Q1/ Construct a multiplexer (16*1) using only the following logical circuits
Mux (4*1) 4 pieces
Mux (2*1) 3 pieces

Q2/ Draw a logical circuit that could be used to add two numbers each one consists of 6-bit using only the following logical circuits
- A Half adder 1 piece
- A Full adder 1 piece
- A 4-bit adder 1 piece

Q3/ a) Represent \( f(x,y,z) = \overline{X \ Y} + X \overline{Y} + Y \ Z \) on a Karnaugh map then find the simplest expression.
   b) If you want to design a logical circuit that convert an Excess-3 code to binary. Write only a truth table for this circuit.

Q4/ Design a sequential circuit for a counter of 3 bit. Its count up if \( u=1 \) while its count down if \( u=0 \). The design must consist of 2 D flip flops and one JK flip flop.

Q5/ a) Perform the following mathematical operations in binary system.
\((-9) - 4 = \)
\(26.25 / 5 = \)
b) Find the noise margin for a certain logical gate if following data is exist in its data sheet:
\( V_{\text{IH}}=2\text{v} \quad I_{O\text{L}}=16\text{mA} \quad V_{\text{IL}}=0.8\text{v} \)
\( I_{O\text{H}}=800\mu\text{A} \quad V_{\text{OH}}=3.4\text{v} \quad V_{\text{OL}}=0.2\text{v} \).
Q6/ a) Use 74151 (8 input data selector / multiplexer) to perform the canonical form
\[ Z = \sum_m (0, 3, 5, 6, 7) \]
Make all the connections needed for the block diagram below

b) Select the correct answer

1- How many control lines does 32 to 1 line Mux has?
   a- 3  
   b- 4  
   c- 5  

2- Latch may be constructed from
   a- Three Inverters  
   b- Two Inverters  
   c- five Inverters  

3- The most convenient way to construct a bit parity generator is with
   a- XOR  
   b- NOR  
   c- NAND  

4- To convert a full adder into a full subtractor which of these logic gates is required
   a- OR  
   b- XNOR  
   c- XOR  

5- CMOS logic circuits can work on a power supply of
   a- 5 V  
   b- 12 V  
   c- either 5 V or 12 V  

With my best wishes,
Take A. Al-Sudagher
Static

Note: Answer two questions only

Q1) Replace the loading acting on the beam by a single resultant force (magnitude and direction). Specify where the force acts measured from end A.

Q2) Calculate the forces in members BH, HI, and BC for the truss loaded by the 40 and 60 KN forces.

Q3) The mass of the box on the left is 30 kg. And the mass of the box on the right is 40 kg. The coefficient of static friction between each box and the inclined surface is \( \mu_s = 0.2 \). Determine the minimum angle \( \alpha \) for which the boxes will remain stationary.

Thermodynamics

Question) A cylinder fitted with a frictionless leak-proof piston contains a working fluid is subjected undergoes a cycle with the following process:

(1-2) polytropic compression according to the law \( (pV^n = C) \), from initial conditions at a pressure of 1 bar and volume 0.5 m\(^3\) until the pressure increased to 5 bar and volume 0.148 m\(^3\).

(2-3) constant volume process which raise the pressure to 6 bar.

(3-4) heating at constant pressure process.

(4-1) adiabatic expansion according to the law \( (PV^{1.6} = C) \), back the fluid to initial conditions. Sketch the cycle on P-V diagram and determine:

1- index \( n \).

2- Volume at the end of constant pressure process \( V_4 \).

3- summation work of the cycle.

Dynamics

Q1) An airplane lands on a straight runway with the touchdown speed of 200 km/h, whereupon the brakes are applied causing a deceleration proportional to the velocity of the plane, \( a = -105v \). Determine the time required for the plane to reduce its velocity to 20 km/h after touchdown, and the distance traveled during that interval.

Q2) A 1500 kg crate is being moved by a crane as shown. Determine the tension in the hoisting cable when (a) the crate is being lifted with an upward acceleration of 3 m/s\(^2\), and (b) the crate is being lowered with a downward acceleration of 3 m/s\(^2\).

Strength of materials

Question) The steel rod shown has a diameter of 5 mm. It is attached to the fixed wall at A, and before it is loaded, there is a gap between the wall at B and the rod of 1 mm. Determine the reactions at A and B if the rod is subjected to an axial force of \( F = 20 \) kN as shown. Neglect the size of the collar at C. Take \( E_{sr} = 200 \) Gpa.
**Q1 Statics**

4 panels 5 m

**Q2 Statics**

$40 \text{kN}$

$50 \text{kN}$

$\varphi = 0$

$s_o = 0$

$v_o = 200 \text{ km/h}$

**Q3 Statics**

**Q1 Dynamics**

**Q2 Dynamics**

$P = 20 \text{kN}$

1 mm

400 mm

800 mm

(a)

$Q \text{ Strength}$
لاعة: ملاحظة: ملاحظة أجب عن أربعة أسئلة على أن يكون السؤال الثالث من ضمنها (الدرجات بالتناظر).

س1/1-عرف مايأتي (حقوق الإنسان - عقد الزواج - الدولة - الجنسية)

ب- أشرح بياجاح حق الإنسان في تقرير المصير؟

س2/1: بين السند الشرعي والقانوني لحق الإنسان في العمل. وذكر أن الواجبات التي يجب على الدولة القيام بها لاستيفاء المستحق لهذه الحق.

س3/1: هناك جملة من الحقوق المثيرة بالشخصية التي اترتها الوثائق الدولية... أنصحها؟

س4/1: عندما يأتي:
1. وظائف البرلمان
2. أهم الوثائق الدولية المتعلقة بحقوق الإنسان

س5/1: أبحث في حق الإنسان تكون اسرة. بين بنيا السند الشرعي والقانوني لهذا الحق مع ذكر أهم الحقوق بين الزوجين؟

تمنيتى لكم بالنجاح والتفوق.
Q1: Given **Front view & Right side view**, draw the Isometric body using scale **1:1**. (All dimension in millimeters). 

Q2: Draw the main views **Front, Right side & Top views** for the given isometric drawing in scale **1:1**. (All dimension in millimeters). 

Q3: Draw the given figure using scale **1:1** showing all the **tangent points and arcs centers**. (All dimension in millimeters). 

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**S4:** (a) أجب بعبارة صح أو خطأ لكل من العبارات أدناه مع تصحيح الخطأ إن وجد:

1. **Mline** - يستخدم الإليزا لتهيئة تقاطعات عناصر الـ
2. **Stretch** - يستخدم الإليزا لتمييز الرسوم الثنائية والثلاثية الإبعاد.
3. **Attdf** - يعمل الإليزا لغرض تعين نجام للرسوم التي تكون على شكل قوابض (Blocks).
4. **Offset** - يعمل الإليزا على عمل موازيات للرسوم.
5. **Divide** - يعمل الإليزا لغرض تقسيم الرسوم الثنائية الإبعاد بوحدة تقسيم يتم تحديدها مع ترك الباقى.

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**S9:** (ب) إملأ الفراغات أدناه بكلمات مناسبة:

1. **ال أمر** — لتحديد مواصفات الرسوم التي بينها خصائص مشتركة دفعة واحدة.
2. **ال أمر** — لغرض إدخال ملاحظات رسم كمراجع خارجية فائنا نستدعيه الإليزا.
3. **ال أمر** — لغرض توليد الرسوم بشكل أفضل.
4. **ال أمر** — على عمل نسخة جديدة للرسوم بالمقاييس الذي نحدده مع بقاء الشكل الأصلي كما هو.
Question 1:
Choose one of the given four words or numbers to match the blanks in each of the following sentences:

a. The process of converting source code file to an object code file is called ........
   (i) Compilation (ii) Executing (iii) Linking (iv) Converting

b. The C function returns the inverse of the natural logarithm of a given variable is called ........
   (i) ALOG (ii) pow10 (iii) aLN (iv) exp

c. The C standard library contains the (randomize) function is called .......
   (i) stdio (ii) conio (iii) dos (iv) stdlib

d. The format character ........ is used for double data type in exponent form.
   (i) le (ii) Le (iii) lf (iv) Lf

e. Long integer data type in C programs consists of ........ bits.
   (i) 16 (ii) 32 (iii) 64 (iv) 80

f. For the statement, char A=0x8f; value of A will be ........ in decimal.
   (i) -102 (ii) 102 (iii) -113 (iv) 143

g. For the statement, int B = ( 0x78&32) | 0x24; value of B will be ........ in decimal.
   (i) 18 (ii) 36 (iii) -36 (iv) 24

h. For the statement, int C = ( 15<<2 ) ^ 0x40; value of C will be ........ in hexadecimal.
   (i) 7C (ii) 60 (iii) 2A (iv) 40

i. For the statement, float D = fmod (30.8); value of D will be ........
   (i) 4.0 (ii) 5.0 (iii) 6.0 (iv) 7.0

j. For the statement, int E = 10+ random (50); minimum value of E will be ........ in decimal.
   (i) 10 (ii) 60 (iii) 50 (iv) 49

Question 2:
A. Write C program to clear the standard text mode screen and draw a solid rectangle of (20) characters length and (5) characters width in the right top corner of the screen
   Note: Use the character (X) in drawing of the rectangle.

B. Represent the following mathematical equations into forms of single C statements:

(i) \( G = \log_{10} \frac{x+1}{x-1} \)
(ii) \( R = \frac{x^3 + y^3}{2x + y} \)
(iii) \( y = \sqrt{x^2 - 100} \) for \( |x| > 10 \)
     \( y = 0 \) for \( -10 < x < +10 \)

Question 3:
A. Write C program to read three integer sides of a triangle, then check and print if the triangle is equilateral or not.

B. Write C program to define (15) elements one dimensional array of float data type. Use single loop (while) statement in program to read elements of the array interactively from console, and to find, print maximum element value have been entered to the array.
Question 4:

A. Write the C function that can return a random number between two given limits (minimum and maximum). Show how you can use this function in main program to generate random number between (-20) and (+60).

B. Write C program to define the following array:

\[
N = \begin{bmatrix}
1.1 & -2.2 & 3.4 & 6.8 \\
2.8 & -1.5 & 6.3 & 5.5 \\
3.0 & -4.1 & 5.0 & 7.7
\end{bmatrix}
\]

Then write the statements that can find and print to console the transpose of the array.

Question 5:

A. Write C program to define the following macros:

- `Hypot` to get hypotenuse of two given sides of right angled triangle.
- `Max4` to get the maximum of four given inputs.

Show how you use these macros in main program to print the hypotenuse of right angled triangle has the sides of (4) and (6), find and print the maximum of (-12.5, -10.8, 12.6, and 4.8) respectively.

A. Write C function that can return sum of elements in each column of 2D array with integer data type, function can be applied to arrays has maximum of (32) columns. Apply function in the main program to get and print sum of elements in each column of the following array:

\[
A = \begin{bmatrix}
3 & -1 & 4 & 6 \\
-1 & 3 & 2 & -4 \\
2 & -4 & 9 & 5
\end{bmatrix}
\]

GOOD LUCK