

مجلس الخدمة المدنية

إدارة الموظفين

اللجنة الفاحصة

مباراة على أساس الألقاب لوظيفة مهندس أو مهندس رئيس قسم

في الفئة الثالثة الرتبة الثانية (أ) من السلك الفني

في مؤسسة كهرباء لبنان

الاختصاص : الهندسة الميكانيكية

مسابقة في الاختصاص المطلوب بإحدى اللغتين الفرنسية أو الإنكليزية وفق البرنامج المرفق بالقرار رقم ٢/١٦٥ تاريخ ٢٧/٣/٢٠١٠ : المدة : ثلاث ساعات

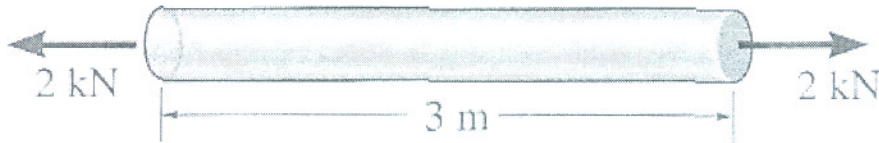
- 1- A water cooled cooling tower (used to cool the condenser of chillers) reduces the water temperature close to dry bulb temperature or ambient wet bulb temperature or dew point temperature /justify ?.
- 2- The essential parameters to estimate cooling load from outside air across an air handling unit (AHU) are flow rate ,or dry bulb temperature or relative humidity or all previous parameters? justify .
- 3- The performance of refrigerators and heat pumps is expressed in terms of the coefficient of performance respectively COP_h and COP_r .,prove that COP_h= COP_r+1 .
- 4- A certain refrigeration application requires maintaining the refrigerated space at -32 deg. C. Would you recommend a simple refrigeration cycle with refrigerant 134-a or a two/multiple stage cascade refrigeration cycle ? justify .
- 5- The reversed Carnot cycle have four processes (two reversible isothermal and two isentropic process) , show on a schematic (T, S) these four processes , and the location of the condenser and the evaporator .on the schematic cycle .
- 6- Plot the Rankine cycle in T-S diagram . and
 - a) give the equation of the thermal efficiency of this cycle .
 - b) how can we increase this efficiency ? Explain .

7- The characteristics of a centrifugal pump are as follows:

Q m ³ /min	0	7	14	21	28	35	42	49	56
Hp m	40	40.6	40.4	39.3	38	33.6	25.6	14.5	0
η %	0	41	60	74	83	83	74	51	0

- a- Determine the pump operating point for the case when this pump is used to transfer water between two reservoirs having difference in levels of 15 m through a pipe of 0.45 m diameter and 400 m of length, and a friction factor of 0.016
- b- Calculate the power absorbed by the pump,
- c- Explain the methods used to prevent the water hammer in the system.
- d- What is the type of the flow in pipes (the kinematic viscosity of the water is 1centiStokes)

8- An 8-mm-diameter brass rod has a modulus of elasticity of $E_{br} = 100 \text{ GPa}$. If it is 3 m long and subjected to an axial load of 2 kN, determine its elongation. What is its elongation under the same load if its diameter is 6 mm?



9- If 25 mm of a $\varnothing 3.2 \text{ mm}$ diameter, 300 mm long steel welding rod is used for every 12 mm of a weld. How many kilograms of rod are used in making 150 linear meters of welding? The last 50 mm of each rod are unusable, and the density of steel is 7.87 g/cm^3 .

10- Label the following sketch showing the schematic of the oxyfuel gas welding process by locating the correct position number in front of the correct term in the following table:

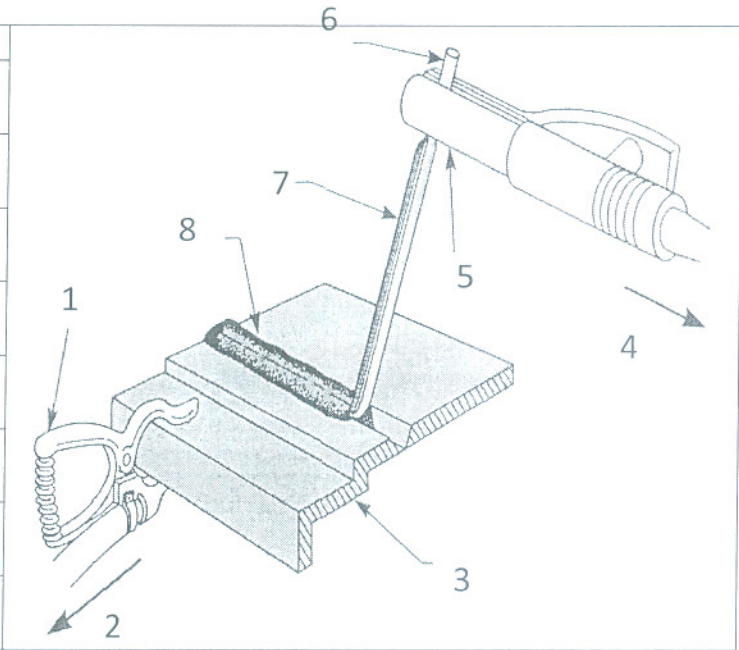
Position	Term
	Recast metal
	Oxyfuel mixture
	Flame
	Molten pool
	Welding Torch
	Consumable filler metal

The diagram shows a cross-section of the oxyfuel gas welding process. A welding torch (2) is positioned on the left, directing an oxyfuel mixture (1) through its nozzle. This mixture forms a flame (3) that melts the base metal (4) and a consumable filler metal (5) to create a molten pool (6). The recast metal (7) is shown on the right side of the weld.

11- If 40 % of a casting is sprue, gates, and risers. How much aluminum is melted per day to produce 350 finished castings weighing 1.9 kg each?

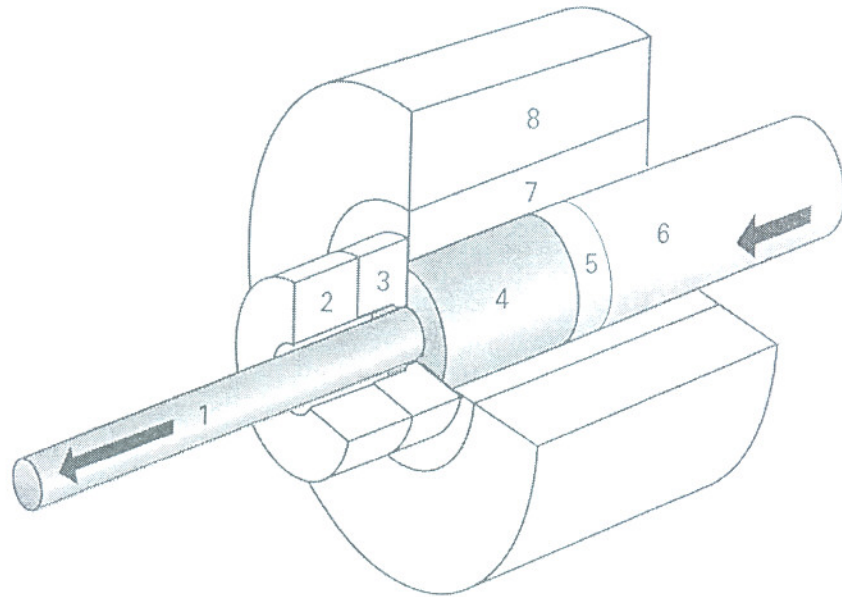
12- Label the following sketch showing the schematic of the arc welding process by locating the correct position number in front of the correct term in the following table:

Position	Term
	To power supply
	Electrode Holder
	Weld Metal
	Workpiece
	Bare section for contact
	Electrode
	To power supply
	Ground Clamp

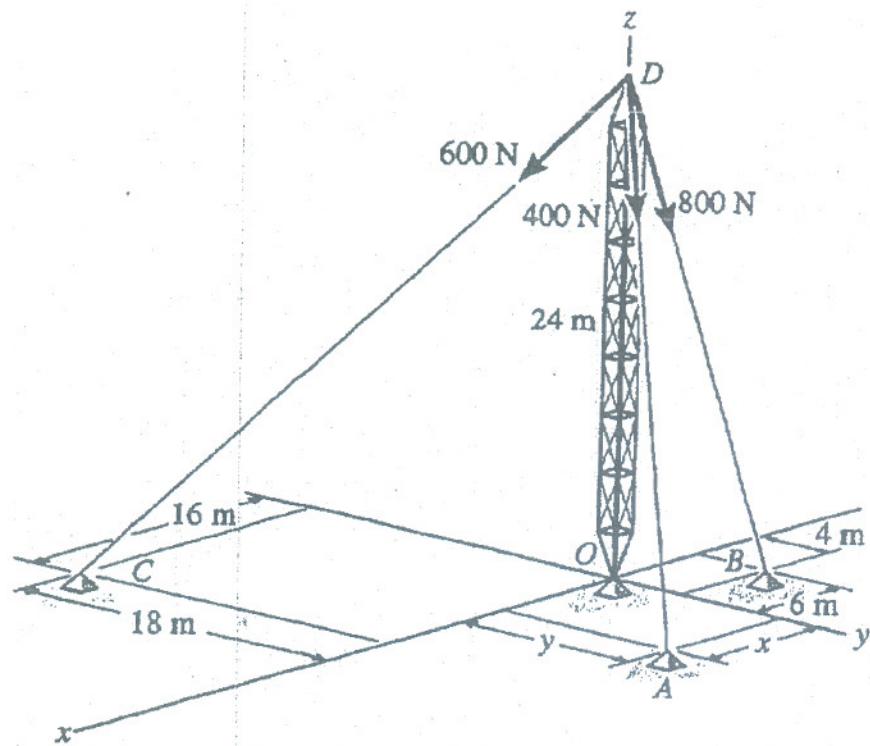


13- Name the equipment components of the direct extrusion forming operation in the following figure:

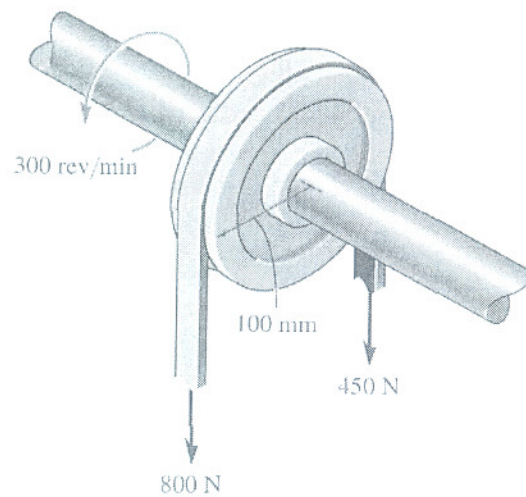
1	
2	
3	
4	
5	
6	
7	
8	



14- The tower is held in place by three cables. If the force of each cable acting on the tower is shown, determine the magnitude and coordinate direction angles α , β , γ of the resultant force. Take $x = 20$ m, $y = 15$ m.



15- The 60-mm-diameter shaft rotates at 300 rev/min. This motion is caused by the unequal belt tensions on the pulley of 800 N and 450 N. Determine the power transmitted and the maximum shear stress developed in the shaft.



بيروت، في ٢٠١٠/٥/١٥

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