



Level: 1 (Diff.Eq.)  
Date: 2018 (2d term)

CODE: (Bas126)  
Allowed time: 3hrs

**Q (1) (12M)**

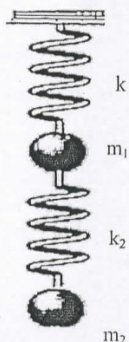
- (a) Find the orthogonal trajectories of the following family of curves  $y^2 + x^2 = c$
- (b) Solve  $[y \sec^2 x + \sec x \tan x] dx + (\tan x + 2y) dy = 0$
- (c) Solve  $(x + 3y + 1) dx + (x - y + 1) dy = 0$

**Q (2) (12M)**

- (a) Solve  $y''' + y'' - 6y' - 18y = e^{3x} + e^{-x}$
- (b) Solve  $y'' + 3y' + 2y = e^{2x} \cos x$
- (c) Solve  $y'' + y = \operatorname{cosec} x \cot x$

**Q (3) (16M)**

- (a) Find Fourier odd cosine series of  $f(x) = x$   $0 \leq x \leq \frac{\pi}{2}$  and period  $2\pi$
- (b) Find Laplace transform of
  - (i)  $(t^3 + 3t^2 + 2t + 5)U(t - 1)$
  - (ii)  $t e^t \sinh 3t \cos t$
  - (iii)  $\int_0^t e^{-3t} \cosh 2t \sin t dt$
- (c) Evaluate Inverse Laplace transform of
  - (i)  $\frac{(s+1)e^{-\pi s}}{(s^2+1)(s^2+2)}$
  - (ii)  $\ln \left[ \frac{s^2+3}{s^2+1} \right]$
- (d) Consider a mass- spring system as in figure . Use Hook's law to find the displacement  $y_1(t)$  and  $y_2(t)$  at any time by use Laplace transformations . If  $K_1 = 50$  and  $K_2 = 40$  (spring constant) ,  $m_1 = 5$  and  $m_2 = 4$  (mass), initial Velocity and displacement are  $y_1'(0) = 10$  ,  $y_1(0) = 1$  and  $y_2'(0) = 20$  ,  $y_2(0) = 5$







## Construction Engineering Program



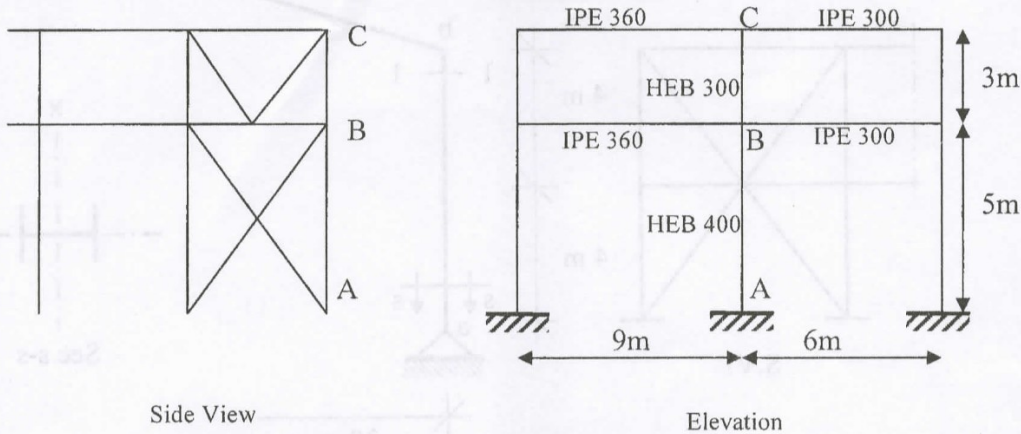
University

Faculty of Engineering

Course Title	Design of steel structures	Final Exam	Allowed time	3 hour
	26/5/2018		No. of Pages	2

### Question (1) 10%

the buckling lengths of columns AB and BC in-plane and out-of-plane. Then calculate the slenderness ratio for columns AB and BC in-plane and out-of-plane.



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(a) D

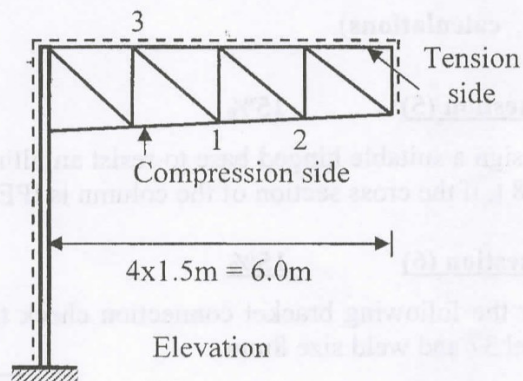
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### Question (2) 20%

required to answer the following questions for the given truss shown below. Steel used is St37. Gusset plate thickness = 10mm.

(b) D

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2.  
design a compression member (1-2) to carry an ultimate compression force of 15 ton. The member is composed of 2 angles back-to-back and welded at the ends.



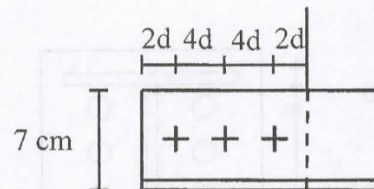
### Que

(a) It design a tension member (1-3) to carry an ultimate tension force of 10 ton. The member is welded at the ends. The length of the member is 3m.

M

### (b) Question (3) 20%

ccis required to find the maximum strength that can be carried by the given bolted connection. The member is composed of 2 angles back-to-back 70x70x7, using S275. Gusset plate thickness = 10mm. The bolts are M20 grade 6.8.



**Best** is required to design the same connection as welded connection to carry the maximum strength that can be carried by the bolted connection calculated above.

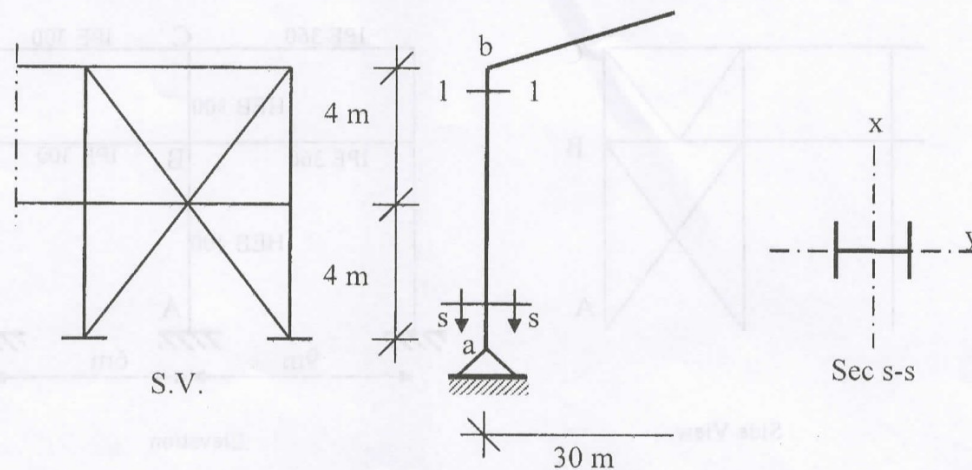


**Question (4) 20%**

(A) It is required to *design* Sec. 1-1 of the column of the following frame. The frame is constructed from St52. The ultimate staining actions at Sec. 1-1 are:

$$M_u = 85t.m, P_u = -30t \text{ and } V_u = 20t.$$

Note that special lateral bending restraints are provided for the column every 2.0m.



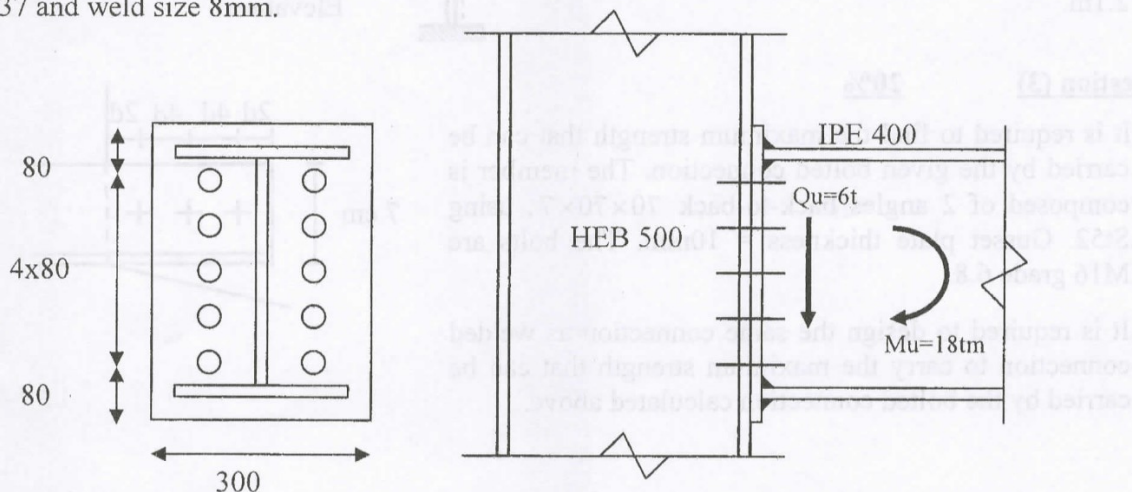
(B) Discuss the expected mode of failure for compact sections with  $l_b > L_r$ . Then, compare it with the expected mode of failure for non-compact sections with  $L_p < l_b < L_r$  (**without calculations**).

**Question (5) 15%**

Design a suitable hinged base to resist an ultimate axial force of 15 t and an ultimate shearing force of 8 t, if the cross section of the column is IPE 400. Use Steel 37. Then draw it with a scale 1:10.

**Question (6) 15%**

For the following bracket connection check the weld between the bracket and the head plate. Use steel 37 and weld size 8mm.







Course Title	General Chemistry	Final Exam answer	Course Code	BAS012
Date	26-5-2018	No. of Pages 6	Allowed time two hours	Exam no. Adc235

**Answer the following questions****Question (1) : Answer this question in the answer sheet****Choice the correct answer : .....(3/1marks)**

- 1) A piston cylinder device initially contains  $0.4 \text{ m}^3$  of air at 100 Kpa and  $80^\circ\text{C}$ . The Air is now compressed to  $0.1 \text{ m}^3$  in such way that the temperature inside the cylinder remains constant. Determine the work done during the process?  
 A.  $50.5 \text{ K pa}\cdot\text{m}^3$     B.  $55.45 \text{ K pa}\cdot\text{m}^3$     c.  $53.40 \text{ K pa}\cdot\text{m}^3$     D.  $45.55 \text{ K pa}\cdot\text{m}^3$
- 2) Given the following notation for an electrochemical cell:  $\text{Pt(s)} | \text{H}_2(\text{g}) | \text{H}^+(\text{aq}) || \text{Ag}^+(\text{aq}) | \text{Ag(s)}$ , what is the balanced overall (net) cell reaction?  
 a.  $2\text{H}^+(\text{aq}) + 2\text{Ag}^+(\text{aq}) \rightarrow \text{H}_2(\text{g}) + 2\text{Ag(s)}$     b.  $\text{H}_2(\text{g}) + 2\text{Ag(s)} \rightarrow \text{H}^+(\text{aq}) + 2\text{Ag}^+(\text{aq})$   
 c.  $\text{H}_2(\text{g}) + \text{Ag}^+(\text{aq}) \rightarrow \text{H}^+(\text{aq}) + \text{Ag(s)}$     d.  $\text{H}_2(\text{g}) + 2\text{Ag}^+(\text{aq}) \rightarrow 2\text{H}^+(\text{aq}) + 2\text{Ag(s)}$
- 3) Consider an electrochemical cell constructed from the following half cells, linked by an external circuit and by a KCl salt bridge.  
 • an Al(s) electrode(anode) in 1.0 M  $\text{Al}(\text{NO}_3)_3$  solution  
 • a Pb(s) electrode(cathode) in 1.0 M  $\text{Pb}(\text{NO}_3)_2$  solution. The balanced overall (net) cell reaction is  
 A.  $\text{Pb(s)} + \text{Al}^{3+}(\text{aq}) \rightarrow \text{Pb}^{2+}(\text{aq}) + \text{Al(s)}$ .    B.  $3\text{Pb(s)} + 2\text{Al}^{3+}(\text{aq}) \rightarrow 3\text{Pb}^{2+}(\text{aq}) + 2\text{Al(s)}$ .  
 C.  $3\text{Pb}^{2+}(\text{aq}) + 2\text{Al(s)} \rightarrow 3\text{Pb(s)} + 2\text{Al}^{3+}(\text{aq})$ .    D.  $\text{Pb}^{2+}(\text{aq}) + \text{Al(s)} \rightarrow \text{Pb(s)} + \text{Al}^{3+}(\text{aq})$ .
- 4) A certain electrochemical cell has for its cell reaction:  $\text{Zn} + \text{HgO} \rightarrow \text{ZnO} + \text{Hg}$   
 Which is the half-reaction occurring at the *anode*?  
 A.  $\text{HgO} + 2\text{e}^- \rightarrow \text{Hg} + \text{O}^{2-}$     B.  $\text{Zn}^{2+} + 2\text{e}^- \rightarrow \text{Zn}$   
 C.  $\text{Zn} \rightarrow \text{Zn}^{2+} + 2\text{e}^-$     D.  $\text{ZnO} + 2\text{e}^- \rightarrow \text{Zn}$
- 5) Consider an electrochemical cell based on the following cell diagram:  
 $\text{Pt} | \text{Pu}^{3+}(\text{aq}), \text{Pu}^{4+}(\text{aq}) || \text{Cl}_2(\text{g}), \text{Cl}^-(\text{aq}) | \text{Pt}$   
 Given that the standard cell emf is 0.35 V and that the standard reduction potential of chlorine is 1.36 V, what is the standard reduction potential  $E^\circ(\text{Pu}^{4+}/\text{Pu}^{3+})$ ?  
 A. 2.37 V    B. 1.01 V    C. -1.71 V    D. -1.01 V
- 6) Consider an electrochemical cell based on the spontaneous reaction  
 $2\text{AgCl(s)} + \text{Zn(s)} \rightarrow 2\text{Ag(s)} + 2\text{Cl}^- + \text{Zn}^{2+}$ .  
 If the zinc ion concentration is kept constant at 1 M, and the chlorine ion concentration is decreased from 1 M to 0.001 M, the cell voltage should  
 A. increase by 0.06 V.    B. increase by 0.18 V.  
 C. decrease by 0.06 V.    D. decrease by 0.18 V.
- 7) Hydrogen peroxide ( $\text{H}_2\text{O}_2$ ) decomposes according to the equation  
 $\text{H}_2\text{O}_2(\text{l}) \rightarrow \text{H}_2\text{O}(\text{l}) + (1/2)\text{O}_2(\text{g})$ .  
 Calculate  $K_p$  for this reaction at  $25^\circ\text{C}$ . ( $\Delta H^\circ = -98.2 \text{ kJ/mol}$ ,  $\Delta S^\circ = 70.1 \text{ J/K}\cdot\text{mol}$ )  
 A.  $1.3 \times 10^{-21}$     B. 20.9    C.  $3.46 \times 10^{17}$     D.  $7.5 \times 10^{20}$
- 8) Increasing the permeability of the concrete will allow to the .....from air and chloride from solution to penetrate to the steel and decrease the pH.





- i. (a) CO (b) CO<sub>2</sub> (c) Cl<sub>2</sub> (d) O<sub>2</sub>
- 9) Atmospheric air consists of .....by volume  
 a. 23% O<sub>2</sub> & 77% N<sub>2</sub> b. 21% O<sub>2</sub> & 79% N<sub>2</sub> c. 27% O<sub>2</sub> & 73% N<sub>2</sub> d. 25% O<sub>2</sub> & 75% N<sub>2</sub>
- 10) 10 moles of O<sub>2</sub> is added to 10 moles of H<sub>2</sub>, how many moles of H<sub>2</sub>O will it produce?  
 a. 5 moles b. 10 moles c. 15 moles d. 20 moles
- 11) A container has 10 grams of water 5 grams of water is added and 2 grams of water is taken out, what is the final amount of water?  
 a. 7 grams b. 10 grams c. 13 grams d. 15 grams
- 12) 10 moles of A were present in a system initially, and 10 moles of C are added to it, it follows the reaction 2A + C → 5B, what are number of moles of B produced?  
 a. 5 b. 10 c. 25 d. 50
- 13) Common Ion Effect : The ionization of a..... electrolyte is diminished by the addition of a ..... electrolyte, which lead to a common ion,  
 a. strong - weak b. strong - strong c. weak -weak d. weak- strong
- 14) .Calculate the value of K<sub>sp</sub> of Ag<sub>2</sub>CrO<sub>4</sub> assuming that he solubility of Ag<sub>2</sub>CrO<sub>4</sub> = 1.3x10<sup>-4</sup> mole/l  
 a. 1.69 x 10<sup>-8</sup> b. 8.79 x 10<sup>-12</sup> c. 2.86 x 10<sup>-16</sup> d. 2.6 x 10<sup>-8</sup>
- 15) The ionization constant of acetic acid at 25 °C is 1.82x10<sup>-5</sup>. Calculate the pH of 0.1 mole/ L acid.  
 a. 2.78 b. 3 c. 5 d. 1
- 16) Consider the following reaction, for which the equilibrium constant, K<sub>c</sub> = 100.  
 i. N<sub>2</sub>(g) + 2O<sub>2</sub>(g) → 2NO<sub>2</sub>(g)  
 What is K<sub>c</sub> for the following reaction? NO<sub>2</sub>(g) → O<sub>2</sub>(g) + ½N<sub>2</sub>(g)  
 a. 0.01 b. 0.1 c. 1 d. 10
- 17) Examples of weak electrolytes.....  
 A. weak acid, weak alkali and salts. B. weak acid, weak alkali  
 C. weak acid, strong alkali and salts. D. strong acid, weak alkali and salts.
- 18) K<sub>1</sub> and K<sub>2</sub> are the velocity constants of forward and backward reactions. The equilibrium constant k of the reaction is.....  
 A. K<sub>1</sub> × K<sub>2</sub> B. K<sub>1</sub> - K<sub>2</sub>  
 C. K<sub>1</sub> / K<sub>2</sub> D. (K<sub>1</sub> + K<sub>2</sub>) / (K<sub>1</sub> - K<sub>2</sub>)
- 19) Which one of the following reactions will be favoured at low pressure?  
 a. N<sub>2</sub>(g) + O<sub>2</sub>(g) → 2NO(g) b. H<sub>2</sub>(g) + I<sub>2</sub>(g) → 2HI(g)  
 c. PCl<sub>5</sub>(g) → 2PCl<sub>3</sub>(g) + Cl<sub>2</sub>(g) d. N<sub>2</sub>(g) + 3H<sub>2</sub>(g) → 2NH<sub>3</sub>(g)
- 20) Consider the reaction, CaCO<sub>3</sub>(s) → CaO (s) + CO<sub>2</sub>(g) in a closed container at equilibrium. What would be the effect of addition of CaCO<sub>3</sub> on the equilibrium concentration of CO<sub>2</sub>  
 (A) Increases (B) Unpredictable (C) Decreases (D) Remains unaffected
- 21) For the reaction, PCl<sub>5</sub>(g) → 2PCl<sub>3</sub>(g) + Cl<sub>2</sub>(g) the forward reaction at constant temperature is favoured by.....  
 (A) introducing an inert gas at constant volume (B) introducing PCl<sub>3</sub>(g) at constant volume  
 (C) introducing PCl<sub>5</sub>(g) at constant volume (D) introducing Cl<sub>2</sub>(g) at constant volume
- 22) What material is used to coat iron in the galvanizing process?  
 a) Copper b) Tin c) Zinc d) None of the above





- 23) The temperature of a system rises by  $30^{\circ}\text{C}$  during a heating process, but this rise in Temperature in Kelvin
- a.  $-243^{\circ}\text{K}$       b.  $30^{\circ}\text{K}$       c.  $303^{\circ}\text{K}$       d.  $490^{\circ}\text{K}$
- 24) A gas is compressed in a cylinder from a volume of 20 L to 2.0 L by a constant pressure of 10.0 atm. Calculate the amount of work done on the system. [1 L·atm = 101.3 J]
- a.  $1.01 \times 10^4 \text{ J}$       b.  $-180 \text{ J}$   
c.  $1.81 \times 10^4 \text{ J}$       d.  $-1.82 \times 10^4 \text{ J}$
- 25) All carbon converted to carbon monoxide, all hydrogen converted to water and all sulfur converted to sulfur dioxide, It is
- a. A combustion reaction      b. Complete reaction      c. Incomplete reaction      d. Reversible reaction
- 26) When Pt and Co are connected to each other in presence of electrolyte, which one gets corroded
- a. Pt      b. Co      c. None      d. Can't decide
- 27) What would happen to the equilibrium position if the total pressure were increased?
- a.  $\text{Fe}_2\text{O}_3(\text{s}) + 3\text{CO}(\text{g}) \rightleftharpoons 2\text{Fe}(\text{l}) + 3\text{CO}_2(\text{g})$   
a. The reaction would move to the left.      b. The reaction would move to the right.  
c. The equilibrium would not change.      d. Not sufficient information to decide.
- 28) The following voltaic cell is :  $\text{Zn} / \text{Zn}^{2+} // \text{Sn}^{2+} / \text{Sn}$ . Which one of the following best describes the chemical operation of the cell?
- a. The Zn electrode is the cathode; Zn is being oxidised.      b. The Zn electrode is the anode; Zn is being oxidised.  
c. The Sn electrode is the anode;  $\text{Zn}^{2+}$  is being reduced.      d. The Sn electrode is the cathode; Sn is being oxidised.
- 29) The potential difference between the potential of the anode and potential of the cathode in a cell is called:
- a. The electromotive series (ems).      b. The electromotive force (emf).      c. Standard potential.      d. Cathodic potential.
- 30) As the temperature of a fixed volume of a gas increases, the pressure will \_\_\_\_.
- a. vary inversely      b. not change      c. Decrease      d. increase
- 31) Factors Influence Corrosion process are:
- a. Concentration of electrolyte.      b. Electrode potential.      c. Aeration.      d. All the previous.
- 32) Non-metallic coating is Method of protecting metals against corrosion such as:
- A. Temporary Coating      B. Coating with Zn      C. Coating with Cu      D. All the previous.
- 33) They are Chemical substances added to the corrosive solution in a small amount (e.g.0.1%) they classified according their mechanism of action:
- coated materials      B. Coating substances      C. Inhibitors      D. All the previous.      A. Inhibitors &
- 34) Cathodic protection of underground steel pipeline can be carried out by using :
- A. less Nobel galvanic anode.      B. Zn or Mg rode      C. Cu rode      D. non of all the previous.
- 35) 24. Corrosion of Steel bar Reinforcement in Concrete
- A. It is an electrochemical process      B. It is a chemical process      C. it is spontaneous process      D. all the previous.
- 36) 2.The unit of mass, length, and time are kilogram, meter and second respectively.
- a. English System.      b. SI System.      c. united states system      d. all the previous.
- 37) It is a quantity of matter or a region in space chosen for study.





- a. Surrounding. b. Boundary. c. System. d. a & c
- 38) It is the device which converts heat into work.  
Reservoir. b. Heat engine. c. Motor d. generator
- 39) At 700 K, the equilibrium constant for the reaction  $\text{CO(g)} + \text{H}_2\text{O(g)} \rightleftharpoons \text{CO}_2\text{(g)} + \text{H}_2\text{(g)}$  is 5.10. What is  $\Delta G^\circ$  for this reaction at this temperature?  
a. 9481 J/mol b. 9481 kJ/mol  
c. 2280 J/mol d. 93.51 J/mol
- 40) Choose the substance with the higher entropy per mole at a given temperature:  $\text{CO}_2\text{(g)}$  or  $\text{CO}_2\text{(aq)}$ .  
a.  $\text{CO}_2\text{(aq)}$ . b.  $\text{CO}_2\text{(g)}$  &  $\text{CO}_2\text{(aq)}$ .  
c.  $\text{CO}_2\text{(s)}$ . d.  $\text{CO}_2\text{(g)}$
- 41) Many different ways have been proposed to make batteries. One cell is set up with copper and lead electrodes in contact with  $\text{CuSO}_4\text{(aq)}$  and  $\text{Pb(NO}_3)_2\text{(aq)}$ , respectively. If the  $\text{Pb}^{2+}$  and  $\text{Cu}^{2+}$  concentrations are each 1.0 M, what is the overall cell potential?  

$$\text{Pb}^{2+} + 2\text{e}^- \rightarrow \text{Pb} \quad E^\circ = -0.22 \text{ V}$$

$$\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu} \quad E^\circ = +0.34 \text{ V}$$
a. 0.12 v b. 0.56 v  
c. 5.6 v d. 1.2 v  
e.
- 42) A sample of a gas occupies  $1.40 \times 10^3$  ml at  $25^\circ\text{C}$  and 760 mmHg. What volume will it occupy at the same temperature and 380 mmHg?  
a. 2,800 ml b. 2,100 ml  
c. 1,400 ml d. 700 ml





- 43) A small bubble rises from the bottom of a lake, where the temperature and pressure are  $4^{\circ}\text{C}$  and  $3.0\text{ atm}$ , to the water's surface, where the temperature is  $25^{\circ}\text{C}$  and the pressure is  $0.95\text{ atm}$ . Calculate the final volume of the bubble if its initial volume was  $2.1\text{ mL}$ .  
A.  $0.72\text{ ml}$     B.  $6.2\text{ ml}$     C.  $41.4\text{ ml}$     D.  $7.1\text{ ml}$
- 44) Deviations from the ideal gas law are greater at .....  
A. low temperatures and low pressures.    B. low temperatures and high pressures.  
C. high temperatures and high pressures.    D. high temperatures and low pressures.
- 45) For a substance that remains a gas under the conditions listed, deviation from the ideal gas law would be most pronounced at .....  
a.  $100^{\circ}\text{C}$  and  $2.0\text{ atm}$ .    b.  $-100^{\circ}\text{C}$  and  $2.0\text{ atm}$ .  
c.  $-100^{\circ}\text{C}$  and  $4.0\text{ atm}$ .    d.  $100^{\circ}\text{C}$  and  $4.0\text{ atm}$ .
- 46) Samples of the following volatile liquids are opened simultaneously at one end of a room. If you are standing at the opposite end of this room, which species would you smell first?  
[Assume that your nose is equally sensitive to all these species.]  
A. ethyl acetate ( $\text{CH}_3\text{COOC}_2\text{H}_5$ )    B. camphor ( $\text{C}_{10}\text{H}_{16}\text{O}$ )  
C. diethyl ether ( $\text{C}_2\text{H}_5\text{OC}_2\text{H}_5$ )    D. naphthalene ( $\text{C}_{10}\text{H}_8$ )
- 47)  $5.00\text{ g}$  of hydrogen gas and  $50.0\text{ g}$  of oxygen gas are introduced into an otherwise empty  $9.00\text{ L}$  steel cylinder, and the hydrogen is ignited by an electric spark. If the reaction product is gaseous water and the temperature of the cylinder is maintained at  $35^{\circ}\text{C}$ , what is the final gas pressure inside the cylinder?  
A.  $0.92\text{ atm}$     B.  $18.3\text{ atm}$     C.  $2.58\text{ atm}$     D.  $7.86\text{ atm}$
- 48) A flammable gas made up only of carbon and hydrogen is found to effuse through a porous barrier in  $1.50\text{ min}$ . Under the same conditions of temperature and pressure, it takes an equal volume of bromine vapor  $4.73\text{ min}$  to effuse through the same barrier. suggest what this gas might be. if molr mass of  $\text{Br}_2=159.8\text{g/mol}$   
A.  $\text{O}_2$     B.  $\text{C}_2\text{H}_4$     C.  $\text{CH}_4$     D.  $\text{NH}_3$
- 49) from Raw materials used in the manufacture of cement Lime Stone : which is consider as a source of.....  
A.  $\text{Al}_2\text{O}_3$     B.  $\text{Al}_2\text{O}_3$  &  $\text{SiO}_2$     C.  $\text{SiO}_2$     D.  $\text{CaO}$ :
- 50) Sand added to adjust the composition of the mixture used in the manufacture of cement to reach %  $\text{SiO}_2 = \dots\dots\dots$  in the Cement  
A.  $11\%$     B.  $21\%$     C.  $12\%$     D.  $22\%$
- 51) If the amount of  $\text{Al}_2\text{O}_3$  ....., the burning of cement will occur at .....temperature and the produced cement will be fast -hardening .  
A. decreases -high    B. increases -high    C. increases -low    D. decreases -low
- 52) The Chemical Composition of a sample of cement are as the following:( loss  $3.7\%$  ,  $\text{MgO}$   $0.8\%$  ,  $\text{Fe}_2\text{O}_3$   $3.1\%$  ,  $\text{Al}_2\text{O}_3$   $4.5\%$  ,  $\text{SiO}_2$   $23.4\%$  ,  $\text{CaO}$   $64.5\%$ ) Calculate the hydraulic modulus of the following compounds :  
A.  $2.08$     B.  $3.07$     c.  $1.45$     D.  $7.80$





53) The one-day strength of this cement is equal to the three-day strength of OPC with the same water-cement ratio. It is .....cement

- A. High Alumina B. RHPC C. Blast Furnace Slag D. OPC

54) The cement that produced from China clay , together with chalk or limestone is.....cement.

- a. High Alumina b. Sea water c. White Portland d. Low Heat

Question(2): ..... ( 9 marks)

Write (✓) for the true statement and write (x) for the false sentence in the answer sheet

- 1. Reactions inside the rotary kiln (furnace) , All Iron oxide reacts with Al2O3 and CaO to form C4AF..... ( )
2. The compounds which are responsible for final strength of Cement is Tricalcium silicate & Tricalcium Aluminate..... ( )
3. Irreversible reactions are the reactions that occur in both directions, forward and backward, so both reactant and products are always found in solution and can combine again. .... ( )
4. Chemical corrosion takes place due to direct attack by acids or alkalis..... ( )
5. Metals above H2 in the e.m.s do not dissolve in acids (known by Nobel metals)because it is difficult to loss their electrons and difficult to convert into ions..... ( )
6. Temporary Coating (coating with lubricating oil or Vaseline which removed easily by an organic solvent ).....( )
7. coating with more Nobel metal(must be free from cracks or pores )like Zn..... ( )
8. Adiabatic changes mean that: It is the process in which the system does not gain or loss heat . It is closed system..... ( )
9. Kelvin – Planck statement of second law of thermodynamic: (No heat engine can have thermal efficiency 100%)..... ( )
10. Corrosion is a big industrial problem due to Plant shut down as a result of equipment failure only..... ( )
11. The efficiency of the equipments decreases owing to the deposition of corrosion products on the inner surface of this equipments..... ( )
12. For a given substance the entropy always increases in the following order: S (gas) < S (liq) < S (solid). .... ( )
13. Gas Effusion is a direct demonstration of gaseous random motion is provided by diffusion , the gradual mixing of molecules of one gas with molecules of another by virtue of their kinetic properties. .... ( )
14. Bauxite dded in the manufacture of cement as a source of Iron oxides..... ( )
15. If the amount of calcium increases in the mixture too much during the production of cement , The cement damaged and exposed to cracking..... ( )

End of questions ..... Best Wishes

Prof. Dr. Mona Ahmed Darweesh





Tanta University

Construction Engineering Program  
Final Exam of Academic Year 2017/2018  
Second term



Faculty of Engineering

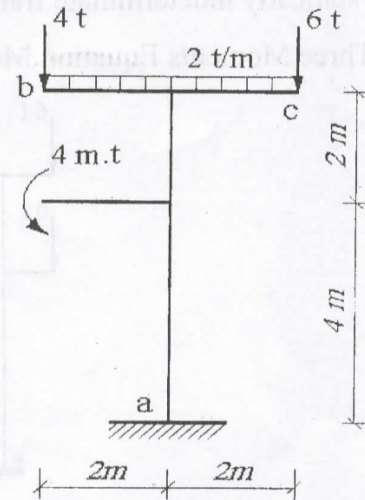
Course Title: Theory of Structures II	Course Code: CES 142	Year: 1 <sup>st</sup> level.
Date: 27 May, 2018	Allowed Time: 3 hrs	Total Marks: 40 marks

اجب عن الأسئلة الآتية -  
- ان العناية بتنظيم الحل و توضيحه لهي محل تقدير  
- قم بفرض اى معلومات قد تراها غير معطاه  
- دعم دائما اجاباتك بالرسومات التوضيحية

**Question [1] ( 8 marks)**

a- Calculate the horizontal and vertical deflection at point (b) of the frame shown in Fig. 1.a ,  $EI = 10000 \text{ t.m}^2$

**(4 marks)**



b- For the given beam with ( $EI = 10000 \text{ m}^2.t$ ) shown in Fig. 1.b, using the virtual work to compute the vertical deflection at point (d). Further than find the value of uniform load ( $w = ?$ ) such that the deflection at point (e) equals to zero. **(4 marks)**

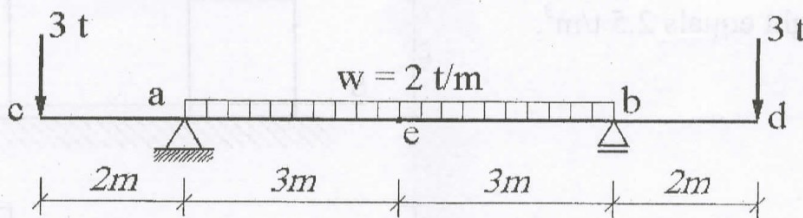


Fig. 1.b

**Question [2] ( 8 marks)**

Draw the S.F and B.M. Diagrams for the statically indeterminate beam shown in Fig. 2 by using Consistent Deformation Method,  $EI = \text{constant}$

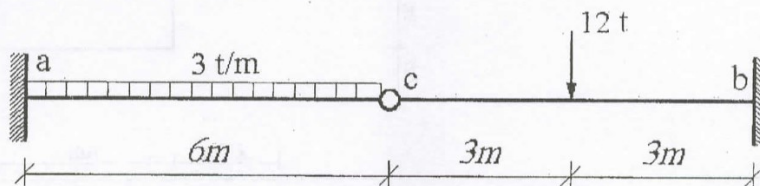


Fig. 2



**Question [3] ( 8 marks)**

Using Three Moments Equation Method, For the shown beam in Fig. 3, draw the S.F and B.M. Diagrams due to applied loads  $EI = \text{constant}$

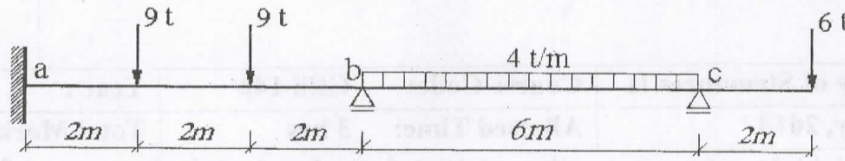


Fig. 3

**Question [4] ( 8 marks)**

For the statically indeterminate frames shown in Fig. 4, Draw the N.F, S.F and B.M. Diagrams by using Three Moments Equation Method

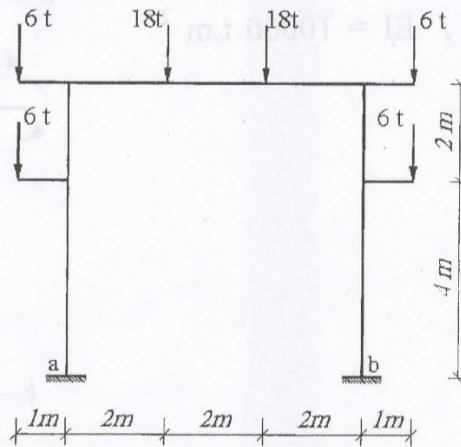
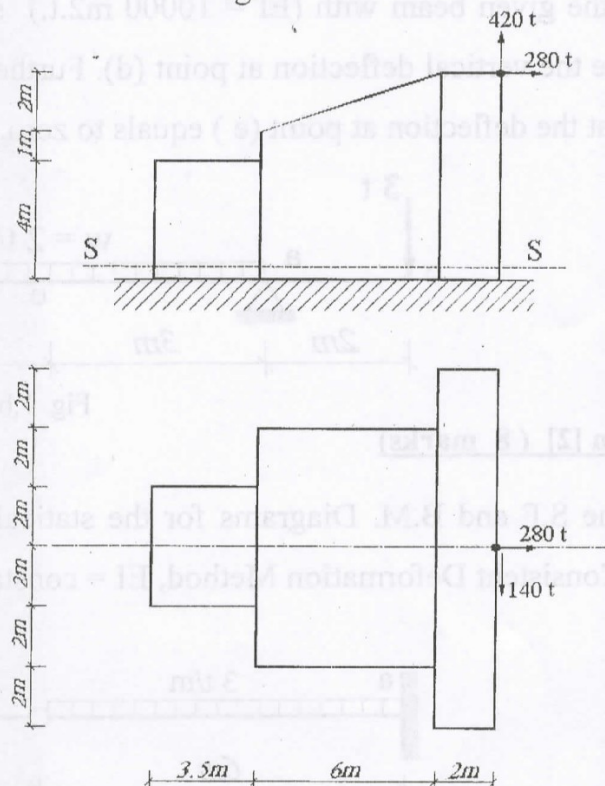


Fig.4

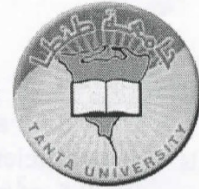
**Question [5] ( 8 marks)**

For the given structure shown in Fig.5, draw the normal stress distribution at sec. S-S if the specific weight equals  $2.5 \text{ t/m}^3$ .



☺ With the best wishes ☺





- Assume any missing data
- Answers should be **in the same order** of questions (i.e., you are required to answer question Number 1 **completely**, then answer question Number 2 **completely**, and so on .....

يتم اجابة الاسئلة بنفس ترتيب ورقة الاسئلة. أي يتم اجابة السؤال الأول بالكامل بجميع أجزائه متتالية وبففس الترتيب ثم اجابة السؤال الثاني بالكامل بجميع أجزائه متتالية وبففس الترتيب، وهكذا لباقي الاسئلة.....

**Question No. 1 (8 Marks)**

**1-a) What** are the factors affected on choice of dewatering method. **(2 Marks)**

**1-b) Illustrate** by clear sketches **only** the different systems can be used for ground water reduction. **(2 Marks)**

**1-c)** The section of trench excavation is 1.50 m wide and 3.0 m depth and 150 m long. The soil profile consists of 4.0 m medium clay underlain by 4.0 m fine sand on very stiff to hard clay and the initial ground water table is (-1.0 m). One row of full penetration wellpoints 0.05 m in diameter – placed 1.0 m apart of the trench was used for dewatering process with the yield discharge of the well is 0.0004 m<sup>3</sup>/sec. The coefficient of permeability for sand layer = 0.0002 m/sec and the constant C = 1200.

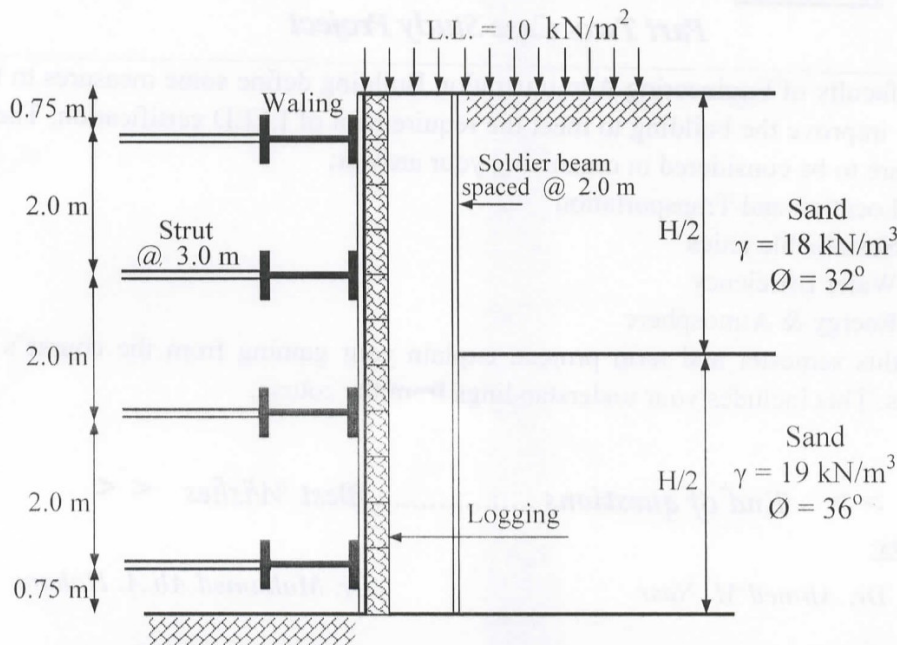
**Design** the required dewatering system. **(4 Marks)**

**Question No. 2 (12 Marks)**

**2-a) Explain briefly with clear sketches the following:** **(6 Marks)**

1. Classification of piles with respect to pile installation method.
2. Continuous flight auger piles CFA
3. Connection between pile and pile cap

**2-b)** For the braced-cut shown in figure (1), **design** the soldier beams, lagging, waling, and strut. **Note:** width of excavation = 1.5 m,  $F_{all\ steel} = 140000\ kN/m^2$  and  $F_{all\ wood} = 4000\ kN/m^2$ . **(6 Marks)**

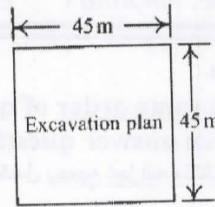


**Fig. (1)**

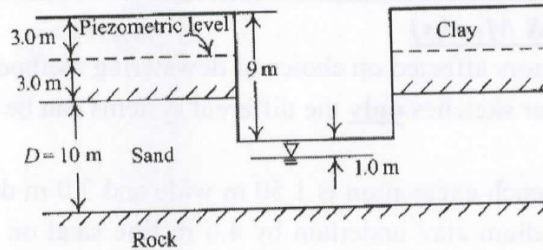


**Question No. 3 (4 Marks)**

For the excavation site shown in Figure 2, Design the dewatering system by using full penetration deep wells. The coefficient of permeability of sand layer  $K = 6.6 \times 10^{-4}$  m/sec. the pumping capacity for one deep well =  $0.5 \text{ m}^3/\text{min}$ .



**Fig. (2)**



**Question No. 4 (8 Marks)**

**Part One. Green Building**

1. Define the following terms, illustrative figures are appreciated:
  - A. Green Building
  - B. LEED
  - C. Green Roof
  - D. Light Pollution
  - E. Renewable Energy
  - F. Decertification
2. Mention 5 Broad Areas of Application for LEED.
3. Plot a table that includes the 2009 LEED-NC v3 Certification Levels that includes each certificate with correlated points.

**Question No. 5 (8 Marks)**

**Part Two. Case Study Project**

1. For the faculty of Engineering Administration Building define some measures to be taken in order to improve the building to meet the requirement of LEED certification. The following factors are to be considered in organizing your answer;
  - A. Location and Transportation
  - B. Sustainable cities
  - C. Water Efficiency
  - D. Energy & Atmosphere
2. During this semester and term project, explain your gaining from the course's topics and applications. This includes your understandings from the course.

>> *End of questions .....* *Best Wishes* <<

Course Coordinators:

*Prof. Dr. Ahmed M. Nasr*

*Dr. Mohamed Ali A. Hakam*



series	Water flow	The discharge	The drawdown at any point
1	Single row of full penetration wellpoints – artesian single water source	$Q = \frac{KDX}{L} (H - h_e)$	$(H - h) = \frac{Q}{KDX} * (L - y) = \frac{(L - y)}{L} (H - h_e)$
2	Single row of full penetration wellpoints – gravity single water source	$Q = \frac{KX}{2L} (H^2 - h_e^2)$	$(H^2 - h^2) = \frac{2Q}{KX} * (L - y) = \frac{(L - y)}{L} * (H^2 - h_e^2)$
3	Single row of full penetration wellpoints – artesian two water source	$Q = \frac{2KDX}{L} (H - h_e)$	$(H - h) = \frac{Q}{2KDX} * (L - y) = \frac{(L - y)}{L} * (H - h_e)$
4	Single row of full penetration wellpoints – gravity two water source	$Q = \frac{KX}{L} (H^2 - h_e^2)$	$(H^2 - h^2) = \frac{Q}{KX} * (L - y) = \frac{(L - y)}{L} * (H^2 - h_e^2)$
5	Single row of partial penetration wellpoints – artesian two water source	$Q = \frac{2KDX}{L + \lambda D} (H - h_e)$	$(H - h) = H - [h_e + \frac{y + \lambda D}{L + \lambda D} (H - h_e)]$
6	Single row of partial penetration wellpoints – gravity two water source	$Q = [0.73 + 0.27 * \frac{H - h_0}{H}] * \frac{KX}{L} * (H^2 - h_0^2)$	
7	Single deep well - full penetration – artesian circular water source	$Q_w = \frac{2\pi K D}{\ln(R/r_w)} (H - h_e)$	$(H - h) = \frac{Q}{2\pi K D} \ln(R/r)$
8	Single deep well - partial penetration – artesian circular water source $G = \frac{M'}{D} * [1.0 + 7.0 \sqrt{r_w/2M'} \text{Cos} \frac{\pi M'}{2D}]$	$Q_w = \frac{2\pi K D}{\ln(R/r_w)} G (H - h_e)$	$(H - h) = \frac{Q}{2\pi K D G} * \ln(R/r)$
9	Single deep well - full penetration – gravity circular water source	$Q_w = \frac{\pi K}{\ln R/r_w} (H^2 - h_e^2)$	$(H^2 - h^2) = \frac{Q}{\pi K} * \ln(R/r)$
10	Single deep well - partial penetration – gravity circular water source	$Q_w = \frac{\pi K}{\ln R/r_w} (H^2 - h_e^2)$	$(H^2 - h^2) = \frac{Q}{\pi K} * \ln(R/r)$
11	Check of the drawdown - Artesian wells		$H - h = \frac{1}{2\pi K D} * \sum Q_i \ln(R/r_i)$
12	Check of the drawdown - gravity wells		$H^2 - h^2 = \frac{1}{\pi K} * \sum Q_i \ln(R/r_i)$





تسييد

الاستير



Construction Engineering Program

Tanta University

Faculty of Engineering

Course Title	أساسيات الإدارة	Final Exam	Course Code	Hum135
Date	28/5/2018	No. of Pages ( 1 )	Allowed time	2 hours

( ٢٠ درجة )

السؤال الأول:- تناول بالشرح كل مما يلي:-

- ١- أثر العوامل الموقفية على عملية تفويض السلطة؟
- ٢- الخطوات الرئيسية لعملية الرقابة؟
- ٣- المدخل المستخدمة لقياس فعالية المنظمات؟
- ٤- يمكن تصنيف القرارات وفقاً لعدة أسس. وضح ذلك؟

( ١٠ درجات )

السؤال الثاني:- أكمل العبارات التالية بالكلمات أو الأجزاء المناسبة:-

- ١- من المهام الإدارية التي لا ينبغي تفويضها.....،.....،.....،.....،.....
- ٢- تمر عملية تفويض السلطة بمجموعة من الخطوات هي.....،.....،.....،.....،.....
- ٣- تقسم النظم الرقابية وفقاً لموقعها من الأداء إلى .....،.....،.....،.....،.....
- ٤- من المصادر الأساسية لتكوين السياسات.....،.....،.....،.....،.....
- ٥- الإعتبارات التي يجب مراعاتها فى تقسيم الأعمال إلى وحدات إدارية.....،.....،.....،.....،.....

( ١٠ درجات )

السؤال الثالث:- ضع علامة (√) أم (×) أمام العبارات التالية مع التبرير:-

- ١- إن التخطيط يقلل المرونة فى العمل.
- ٢- تقسم المدرسة الكلاسيكية إلى ثلاثة مدارس فرعية.
- ٣- يركز مدخل التحكم فى قياس فعالية المنظمة على الأداء الداخلى.
- ٤- تتوقف عملية التخطيط على درجة التأكد البيئى.
- ٥- يوجد نوعان من الخطط التشغيلية.
- ٦- تصنف الأنظمة الرقابية وفقاً لاسلوب الممارسة إلى رقابة داخلية ورقابة خارجية.
- ٧- تتمثل إغراءات المساهمون كأحد أصحاب المصالح الخارجية فى الأجور والمكافآت.
- ٨- قسم مازلو الحاجات الإنسانية إلى ثلاثة مجموعات من الحاجات.
- ٩- يمكن تصنيف منظمات الأعمال وفقاً لعدة أسس.
- ١٠- دور مخصص الموارد يدخل ضمن أدوار المديرين المتعلقة بالعلاقات بين الأشخاص.

*End of questions ..... Best Wishes*

Dr. Tarek Radwan





Course Title	Engineering Physics (II)	Final Exam	Course Code	BAS042
Date	5\6\2018	No. of Pages: 3	Allowed time	3 hours

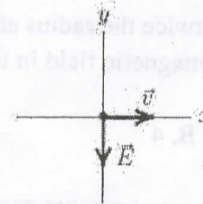
**Question 1 (10 Marks): Choose the correct Answer**

(1) The units of magnetic dipole moment are:

- A. ampere
- B. ampere · meter
- C. ampere · meter<sup>2</sup>
- D. ampere/meter
- E. ampere/meter<sup>2</sup>

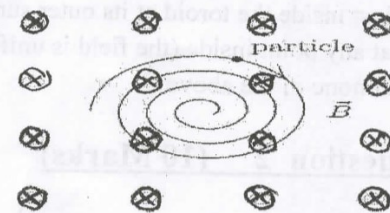
(2) An electron is traveling in the positive x direction. A uniform electric field  $\vec{E}$  is in the negative y direction. If a uniform magnetic field with the appropriate magnitude and direction also exists in the region, the total force on the electron will be zero. The appropriate direction for the magnetic field is:

- A. the positive y direction
- B. the negative y direction
- C. into the page
- D. out of the page
- E. the negative x direction



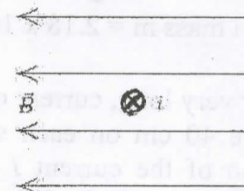
(3) A uniform magnetic field is directed into the page. A charged particle, moving in the plane of the page, follows a clockwise spiral of decreasing radius as shown. A reasonable explanation is:

- A. the charge is positive and slowing down
- B. the charge is negative and slowing down
- C. the charge is positive and speeding up
- D. the charge is negative and speeding up
- E. none of the above



(4) The figure shows a uniform magnetic field  $\vec{B}$  directed to the left and a wire carrying a current into the page. The magnetic force acting on the wire is:

- A. toward the top of the page
- B. toward the bottom of the page
- C. toward the left
- D. toward the right
- E. zero



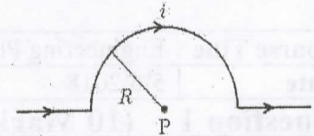
(5) The diagrams show five possible orientations of a magnetic dipole  $\vec{\mu}$  in a uniform magnetic field  $\vec{B}$ . For which of these is the potential energy the greatest?







(6) The magnitude of the magnetic field at point P, at the center of the semicircle shown, is given by:



- A.  $2\mu_0 i/R$
- B.  $\mu_0 i/R$
- C.  $\mu_0 i/4\pi R$
- D.  $\mu_0 i/2R$
- E.  $\mu_0 i/4R$

(7) The magnetic field outside a long straight current-carrying wire depends on the distance R from the wire axis according to:

- A. R
- B.  $1/R$
- C.  $1/R^2$
- D.  $1/R^3$
- E.  $1/R^{3/2}$

(8) Two parallel long wires carry the same current and repel each other with a force F per unit length. If both these currents are doubled and the wire separation tripled, the force per unit length becomes:

- A.  $2F/9$
- B.  $4F/9$
- C.  $2F/3$
- D.  $4F/3$
- E.  $6F$

(9) Solenoid 2 has twice the radius and six times the number of turns per unit length as solenoid 1. The ratio of the magnetic field in the interior of 2 to that in the interior of 1 is:

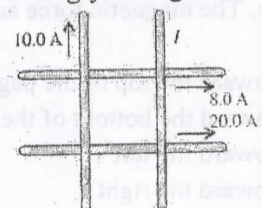
- A. 2
- B. 4
- C. 6
- D. 1
- E.  $1/3$

(10) A toroid with a square cross section carries current i. The magnetic field has its largest magnitude:

- A. at the center of the hole
- B. just inside the toroid at its inner surface
- C. just inside the toroid at its outer surface
- D. at any point inside (the field is uniform)
- E. at none of the above

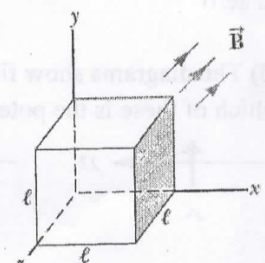
**Question 2 (10 Marks)**

(1) Consider a mass spectrometer. The magnitude of the electric field between the plates of the velocity selector is 2500 V/m, and the magnetic field in both the velocity selector and the deflection chamber has a magnitude of 0.035 T. Calculate the radius of the path for a singly charged ion having a mass  $m = 2.18 \times 10^{-25}$  kg. (5 Marks)



(2) Four very long, current carrying wires in the same plane intersect to form a square 40 cm on each side, as shown in Fig. Find the magnitude and direction of the current I so that the magnetic field at the center of the square is zero. (2 Marks)

(3) A cube of edge length  $l = 2.5$  cm is positioned as shown in Figure. A uniform magnetic field given by  $\vec{B} = (5\hat{i} + 4\hat{j} + 3\hat{k})$  T exists throughout the region. (a) Calculate the magnetic flux through the shaded face. (b) What is the total flux through the six faces? (3 Marks)





**Question 3 (20 Marks):**

(1) A rectangular glass block has a length of 100 mm, width 50 mm and depth 20 mm at 293 K. When heated to 353 K its length increases by 0.054 mm. What is the coefficient of linear expansion of the glass? Find also (a) the increase in surface area (b) the change in volume resulting from the change of length. (3 Marks)

(2) The compression ratio of a diesel engine is 15.0 to 1; that is, air in a cylinder is compressed to 1/15 of its initial volume. (a) If the initial pressure is  $1.01 \times 10^5$  pa and the initial temperature  $27^\circ\text{C}$  is find the final pressure and the temperature after adiabatic compression. (b) How much work does the gas do during the compression if the initial volume of the cylinder is 1 L Use the values  $C_V = 20.8$  J/mol . K and  $\gamma = 1.4$  for air. (3 Marks)

(3) A 20.0-L tank contains 300 mol of helium at a pressure of 400 atm. (a) What is the value of  $an^2/V^2$  and what fraction of the pressure is it? (b) What is the value of  $nb$  and what fraction of the volume of the container is it? (c) What is the temperature of the helium? The  $a$  and  $b$  coefficients for helium are  $a = 0.0346$  atm.L<sup>2</sup>/(mole)<sup>2</sup>,  $b = 23.8$  mL/mole. (3 Marks)

(4) A pipe made of steel has inner and outer radii of 2.5 and 3 cm respectively. The pipe carries hot water at a temperature  $\theta_H = 70^\circ\text{C}$  and has a thermal conductivity of  $14$  W/m.C°. The pipe's outer surface temperature is  $\theta_c = 60^\circ\text{C}$ . (a) What is the rate of heat flow per unit length of the pipe? (b) When an additional cylindrical insulator of thermal conductivity of  $0.2$  W/m. °C is used, what is the thickness required to reduce heat loss by a factor of 10 and achieve an outer temperature of  $30^\circ\text{C}$ ? (3 Marks)

(5) Consider a person standing in a breezy room at  $20^\circ\text{C}$ . Determine the total rate of heat transfer from this person if the exposed surface area and the average outer surface temperature of the person are  $1.6$  m<sup>2</sup> and  $29^\circ\text{C}$ , respectively, and the convection heat transfer coefficient is  $6$  W/m<sup>2</sup> · K, ( $\sigma = 5.6704 \times 10^{-8}$  W/m<sup>2</sup> K<sup>4</sup>) (2 Marks)

(6) An automobile engine has an efficiency of 22 % and produces 2510J of work. How much heat is rejected by the engine? (3 Marks)

(7) An ideal gas occupies a volume of  $100$  cm<sup>3</sup> at  $20^\circ\text{C}$  and  $100$  Pa. Find the number of moles of gas in the container. How many molecules are in the container?  $R = 8.315$  J/(mol.K.) (3 Marks)

*End of the questions ..... Best Wishes*

*Dr. Hatem Fouad*

*Dr. Soha Talaat*