, time invariance, and causality of the digital systems defined by the following difference equations:

i. $y(n) = 2x(n + 1) + x(n) - 0.5x(n - 2)$
ii. $y(n) = 5x(n) + 2x(2n - 1)$

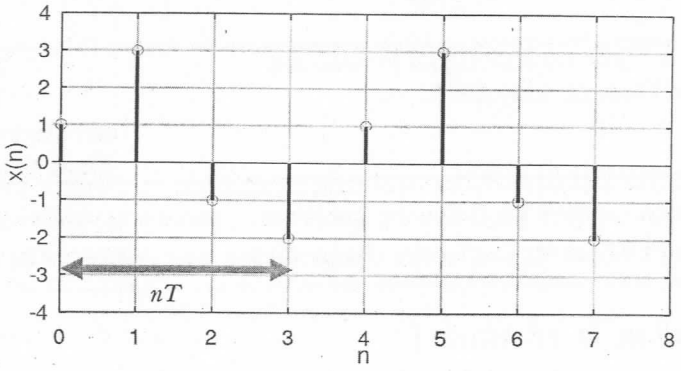
b) A sequence of a digitized signal as shown. The sampling frequency, $f_s = 50Hz$. If the first four samples are used.

i. Compute the DFT, the one sided amplitude and power spectrum of that signal.

ii. Compute the frequency resolution and frequency bins.

iii. Compute the Triangular window weights.

iv. Find the DFT for the windowed sequence.



c) A sequence of digitized signal is obtained by sampling at rate of $10KHz$. If the frequency resolution is required to be less than $2Hz$, determine the number for data points required for applying the FFT algorithm (assume that all the required data points are available).

Question 4: *(12 Marks)*

a) A relaxed digital system can be described using the difference equation:

$y(n) + 0.2y(n-1) - 0.3y(n-2) = x(n) + 0.5x(n-1)$

Determine the output *y(n)* due to an input impulse using the Z transform technique.

b) Find the inverse Z transform for:

$$X(z) = \frac{z^{-1}}{(1 - z^{-1})(1 - 0.2z^{-1})^2}$$

End of questions, Good luck

Prof. M. Nasr, Assoc. Prof. S. Napoleon

TANTA UNIVERSITY

Mechatronics Engineering Program

Final EXAM 2022/2023 - Second Term

Faculty Of Engineering

Course	**Electric Machines (EPE201)**		
Time	**3 hours**	**Mark**	**40**
Date	**03 / 06 /2023**	**Number of pages**	**2**

Answer ALL the following questions:

Clarify your answer with suitable sketches as you can

The first question (10 marks)

A Using suitable sketches, explain the job of the commutator and brushes in the operation of the DC motor and the DC generator.

B *State if the following sentences are **(true)** or **(false)** and **give the scientific reason for each choice**:*

1. The series connected DC motor is preferable for low torque applications.
2. DC motors are the most widely used motors in the industrial systems.
3. The field winding of the shunt connected DC motor has a larger number of turns compared to the series connected motor.
4. The field winding of the series connected DC motor has a smaller cross-sectional area compared to the shunt connected motor.

C A separately excited DC machine is operated with a constant field current. Under no-load conditions (motor torque = 0), the motor rotates at 1000rpm when the armature is connected to a 24V DC supply. Armature resistance $R_A = 0.4\Omega$ and rotational losses are negligible. Calculate:

1. Value of $(k\phi)$
2. Armature current and terminal voltage for 200W output power at 1200rpm speed.

The second question (10 marks)

A Using the equivalent circuits, explain the differences between the ideal and practical transformers.

B *State if the following sentences are **(true)** or **(false)** and **give the scientific reason for each choice**:*

1. The dot polarity marks indicate the negative terminals of the primary and secondary induced voltages of a transformer.
2. The open-circuit (no-load) test of a transformer is performed at the rated current.
3. The transformer has high mechanical losses.
4. The transformer has the ability to transfer both AC and DC voltages from the primary to the secondary side.

C A 5kVA, 500/250 V, 50 Hz, single-phase transformer gave the following readings, Open circuit test: 500V, 1A, 50W (L.V. side open) --- Short circuit test: 25V, 10A, 60W (L.V. side shorted).

1. Determine the parameters of the approximate equivalent circuit referred to the primary side.
2. Determine the full load efficiency and voltage regulation at a 0.8 lagging power factor.

Please turn over

The third question (10 marks)

A **Compare** *in details* between synchronous machine rotor types

B Sketch the phasor diagrams of the following machines:

1. A synchronous generator feeding a load of unity power factor.
2. A synchronous motor working at lagging power factor

C **Draw** with all possible information the external characteristics of a stand-alone synchronous generator. Clarify the variation of *both voltage and frequency* under different values of:

1) speed 2) excitation level 3) load power factor

Use a separate graph for each case

D Give brief notes with illustrations about different methods used for synchronous motor starting.

E A 10-MVA, 11-kV, 2-pole 50 Hz synchronous generator has a per phase synchronous impedance of $0.2 + j\,6\ \Omega$. The total constant losses is 150 kW. At full-load and rated terminal voltage with unity power factor, determine:

3 . Necessary prime mover speed	4 . necessary excitation (induced emf)	
5 . load angle	6 . generator efficiency	7 . voltage regulation

The fourth question (10 marks)

A For three phase induction motor:

1 . Draw *both exact and an approximate equivalent circuits*. Define all parameters.
2 . Sketch the torque-speed characteristics. Show and define all quantities.
3 . Draw power flow diagram. Give detailed notes about different types of power.

B Explain how to control speed of three-phase induction motors using:

a) supply voltage b) supply frequency

Use ALL suitable illustrations and graphs of torque-speed characteristics

C A three-phase, star-connected 50-hp, 380-V, 50 Hz, four-pole induction motor has the following data:

Stator: $R_s = 0.1\ \Omega$/phase $X_s = 0.35\ \Omega$/phase

Rotor (referred to stator): $R'_r = 0.125\ \Omega$/phase $X'_r = 0.4\ \Omega$/phase

The stator core and mechanical losses are 1200 W and 900 W respectively. At no-load, the motor draws 18 A at 0.1 lagging power factor. When the motor is operated at slip of 0.025, determine the following:

1. Motor speed	2. Line current and power factor.
3. Electromagnetic torque	4. Motor efficiency

Good Luck *Prof. Essam Eddin Rashad* *Dr. Mohamed Almozayen*

Tanta University	**Advanced Control Systems for Mechanical Applications** Course Code: MEP352 4th Level Mechatronics Engineering Program **Final Exam:** 40Marks (May 27 ,2023)	Faculty of Engineering
Time Allowed: 3 hours		Mechatronics Program

Please answer the following questions:

Question (1) **(8 Marks)**

Discuss the stability for the system given by the characteristic equation:

$$s^5 + 2s^4 + 3s^3 + 4s^2 + 2s + 1 = 0$$

Question (2) **(12 Marks)**

Let us consider a device that consists of a ball rolling on the inside rim of a hoop. The hoop is free to rotate about its horizontal principal axis as shown in Fig. 1. The angular position of the hoop may be controlled via the torque T applied to the hoop from a torque motor attached to the hoop drive shaft. If negative feedback is used, the system open-loop transfer function is given by:

$$G(s)H(s) = \frac{Ks(s+4)}{s^2 + 2s + 2}$$

a) **Sketch** the root locus,
b) **Find** the gain when the roots are both equal (i.e., $\zeta = 1$),
c) **Find** these two equal roots.
d) **Find** the settling time of the system when the roots are equal.

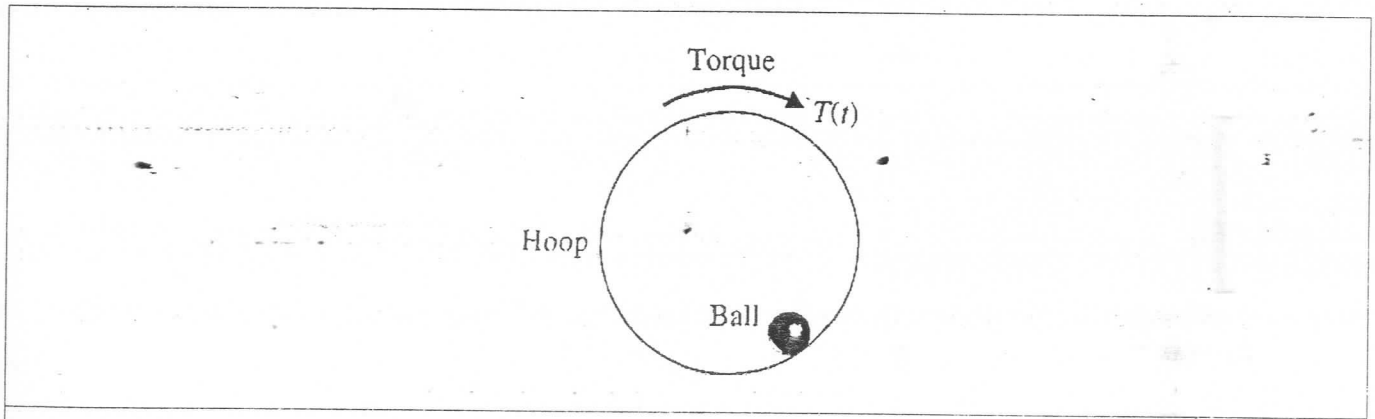


Fig. 1 Hoop rotated by motor

Question (3) (13 Marks)

1. **Draw** the Bode diagram (the logarithmic magnitude and phase angle curves) for the following transfer function:

$$G(s) = \frac{10(1+s)}{(0.2s+1)(5s+1)}$$

2. The magnitude plot of a transfer function:

$$G(s) = \frac{K(1+0.5s)(1+as)}{s(1+s/8)(1+bs)(1+s/36)}$$

is shown in Fig. 2. **Determine** K, a, and b from the plot.

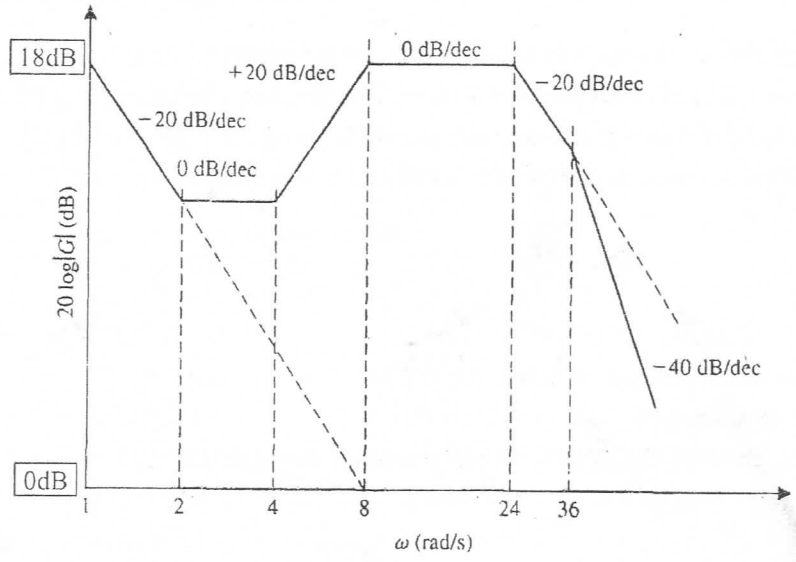


Fig. 2 Bode diagram for a unity feedback system

Question (4) (7 Marks)

Draw the polar plot for the following transfer function (for $K = T = 1$):

$$G(s) = \frac{K}{s(Ts+1)}$$

Best of Luck **Dr. Omar Mehrez**

Tanta University

Mechatronics engineering Program
Total Marks: 40 Marks

Faculty of Engineering

Course Title	Process Control, Programmable Logic Controllers and Microcontrollers	Academic Year 2022/2023	Course Code	CCE405
Level	5			
Date	29-5-2023	No. of Pages (2)	Allowed time	3 hrs
Remarks: Answer all the following questions				

Question number (1) (12 Marks)

a) Explain briefly the common classification of controllers and illustrate to what type the microcontrollers belong to.

b) What are the limitations of the traditional controllers?

c) Explain the effects of increasing the parameter values of the PID controller on the system response characteristics.

d) Explain the operation cycle of PLCs

e) Before you start designing a microcontroller-based project, how can you choose the right microcontrollers?

Question number (2) (14 Marks)

a) If (1:256) Prescaler is assigned to TMR0 with f = 4 MHz and the initial value of TMR0 = 39, find the time of 1 over flow for TMR0 and find the number of required 1s over flows to get time equal to 1 sec.

b) 8 LEDs are connected to PORT C of a PIC16F877A microcontroller. Write a microcontroller PIC16F877A C program to flash (toggle) the odd numbered LEDs (at bit positions 1, 3, 5 and 7).

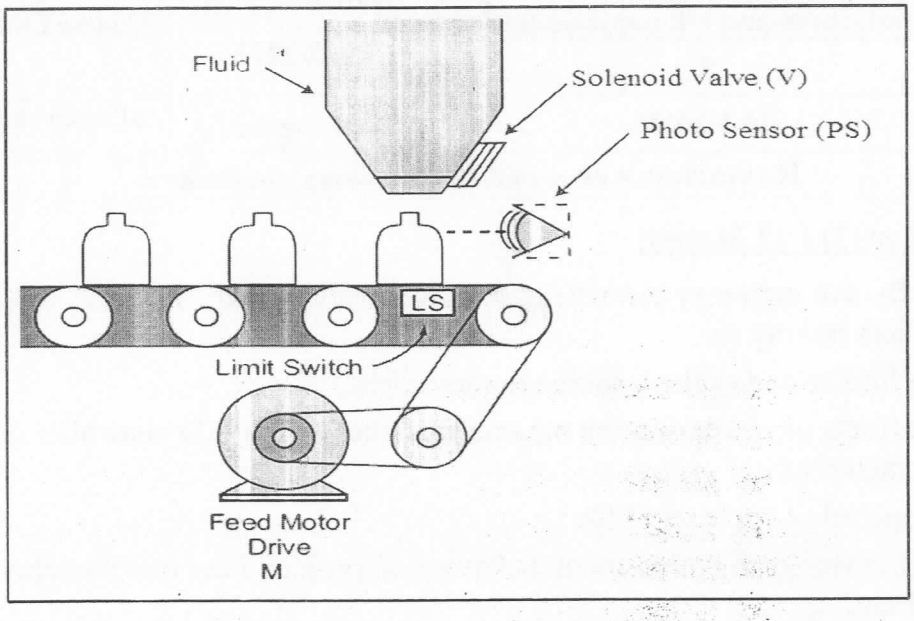
c) Write a microcontroller PIC16F877A C program to use TMR0 as a counter such that:
- The counter input is connected to a push button so that any button press causes timer TMR0 to count one pulse.
- When the number of pulses matches the number stored in the TEST register, a logic one (5v) appears on the RD3 pin.
- Assume the value that stored in the TEST register is 7.

Question number (3) (14 Marks)

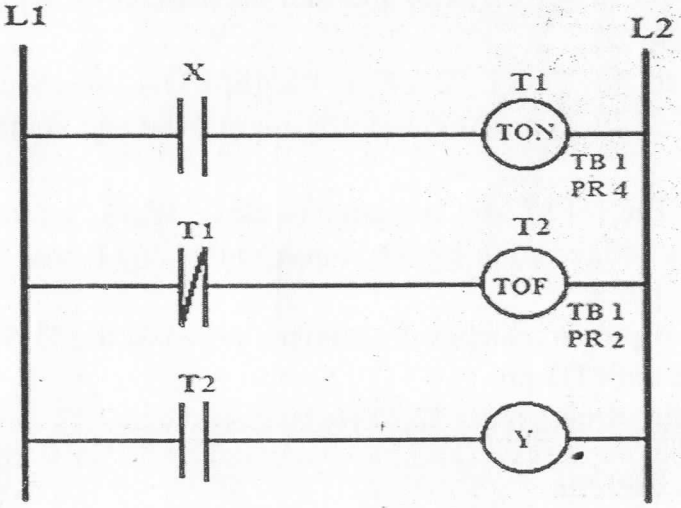
a) Draw the ladder diagram that implements the following logic expressions:

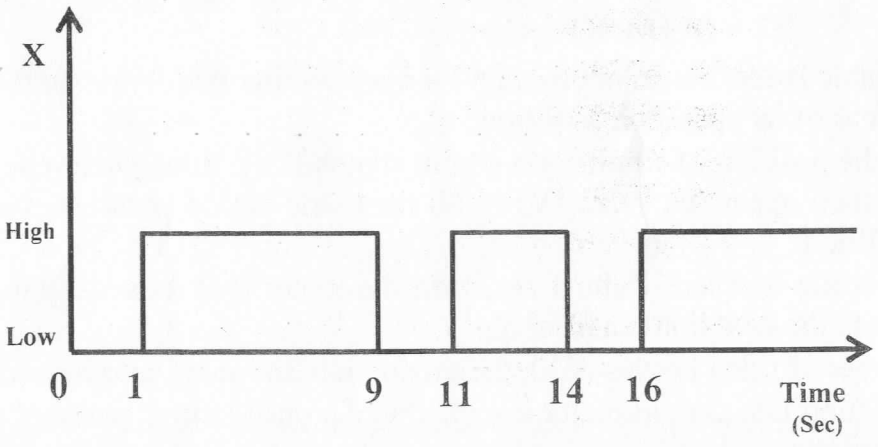
$$Y2 = (A\,B + E\,F)\,(C + D)$$

b) Draw a suitable ladder diagram program for a production line shown in the figure. The sequences of its operation as follow:
- It detects the position of a bottle via a limit switch (LS), stops the motor (M) then, waits 4 sec and then opens the valve (V) to fill the bottle until a photo-sensor (PS) detects a filled condition.
- After the bottle is filled, waits 3 sec, then the motor (M) moves again to repeat these operations to the next bottle and so on.
- If the number of filled bottles is 30, the production line stops automatically.
- The production line should include start and stop push button switches to start and end these operations.



c) For the ladder diagram shown in the following figure, draw the timing diagram to illustrate the states of T1, T2 and Y. Consider the state of X as shown the figure:





Good luck

Dr. Mohamed Abdalla Attia

TANTA UNIVERSITY

Mechatronics Engineering Program

Faculty Of Engineering

Final EXAM 2020/2021 - Second Term

Course	Servo Control Systems (MEP 356)	Time	3 hours
Mark	40		
Date	12 / 6 /2023	Number of pages	2

The first question (10 marks)

a) Indicate whether the statement is true or false.

1. In an AC servo control system, the feedback sensor is used to measure the desired position of the servo motor.
2. A torque limiter is used in an AC servo control system to increase the maximum torque output of the servo motor.
3. Field-Oriented Control (FOC) is a technique commonly used in AC servo control systems to improve motor efficiency and performance.
4. AC servo control systems are primarily used for speed control but not position control.
5. Servo systems can operate in both open-loop and closed-loop control configurations.

b) Identify the choice that best completes the statement.

1. Field-oriented control (FOC) is a technique commonly used in servo control systems to:
   a. Measure the magnetic field strength
   b. Optimize power consumption
   c. Align the magnetic field with the desired torque direction
   d. Minimize the following error
2. Which of the following is NOT a common application of servo mechanisms?
   a. Robotics
   b. CNC machining
   c. Packaging machines
   d. Light switches
3. Which of the following mechanisms is often used to convert rotational motion into linear motion?
   a. Lead screw
   b. Pulley system
   c. Rack and pinion
   d. Camshaft
4. Which of the following methods can be used to increase the torque output of a DC servo motor?
   a. Increasing the voltage supply
   b. Increasing the armature current
   c. Adding a gearbox
   d. All of the above
5. Which of the following factors can limit the maximum speed of a DC servo system?
   a. Voltage supply
   b. Inertia of the load
   c. Back EMF of the motor
   d. All of the above

The second question (15 marks)

a) Provide a block diagram and a concise explanation of the primary elements involved in an FOC algorithm used in a PMSM servo control system.

b) Describe the configuration and functionality of an AC drive system utilizing a three-phase inverter with sinusoidal PWM modulation.

c) Utilizing appropriate illustrations, compare the three fundamental structures employed in position and velocity servo control.

The third question (15 marks)

a) The axes shown in Figure 1 have the following parameters: $n_1 = 30$, $n_2 = 60$, $n_3 = 30$, $n_4 = 90$, $J_{load} = 5 \times 10{-}4\ kg.m^2$ and $J_m = 3 \times 10{-}6\ kg.m^2$. The gearbox efficiency is 94%. What is the load inertia seen by the motor? What is the inertia ratio?

b) In a motion control application, axis #1 needs to move 10 in with a speed of 2 in/s and acceleration of 4 in/s^2. What should be programmed into the motion controller for t_a and t_m in milliseconds (ms)? Assume trapezoidal velocity profile.

c) Given the S-curve velocity profile in Figure 2, plot the position and acceleration profiles as two separate plots.

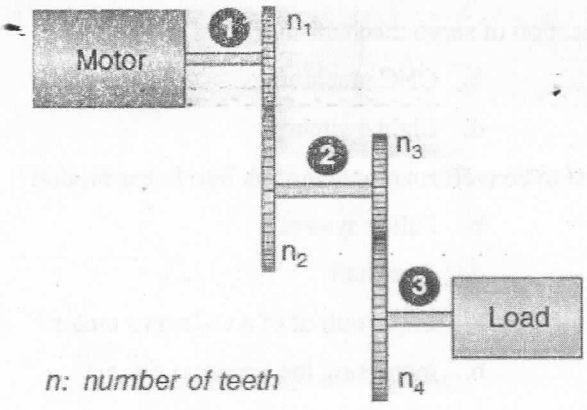


Figure 1

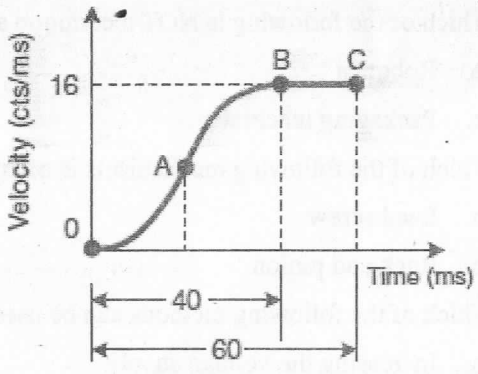


Figure 2

Good Luck

Dr. Ahmed Elrefaie

TANTA UNIVERSITY

Mechatronics Engineering Program

Final EXAM 2022/2023 - Second Term

Faculty Of Engineering

Course	**Electric Machines (EPE201)**		
Time	**3 hours**	**Mark**	**40**
Date	**03 / 06 /2023**	**Number of pages**	**2**

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The third question (10 marks)

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5 . load angle	6 . generator efficiency	7 . voltage regulation

The fourth question (10 marks)

A For three phase induction motor:

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Good Luck *Prof. Essam Eddin Rashad* *Dr. Mohamed Almozayen*

Tanta University | Department: Electronics and Electrical Communications Eng. | Faculty of Engineering

Total Marks: 40 Marks

Course Title: Embedded Systems	Course Code: EEC202	Level: 3
Date: 30/5/2023	Allowed time: 3hrs	No of Pages (3)

Remarks: (Answer questions No.1 and No. 2 in the electronic answer form and question No.3 and No. 4 in the answer book).

Question (1): Choose the correct answer (in the electronic answer form)

1) Which of the following statements is correct?

a) RAM is non-volatile memory whereas ROM is a volatile memory
b) RAM is volatile memory whereas ROM is a non-volatile memory
c) Both RAM and ROM are volatile memories but in ROM data isn't lost when power is switched off
d) Both RAM and ROM are non-volatile memories but in ROM data isn't lost when power is switched off

2) For the instruction, LDI Rd, K. The value of K is .....

a) 8 bits
b) 0 - 255 in decimal
c) 00 – FF in hex
d) All of the pervious

3) Which of the following is suitable for high volume?

a) Flash memory
b) EPROM
c) Mask ROM
d) EEPROM

4) The control buses are used to .....

a) Provide read or write signals to the device
b) Get data from the device or to send data to it
c) Find any connected device
d) All of the above

5) Which of the following instructions is correct?

a) LDI R5, 0x05
b) LDI R17, 0x7F2
c) LDI R17, 0x05
c) LDI R5, 0x7F2

6) The range of byte-sized unsigned operands is .....

a) +127 to -128
b) +128 to -127
c) 0 to 255
d) +127 to -127

7) The S flag is not the same as that of the N flag, when .....

a) N flag = 1
b) V flag = 0
c) N flag = 0
d) V flag = 1

8) The AVR (82H) number is equivalent to ..... decimal signed number.

a) +126
b) -126
c) +130
d) -130

9) When adding two signed numbers, ... is used to indicate whether the result is valid or not.

a) The S flag
b) The N flag

c) The V flag
d) The H flag

10) When adding the following numbers (+70 and +96), the values of N, S and V flags are

a) N=1, S= 1 and V=0
b) N= 0, S= 1 and V=1
c) N= 0, S= 0 and V=1
d) N= 1, S= 0 and V=1

11) The value of C flag in the following code is .....

```
LDI   R20,0x99
LDI   R21,0x58
ADD   R20,R21
```

a) R21 = F1 and C = 1
b) R20 = F1 and C = 0
c) R20 = F1 and C = 1
d) R21 = F1 and C = 0

12) The..... is 2-byte instruction. When the instruction executes the PC is loaded with the contents of Z register.

a) CALL
b) RCAL
c) ICAL
d) JMP

14) For inputting the data, if we put 1s into bits of PORTx register, the ..... are activated.

a) PC
b) LEDS
c) switches
d) Pull up resistors

Question (2): Choose the correct answer (in the electronic answer form)

1) Storage capacity in computers is bites. But, storage capacity of IC chip in bytes
a) True
b) False

2) Address assigned to any device must be unique
a) True
b) False

3) In contrast to GPRs, the SFRs don't have any specific function, and are used for storing general data.
a) True
b) False

4) When using IN instruction, you can use the names of I/O registers instead of their addresses.
a) True
b) False

5) LDS instruction is a 2-bytes instruction, while IN is 4-bytes, so LDS is faster than IN.
a) True
b) False

6) Is "SBI R2, 0x10" a valid AVR instruction?
a) True
b) False

7) The MULSU instruction works on R0 and R1 only.
a) True
b) False

8) All the AVR families' I/O ports have 8 pins.

a) True b) False

9) The SBI, CBI, SBIC and SBIS instructions can be used for all the I/O registers.

a) True b) False

10) The CALL target address can be anywhere in the 4M word address space.
a) True b) False

Question (3)

a) What are the advantages in using the .EQU directive to define a constant value?
b) What is wrong with "STS 0CR0, R23"? What does it do?
c) What does "OUT OCR0, R23" do?
d) What is the largest hex value that can be moved into a location in the data memory? What is the decimal equivalent of the hex value?
e) Write a simple code to (a) load the value $15 into location $67, and (b) add it to R19 five times and place the result in R19 as the values are added. R19 should be zero before the addition starts

Question (4)

a) Show code for a nested loop to perform an action 1000 times.
b) Find the time delay for the delay subroutine shown below if the system has an AVR with frequency of 10 MHz.

```
        LDI     R20, 200
BACK:   LDI     R25, 100
        NOP
        NOP
        NOP
HERE    DEC     R25
        BRNE    HERE
        DEC     R20
        BRNE    BACK
```

c) Write a program to monitor the PB5 bit. When it is HIGH, make LOW-to-HIGH-to-LOW pulse on PA7.
d) Write a program to subtract two 16-bit numbers, 2762H - 1296H. Place the difference in R26 and R27 registers.
e) Write a program to add two 16-bit numbers, 3CE7H and 3B8DH. Place the difference in R3 and R4 registers.

Best Wishes of Success
Assoc. Prof. Heba Elkhobby
DR Basma Eldosouky

Model (B)

Tanta University | **Department:** Mechatronics Program. | **Faculty of Engineering**
Total Marks: 40 Marks
Academic Year: 2022/2023

Course Title: **Computer Engineering 2** Course Code: **CCE202** Year: **3rd level**
Date: **15 / 6 / 2023 (Final Exam)** Allowed time: **3 Hour** No. of Pages: (**3**)

Choose the most appropriate answer: (1.0 point per question-Total : 40 points)

1.If the content of the register R2 =67, what is the effective address of this instruction:
ADD #30, R2
a) 67 b) [30] c) 97 d)[67] e) None of these

2.The effective address of the following instruction is ADD (R1)+, R0
a) [R1] b)[R1]+4 c) R1 d) R1+4 e) None of these

3.……translates virtual addresses into physical addresses.
a) Direct memory access unit b) Memory management unit
c) Virtual address d) None of these

4. For a single BUS architecture, is the below code correct for adding three numbers?

PCout, Marin, READ, Select 4, ADD, Zin
Zout, Yin, PCin, WMFC
MDRout, IRin
R4out, R5out, ADD, R6in, End

a) True b) False c) a & b d) None of these

5. The address bus of a computer has 16 address lines, A15–0. If the address assigned to one device is $(EDA9)_{16}$ and the address decoder for that device ignores lines A4 and A10, what are all the addresses to which this device will respond?
a) E9A9-EDB9-E9B9-EEA9 b) EDA9-E9B9-EDC9-E9B9
c) E9A9-ECB9-E9B9-EEA9 d) E9A9-EDB9-E9B9-EDA9
e) None of the mentioned

6.In …… mapping, the data can be mapped anywhere in the Cache Memory.
a) Associative b) Direct c) Set Associative d) Indirect e) None of these

7.The algorithm to remove and place new contents into the cache is called ……
a) Replacement algorithm b) Renewal algorithm c) Updation d) None of these

8. In …….. technique, I/O devices deals with fewer address lines.
a) memory-mapped I/O b)port mapped I/O
c) address-mapped I/O d) All of the mentioned

9.The …… was the first successful commercial computer. It was intended for both scientific and commercial applications
a) EDVAC b) ENIAC c) UNIVAC I d) None of these

10. The Intel x86 incorporates the sophisticated design principles once found only on mainframes and supercomputers and serves as an excellent example of …….design.
a) CISC-based b) RISC-based c) both a and b are correct d) None of these

Model (B)

11. The write-through procedure is used to……
a) write onto the memory directly b) write and read from memory simultaneously
c) write directly on the memory and the cache simultaneously d) None of these

12. An SRAM has address lines from A0 to A15 and data width from D0 to D7. What is the total capacity of the SRAM will be…….
a) 64 MB b) 32 KB c) 64 KB d) 16 MB e) None of these

13. How many transistors are required for SRAM cell?
a) 2 b) 4 c) 6 d) 8 e) None of these

14.A PROM which can be erased electrically is called ……..
a) EEPROM b) EPROM c) PROM d) ROM e) None of these

15. An SDRAM has 8192 rows, suppose it takes 4 clock cycles to access each row. If the clock rate is 133 MHz, then the total refresh time is ……..
a) 176 msec b) 384 msec c) 246 msec d) None of these

16. When adding unsigned numbers, XOR of the last carry-out from the MSB position with the carry before the last one serves as the overflow indicator.
a) True b) False c) a & b d) None of these

17. The gate delay of the last sum bit in 8-bit ripple carry adder is ……
a) 4 b)8 c)14 d)15 e) 16

18. In ……, memory and input /output devices use different instructions to access their data.
a)Self-organized memory b) memory-mapped
c) port-mapped d) distributed memory) e) None of these

19. For the addition of large integers, most of the systems make use of .....
a) Half adders b) Full adders c) Carry look-ahead adders
d) Ripple carry adder e) carry save adders

20. The return address from the interrupt-service routine is stored on the
a) System heap b) Processor register
c) Processor stack d) Memory e) None of these

21. When we subtract -3 from 2 , the answer in 2's complement form is ……
a) 0001 b) 1101 c) 0101 d) 1001 e) None of these

22. The encoder circuit used to generate control signals contains ……structure.
a) XOR-OR b) AND-OR c) NAND-OR d) OR-NOT e) None of these

23. In ……, many resources can be controlled with a single instruction.
a) vertical organization b)bypass organization
c) horizontal organization d) None of these

24. It is possible to load multiple registers simultaneously from the microprocessor bus.
a) True b) False c) a & b d) None of these

25. The…...was the first chip to contain all of the components of a CPU on a single chip
a) 4004 b) 8008 c) 8080 d) None of these

26. Autoincrement and Autodecrement modes are useful for implementing "Last-In-First-Out" data structures
a) TRUE b) FALSE c) a and b d)None of these

For Questions from 27 to 29

Consider a memory organization: 8-bit memory addresses and assume Word length is 2 bytes

27. The address of the byte before the last is .....

a) 256 b) $(101)_{16}$ c) $(FF)_{16}$ d) 254 e) None of these

28. The number of words is .....

a) 128 b) 60 c) 64 d) 124 e) None of these

29. If M denotes the number of memory locations and N denotes the word size, then an expression that denotes the storage capacity is .....

a) M*N b) M/N c) (2^M)*N d) (2^M)/N e) None of these

30. The 3-address instructions, where operand addresses are memory locations are too big to fit in one word.

a) TRUE b) FALSE c) a & b d) None of these

31. To connect registers inputs to a bus, you can use:

a) Multiplexers b) decoders c) Tri-state d) a & b e) a & c

32. The time between the receiver of an interrupt and its service is .....

a) Interrupt delay b) Interrupt latency c) Cycle time d) Switching time

33. .....increases the cost of adding hardware to the machine.

a) memory-mapped I/O b)port mapped I/O

c) address-mapped I/O d) All of the mentioned

34. The Intel 8008 had been designed for .....

a) specific applications b) general-purpose c) both a and b d) None of these

35. When we subtract 6 from -8 , the answer in 2's complement form is .....

a) 1110 b) 10010 c) 11110 d) 10010 e)None of these

36. The result of (30)-(14) using 5-bit two's complement number system

a) 10000 b) 100010 c) 110000 d) 1010000 e) None of these

For Questions from 37 to 40

The memory locations 1000, 1001 and 1020 have data values 18, 1 and 16 respectively before the following program is executed. Solve the MCQs from (37) to (40):

MOVE	#1000, R_1
MOVE	1(R_1), R2
ADD	#1000, R2
MOVE	20, (R2)
ADD	#7, (R1)

37. The value of R1 after executing the program is:

a) 1000 b) 1 c) 18 d) 1001 e) None of these

38. The value of R2 after executing the program is:

a) 1000 b) 1 c) 18 d) 1001 e) None of these

39. The value of the memory locations 1001 is:

a) 16 b) 20 c) 18 d) 1 e) None of these

40. The value of the memory locations 1000 is:

a) 25 b) 19 c) 1001 d) 1002 e) None of these

End of Questions ***Good Luck***

Examiner: Prof.(Assoc.) Dr. Mahmoud Alshewimy, Dr. Mohamed Abdalla Attia

Tanta University

Department: Structural Engineering
Total Marks: 40 Marks

Faculty of Engineering

Course Title: Composite Structures	Course Code: CSE 333	Year: 2022-2023
Date: 21 Jun 2023 (Second term)	Allowed time: 3 hrs	No. of Pages: (2)

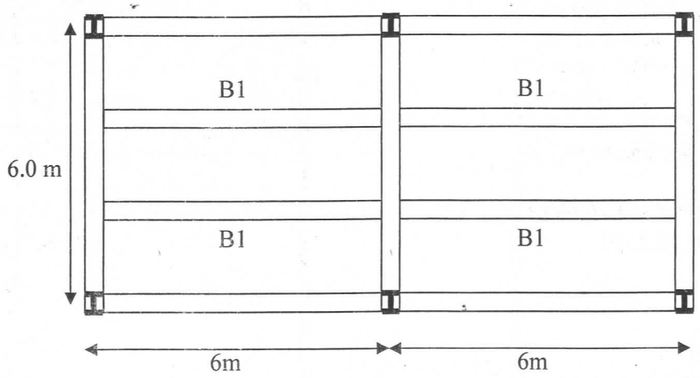
Remarks: Answer the following questions and assume any missing data

Question #1: (45%)

The shown floor system consists of a reinforced concrete slab rested on Steel I-Beams B1 of IPE360 grade 37. Using slab thickness = 10 cm with concrete cubic strength f_{cu} = 400 kg/cm^2, L.L. = 500 kg/m^2, F.C. = 150 kg/m^2, consider the modular ratio = 10.

For an intermediate beam B1, it is required to draw the normal stresses distribution for the following cases:

- B1 as a **simple** non-composite beam(10%).
- B1 as a **simple** composite beam. Consider both cases of shored construction and unshored construction method (20%).
- Design the **shear connectors** using shear connectors of 20 mm diameter, F_y = 3.6 t/cm^2, F_u = 5.2 t/cm^2, weld size = 6mm (15%). (e) = $(R_{sc} I_v) / (Q S)$ $R_{sc} = 5.4*10^{-3} A_{sc} (f_{cu} E_c)^{1/2}$



Designation		Dimensions					strong axis x-x	weak axis y-y
	G	h	b	t_w	t_f	A	I_x	I_y
	kg/m	mm	mm	mm	mm	cm^2	cm^4	cm^4
IPE 360	57.1	360	170	8	12.7	72.7	16270	1043

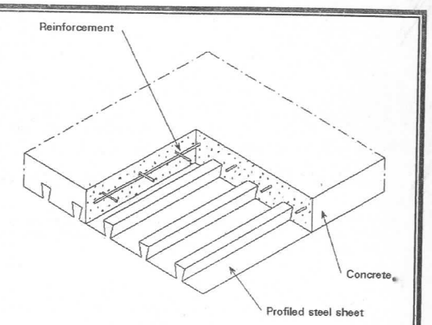
Question #2: (15%)

1. How to calculate the effective width of a slab for composite beam according to Egyptian Code.
2. Describe the relation between the load and the slip for composite construction.
3. Describe with clear sketch the standard push-out test.
4. Compare composite to bare steel beams from the following points of view: load resistance, steel weight, overall height and stiffness.
5. Draw a sketch showing the difference between composite beams with: (a) no interaction, (b) partial interaction and (c) full interaction.
6. What is meant by the term "modular ratio".

P.T.O.

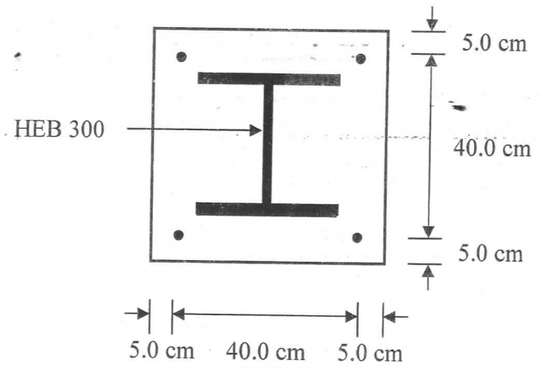
Question #3: (10%)

For the typical one-way spanning composite slab, shown in the figure, explain the functions of the profiled steel sheeting.



Question #4: It is required to design a concrete-filled **circular** tubular column. The column is a *fixed-free* column and its height is 5.5 ms. The design force of the column equals 150 t. The steel tube is formed from St 37 and the concrete cubic strength (f_{cu}) is 300kg/cm^2. Use 4Φ12mm as a minimum longitudinal reinforcement with $F_{yr}=4t/cm^2$. Consider c_1, c_2 and c_3 in design as 1.0, 0.68 and 0.4, respectively. (15%)

Question #5: It is required to check the following square concrete encased I-section $50cm \times 50cm$. The column is loaded by an ultimate bending moment of ($M_u=50t{\cdot}m$) and an axial factored load of ($P_u=200t$). The concrete cubic compressive (f_{cu}) strength is 300 kg/cm^2. The steel I-section is HEB No. 300 with a steel grade of St 37. The hinged-hinged column is 6.0 m length and reinforced by a longitudinal reinforcement of 4Φ12mm ($F_{yr}=4t/cm^2$). Consider c_1, c_2 and c_3 in design as 0.7, 0.48 and 0.2, respectively. (15%)



Design aids for composite column design:

For flexural buckling:

$$F_{ym} = F_y + c_1 F_{yr}\left(\frac{A_r}{A_s}\right) + c_2 f_{cu}\left(\frac{A_c}{A_s}\right) \qquad E_m = E_s + c_3 E_c\left(\frac{A_c}{A_s}\right)$$

$$\lambda_m = \frac{L_b\sqrt{\frac{F_{ym}}{E_m}}}{\pi r_m} \qquad F_{cr} = \begin{cases} F_{ym}(1-0.384\lambda_m^{\,2}) & \lambda_m \le 1.1 \\ \dfrac{0.648F_{ym}}{\lambda_m^{\,2}} & \lambda_m > 1.1 \end{cases}$$

$\phi_c P_n = \phi_c A_s F_{cr}$ and $\phi_c = 0.80$

For Interaction of bending and compression:

For $\frac{P_u}{\phi P_n} \ge 0.20$: $\frac{P_u}{\phi P_n} + \frac{8}{9}\left[\frac{M_{ux}}{\phi_b M_{nx}}\right] \le 1.0$ For $\frac{P_u}{\phi P_n} < 0.20$: $\frac{P_u}{2\phi P_n} + \left[\frac{M_{ux}}{\phi_b M_{nx}}\right] \le 1.0$

Course Examiners:

Prof. Mostafa F. Hassanein
Prof. Mahmoud H. El-Boghdadi

End of Exam

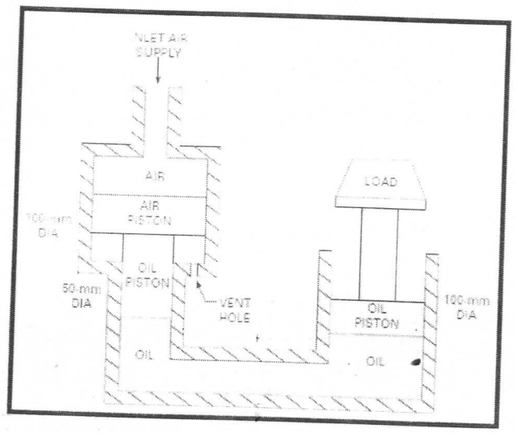
Course Title	Hydraulic/Pneumatic Systems Design	Academic Year 2022/2023 Second Semester Exam	Course Code	MEP331
Year/ Level	4th Level			
Date	17-June- 2023	No. of Pages (3)	Allowed time	3 hrs
			Total Assessment Marks: 40	
Remarks: NO REMARKS				

Question One, (12 Marks):

a) Sketch the engineering symbol for each of the following hydraulic circuits components and mention one function of its use in practical circuits: i- (pilot-operated check valve) ii- (bidirectional hydraulic rotary motor) iii- (pressure reducing valve) iv- (floating centre, manually-actuated by hand, spring-centered, 3-position, 4-way valve) v- (non-pressure compensated flow valve), vi- (sequence valve), vii- (counterbalance valve).

b) Classify the types of hydraulic actuators. Mention examples of the types that cause limited-rotation or continuous rotary motion.

c) Determine the maximum load that can be lifted in the following pneumatic/hydraulic system used to lift a load. If the inlet air pressure is 500 kPa.



Question Two, (8 Marks):

a) Sketch a complete hydraulic circuit shows the function of the meter-in speed control of a hydraulic cylinder. Please, write the names of each component in the sketch.

b) For the hydraulic system in the Figure (a), the following data are given:

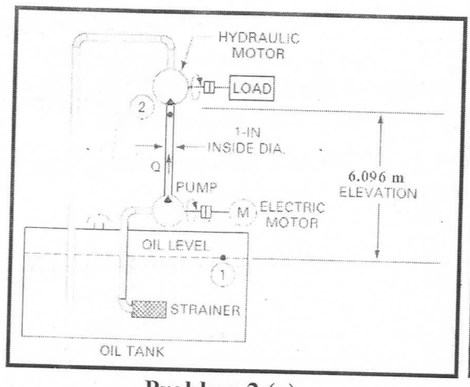
1. The pump is adding 3.73 kW to the fluid.
2. Pump flow is 0.0019 m3/s.
3. All pipes has 1 inch (0.0254 m) inside diameter.
4. The specific gravity of the oil is 0.9.
5. The oil tank is vented to the atmosphere.
6. The elevation difference between stations 1 and 2 is 6.1 m.
7. The pressure at station 1 in the hydraulic tank is atmospheric
8. The head loss H_L between stations 1 and 2 is 9.144 m of oil.

Find the pressure available at the inlet to the hydraulic motor (station 2).

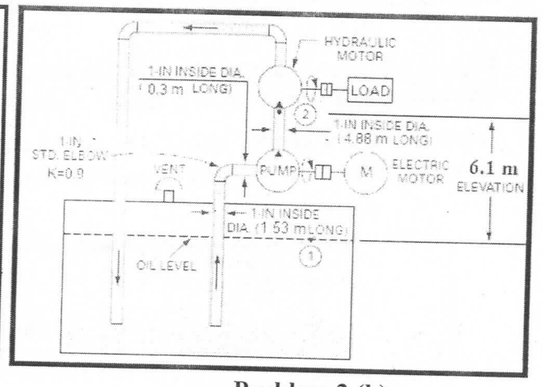
c) For the given hydraulic system in (a) with the same given data from point 1-7, the following data are also provided as shown in Figure (b):

1. The kinematic viscosity of oil is 100 cS. (cS = 10^{-6} m^2/s).
2. Pipe lengths are as follows: pump inlet pipe length = 1.53 m and pump outlet pipe length up to hydraulic motor = 4.88 m.

Find the pressure available at the inlet to the hydraulic motor (station 2).



Problem 2 (a)

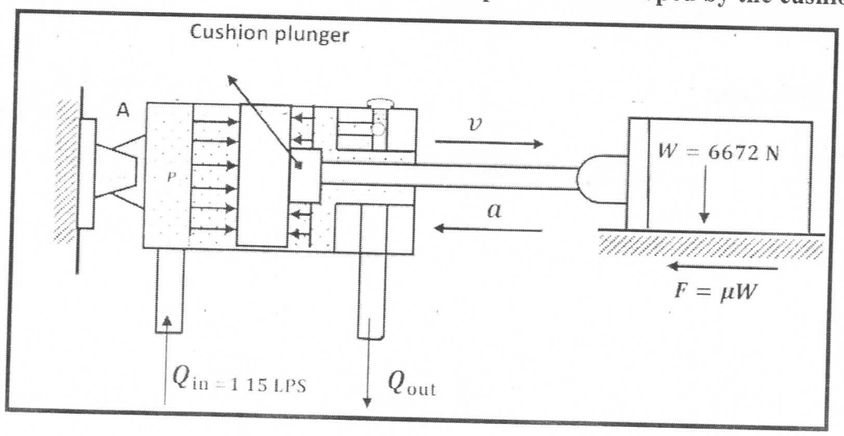


Problem 2 (b)

Question Three, (8 Marks):

a) What is the purpose of cushion devices in hydraulic cylinders? Discuss using a neat sketch of the operation principle.

b) A pump delivers oil at a rate of 1.15 L/s into the blank end of the 76.2 mm diameter hydraulic cylinder. The piston contains a 25.4 mm diameter cushion plunger that is 19.05mm long. The cylinder drives a 6672 N weight which slides on a flat horizontal surface having a coefficient of friction (μ) equal to 0.12, see the Figure. The pressure relief valve setting equals 51.7bar. Find the maximum pressure developed by the cushion.



Question Four, (12 Marks):

a) Sketch a complete hydraulic circuit used for the automatic continuous reciprocation of a hydraulic cylinder. Please, write the names of each component in the sketch.

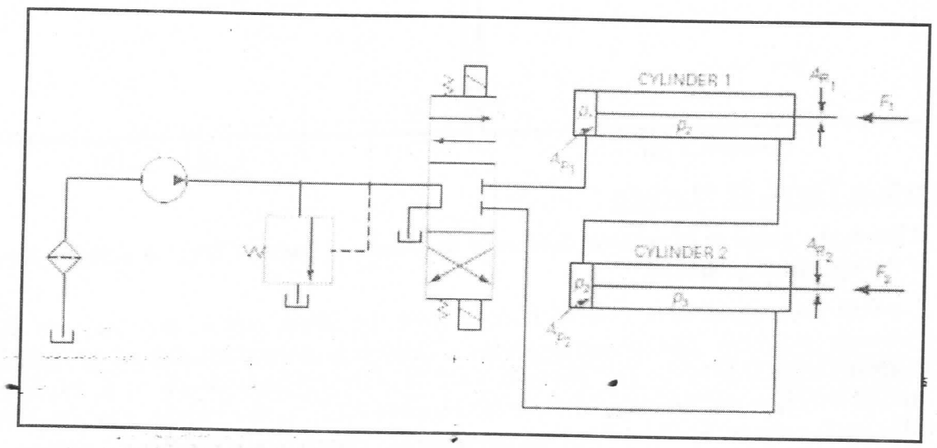
b) Discuss using neat sketch the operation principle of compound pressure relief valves.

c) Sketch a complete hydraulic circuit used for locking a hydraulic cylinder using pilot check valves. Please, write the names of each component in the sketch.

d) For the system in the Figure (for the extension strokes of the cylinders), what pump pressure is required if the cylinder loads are 22,000 N each and cylinder 1 has a piston area of 65 cm^2?

Repeat the above system for the retraction strokes of the cylinders (loads pull to right). The piston and rod areas of cylinder 2 equal 50 cm^2 and 15 cm^2, respectively.

Solve the above system using a back pressure p_3 of 300 kPa instead of zero. The piston area and rod area of cylinder 2 equal 50 cm^2 and 15 cm^2, respectively.



End of questions

Good Luck

EXAMINERS	*Prof. Dr. Ayman Bakry*	

Model B

يوسف شرف

Tanta University — Computers and Control Eng. Department — Faculty of Engineering

Course Title	Image Processing	Academic Year 2022/2023	Course Code	EEC404
Level	Fifth			
Date	19-06- 2023	No. of Pages (5)	Allowed time	3:00 hrs

Question Number (1) **(40 Points)**

Shade the circle of the most appropriate answer in your electronic answer (bubble) sheet:

1) In spatial domain, which of the following operation is done on the pixels in sharpening the image?
a)Integration b)Average c)Median d) Differentiation

2) Which of the following is the valid response when we apply a first derivative?
a) Non-zero at flat segments b) Zero at the onset of gray level step
c) Zero in flat segments d) Zero along ramps

3) Suppose that a flat area with center at (x0,y0) is illuminated by a light source with intensity distribution:

$$i(x, y) = Ke^{-[(x-x_0)^2+(y-y_0)^2]}$$

Assume for simplicity that the reflectance of the area is constant and equal to1.0, and let K=255. If the resulting image is digitized with m bits of intensity resolution, and the eye can detect an abrupt change of 4 shades of intensity between adjacent pixels, what value of m will cause visible false contouring?
a) 28 b) 32 c) 64 d) 128 e) None of these

4) In the Visible spectrum the …….. colour has the maximum wavelength.
a) Violet b) Blue c) Red d) Yellow

5) A commercial use of Image Subtraction is ……..
a) Mask mode radiography b) MRI scan c) CT scan d) None of these

6) Although power-law transformations are considered more versatile than log transformations for compressing of gray-levels in an image, then, how is log transformations advantageous over power-law transformations?
a) The log transformation compresses the dynamic range of images
b) The log transformations reverses the intensity levels in the images
c) The log transformation stretches the dynamic range of images
d) None of the mentioned

7) 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 increases and the detail decreases
d) The contrast decreases and the detail increases

8) In Histogram Matching r and z are gray level of input and output image and p stands for PDF, then, what does pz(z) stands for?
a) Specific probability density function b) Specified pixel distribution function
c) Specific pixel density function d) Specified probability density function

9) Inverse transformation plays an important role in which of the following Histogram processing Techniques?
a) Histogram Linearization b) Histogram Equalization
c) Histogram Matching d) None of the mentioned

10) In Histogram Matching or Specification, $z = G^{-1}[T(r)]$, r and z are gray level of input and output image and T & G are transformations, to confirm the single value and monotonous of G^{-1} what of the following is/are required?
a) G must be monotonic b) G must be strictly decreasing
c) G must be strictly monotonic d) G must be strictly decreasing

11) For a local enhancement using mean and variance, there is one condition: $ms(x, y) \leq k_0 M_G$, where, M_G is global mean, k_0 a constant and ms(x, y) a measure of gray value as light or dark at point (x, y). Then, which fact is true for k_0?
a) It is a negative constant with values less than -1.0
b) It is a positive constant with values less than 1.0
c) It is an integer constant with values between -1.0 and 1.0
d) None of the mentioned

12) For a local enhancement using mean and variance, there is one condition: $\sigma s(x, y) \leq k_2 D_G$, where, M_{DG} is global standard deviation, k_2 a positive constant and $\sigma s(x, y)$ a measure of contrast at point (x, y). Then, which fact is true for k_2 if its values is less than 1.0?
a) Enhancement is being done on light areas
b) Enhancement is being done on dark areas
c) Enhancement is being done independent of value of k_0
d) None of the mentioned

13) A filter is applied to an image whose response is independent of the direction of discontinuities in the image. The filter is/are ……..
a) low-pass filters b) Isotropic filters c) Median filter d) high-pass filters

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: 5%, 1: 5%, 2: 10%, 3: 10%, 4: 25%, 5: 5%, 6: 25%, 7: 15%}. Apply histogram specification on this image to answer questions from **14** to **19**.

1	1	0	0	0	0	0	1
1	1	1	1	0	1	0	1
1	3	4	4	5	5	0	0
0	3	4	4	5	5	5	5
2	4	4	4	3	5	7	0
1	1	4	5	6	5	6	1
1	0	4	4	1	5	6	1
1	0	1	0	0	0	5	0

0	3
1	4
2	4
3	4
4	6
5	7
6	7
7	7

14) The pixels of intensity=1 in the input image will be replaced by …….in the specified image.
a) intensity=2 b) intensity=3 c) intensity=4 d) intensity=5 e) None of these

15) The pixels of intensity=0 in the input image will be replaced by …….in the specified image.
a) intensity=2 b) intensity=3 c) intensity=4 d) intensity=5 e) None of these

16) The pixels of intensity=2 in the input image will be replaced by …….in the specified image.
a) intensity=2 b) intensity=3 c) intensity=4 d) intensity=5 e) None of these

17) The pixels of intensity=4 in the input image will be replaced by …….in the specified image.
a) intensity=6 b) intensity=7 c) intensity=4 d) intensity=5 e) None of these

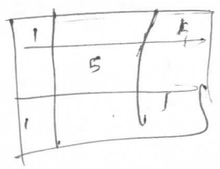
18) The pixels of intensity=5 in the input image will be replaced by …….in the specified image.
a) intensity=6 b) intensity=7 c) intensity=4 d) intensity=5 e) None of these

19) The pixels of intensity=7 in the input image will be replaced by …….in the specified image.
a) intensity=6 b) intensity=7 c) intensity=4 d) intensity=5 e) None of these

20) Applying Laplacian has which of the following result(s)?
a) Produces image having greyish edge lines
b) Produces image having featureless background
c) All of the mentioned
d) None of the mentioned

21) A mask of size 3x3 is formed using Laplacian including diagonal neighbours that has central coefficient as 9. Then, what would be the central coefficient of same mask if it is made without diagonal neighbours?
a) 5 b) -5 c) 8 d) -8

22) The Laplacian is which of the following operator?
a) Nonlinear operator b) Order-Statistic operator
c) Linear operator d) None of the mentioned



23) For what value of constant, a high boost filtering becomes the standard Laplacian sharpening filter?
a) 0 b) 1 c) -1 d) ∞

24) A First derivative in image processing is implemented using which of the following given operator(s)?
a) Magnitude of Gradient vector b) The Laplacian
c) Phase of Gradient vector d) None of the mentioned

25) What is the sum of the coefficient of the mask defined using gradient?
a) 1 b) -1 c) 0 d) None of the mentioned

26) The type of Interpolation where the intensity of the FOUR neighbouring pixels is used to obtain intensity a new location is called……
a) cubic interpolation b) nearest neighbour interpolation
c) bilinear interpolation d) bicubic interpolation

27) 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

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

29) Piecewise Linear Transformation function involves which of the following?
a) Bit-plane slicing b) Intensity level slicing
c) Contrast stretching d) All of the Mentioned

Given ' *cameraman.tif*' gray scale image and is read by Matlab and stored in B array of 256x256 size on a digital computer.

30) M=Max(B,[ ],2), M is a column vector containing the maximum value of each row.
a) True b)False

31) C = Imresize(B,2), returns an image C that is 2-times B using bilinear interpolation.
a)True b)False

32) J = Imtranslate(B,[15, 25],'view'); 'view' parameter is used to adjust the image display after translation process.
a)True b)False

33) tform = Maketform('affine',[1 0 0; .5 1 0; 0 0 1]);
J = imtransform(B,tform);
This code segment is used to apply a horizontal shear to B.
a)True b)False

34) BW = Im2bw(B, level) ; is used for converting B to a binary image
a)True b)False

35) J=Addnoise(B, 'salt & pepper', 0.02); is used to add noise to the image B.
a)True b)False

36) g2 = imadjust (B, [0.3 0.7], [0 1]);is used to

a) Compression the low end and expanding the high end of the gray scale

b) Compression the high end and expanding the low end of the gray scale

c) Stretching specific gray scale region to the full range

d) Stretching the low end and compressing the high end of the gray scale

e) Stretching the high end and compressing the low end of the gray scale

37) 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

38) For Dynamic range ratio the lower limit is determined by

a) Grey level b)Saturation c) Brightness d) Noise e) Contrast

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

a) Key points b) Tie points c) Known points d) end-points

40) What is the output of a smoothing, linear spatial filter?

a) Median of pixels b) Maximum of pixels
c) Geometric mean of pixels d) Mean of pixels

End of questions.....

Examination Committee