University of Asia Pacific
Department of Civil Engineering
Midterm Examination (Fall 2013)
Program: B.Sc. Engg (Civil)

Course Title : Principles of Accounting	**Course:** ACN 301	**Credit Hours: 2.0**
Full marks : 20		**Time** : 1 hr

[Answer all Questions]

1. The bank statement for Laird Company shows a balance per bank of **$15,907.45** on April 30, 2012. On this date the balance of cash per books is **$11,589.45**.

Items to be reconciled:
Deposits in transit: April 30 deposit (received by bank on May 1). $2,201.40
Outstanding checks: 5,904
Errors: Laird wrote check no. 443 for $1,226 and the bank correctly paid that amount. However, Laird recorded the check as $1,262. (Company error to be adjusted in the book balance)
Bank memoranda not recorded in book:
a. NSF check from J. R. Baron for $425.60
b. Charge for printing company checks $30
c. Collection of note receivable for $1,000 plus interest earned $50, less bank collection fee $15.

Instructions:
Prepare a bank reconciliation statement for the month of April. (6)

2. Bruce Jenner started his own civil engineering consulting firm, Jenner Consulting, on May 1, 2012. The following transactions occurred during the month of May.

May 1 Jenner invested $8,000 cash in the business.
     2 Paid $800 for office rent for the month.
     3 Received $3,000 cash advance for future services to be provided.
     12 Withdrew $700 cash for personal use.
     15 Performed $5,300 of services on account.
     20 Paid for the supplies purchased on account on May 3.
     23 Received a cash payment of $3,000 for services provided on account on May 15.
     26 Borrowed $5,000 from the bank on a note payable.
     29 Purchased office equipment for $2,800 on account.

Jenner uses the following chart of accounts: No. 101 Cash, No. 112 Accounts Receivable, No. 126 Supplies, No. 131 Office Equipment, No. 201 Accounts Payable, No. 205 Notes Payable, No. 210 Unearned Revenue, No. 301 Jenner, Capital, No. 305 Jenner, Drawing, No. 401 Service Revenue, No. 726 Salaries Expense, and No. 729 Rent Expense.

Instructions:
   a) **Journalize the May transactions.**
   b) **Post to ledger accounts.**
   c) **Prepare a trial balance.** (9+3+2)

Course code: CE 107 *(A)*
Course title: Introduction of Civil and Environmental Engineering
Time: 60 Minutes   Total marks: 20

Answer all questions

1. a) What are the main branches of Civil Engineering? **(0.5)**
    b) Why Environmental Engineering is important? **(1)**

2. Define the following: **(3.5)**

    a) Ecosystem

    b) Autotrophs

    c) Heterotrophs

    d) Decomposers

    e) Biomass

    f) Secondary production

    g) Primary production

    h) Carnivores

    i) Air Pollution

    j) Phytoplankton

3. Draw the schematic diagram of institutional framework for water resources management in Bangladesh. **(1.5)**

4. Draw the schematic water balance diagram of Bangladesh for average year. **(1)**

5. Write the names of ten international rivers flowing through Bangladesh. **(1)**

6. What is doubling time? Derive the doubling time formula. **(2)**

7. Define biodiversity and write six benefits of biodiversity? **(1.5)**

8. Define acid rain and write down the reasons of acid rain. **(1.5)**

9. a) Explain what climate change is. What is the difference between weather and climate? **(1)**
    b) Write down ten indicators of global warming. **(1)**

10. Draw the schematic diagram of "Earth Climate System and Greenhouse effect". **(1.5)**

11. Write the name of ten greenhouse gases. **(1.5)**

12. a) What are the major classes of air pollutants? **(0.5)**
    b) Write down one example of each class of air pollutant. **(1)**

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Fall 2013 (Set B)

Course #: CE 313 (B)
Full Marks: 40 (= 4 × 10)

Course Title: Structural Engineering II
Time: 1 hour

1. (i) Use the *Portal Method* to draw the approximate Bending Moment Diagram (BMD) of frame *abcde* shown in Fig. 1, if uniformly distributed load w_h = 1 k/ft, and w_v = 0 (i.e., lateral load only).

    (ii) Use *Unit Load Method* to calculate the approximate horizontal deflection at joint *d* of the frame, considering flexural deformations only for the BMD in (i)
    [Given: $EI = 50 \times 10^3$ k-ft^2].

2. (i) Use *Cantilever Method* to draw the approximate Bending Moment Diagram (BMD) of frame *abcde* shown in Fig. 1, if uniformly distributed load w_h = 1 k/ft, and w_v = 0 (i.e., lateral load only).

    (ii) Use *Unit Load Method* to calculate the approximate horizontal deflection at joint *d* of the frame, considering flexural deformations only for the BMD in (i)
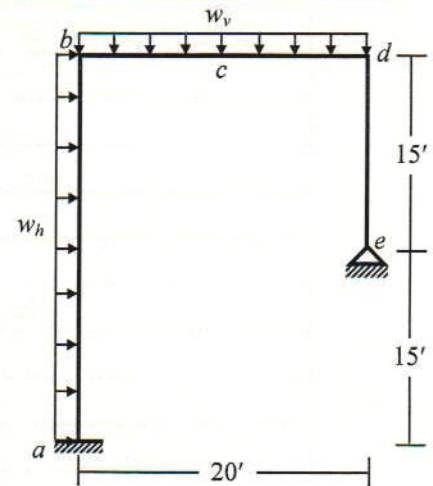   [Given: $EI = 50 \times 10^3$ k-ft^2].

Fig. 1

3. (i) Use approximate locations of inflection points to draw the AFD, SFD and BMD of the frame *abcde* shown in Fig. 1, if uniformly distributed load w_h = 0, and w_v = 1 k/ft (i.e., vertical load only).

    (ii) Use *Unit Load Method* to calculate the approximate vertical deflection at point *c* of the frame, considering axial, shear and flexural deformations
    [Given: $EA = 400 \times 10^3$ k, $GA^* = 200 \times 10^3$ k, $EI = 50 \times 10^3$ k-ft^2].

4. In the bridge portal shown in Fig. 2

    (i) Use *Portal Method* to draw the BMD and SFD of the column *abc*,

    (ii) Calculate the axial force in each member of the truss, assuming the diagonal members to take tension only.

    (iii) Use *Unit Load Method* to calculate the approximate horizontal deflection at point *f* of the bridge portal, considering flexural and shear deformations of the columns and axial deformations of the truss members

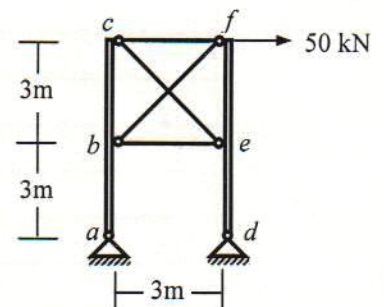   [Given: $EA = 50 \times 10^3$ kN, $GA^* = 500 \times 10^3$ kN, $EI = 20 \times 10^3$ kN-m^2].

Fig. 2

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Course Title: Open Channel Flow   Course No: CE 361
Time: 1.0 hour   Full Marks: 60

[The symbols have their usual meanings]
[The figures at the right margin indicate full marks]

Section- A
Answer all the questions. Marks in this section: 30

1. Define: (i) Prismatic Channel, (ii) Small Slope Channel, and (iii) Energy Coefficient.   **(6)**

2. Compute the discharge per unit width of the channel and the mean velocity from the following velocity measurement along a vertical in a wide channel, when the depth of flow is 6 m (here u is the velocity at a distance z from the channel bottom).   **(6)**

z (m)	0.0	1.0	2.0	3.0	4.0	5.0	6.0
u (m/s)	0.0	1.05	1.67	2.78	3.44	4.12	3.96

3. Draw a neat sketch of a specific energy curve and list up all the characteristics.   **(8)**

4. Compute the critical depth and velocity of a trapezoidal channel with b = 4 m and z = 2. Use the method of bisection when the channel discharge is Q = 12 m³/s and α = 1.0.   **(10)**

Section- B
Answer all the questions. Marks in this section: 30

5. Write short note on the following items: **(3x2=6)**
   (i)   Steady rapidly varied flow
   (ii)   Unsteady spatially varied flow
   (iii) Shear velocity.

6. Water flows in an open channel at a depth of 1.5 m and a mean velocity of 2.50 m/s. Compute discharge and determine the state of flow if the channel is trapezoidal with b = 6 m and z =2.   **(6)**

7. Derive the equation $V = CR^{\frac{1}{2}}S_f^{\frac{1}{2}}$, where the symbols have their usual meaning. Also state the assumptions upon which this equation is based.   **(4+2=6)**

8. Give a neat sketch showing the development of boundary layer in an open channel with an ideal entrance condition.   **(5)**

9. An open channel lined with concrete (d_{50} = 2 mm) is laid on a slope of 0.2%. The channel is circular whose diameter is 2 m. Compute the uniform flow discharge in the channel if the depth of flow is 1.5 m. Also compute Chezy's C and friction factor f.   **(5+1+1=7)**
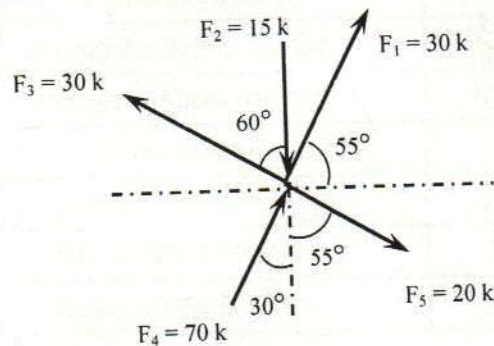
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Department of Civil Engineering
Mid Semester Examination Fall 2013
Program: B.Sc. Engineering (Civil)

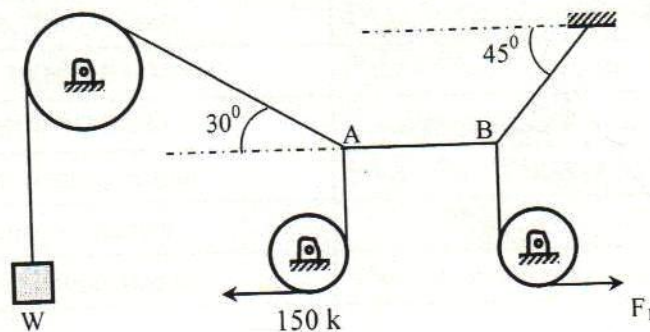Course Title: Engineering Mechanics I
Time: 1 Hour

Course Code: CE 101
Full Marks: 30
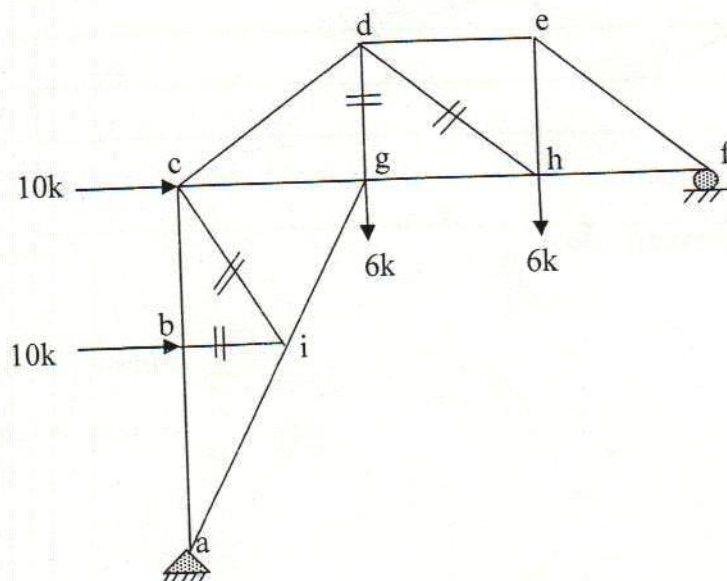
There are three (03) questions. Answer all.

1. In the figure below, calculate the resultant (magnitude and direction) of the following coplanar concurrent force system.

2. In the figure below, find W and F_1 so that the cable AB remains horizontal.

3. For the truss shown in below, find the forces in the members bi, ci, dg and dh.

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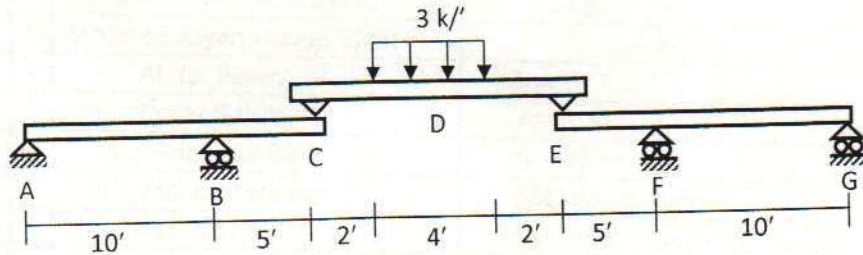Course Code: CE 101 (B)
Course Title: Engineering Mechanics I

Time: 1 (one) Hour
Full Marks: (3x20) = 60

Answer all questions.
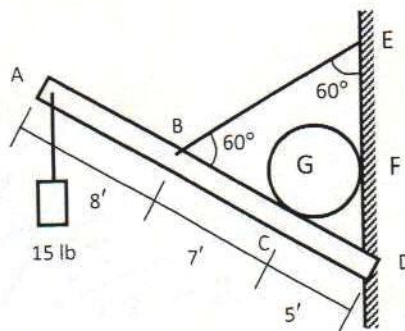*Each question carries equal marks*

1. In the figure below, find W and F_1 so that the cable AB remains in equilibrium as shown.
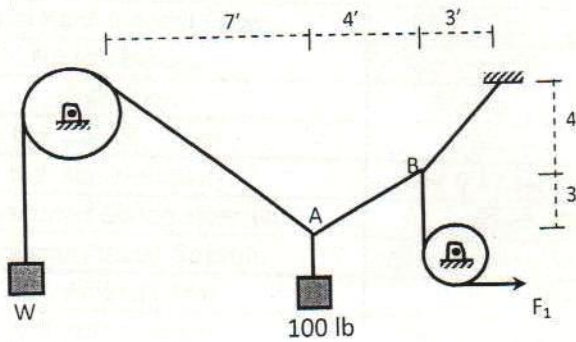
2. In the beam shown below, calculate the reactions at supports A, B, F, G and the bending moment at B.

3. In the structure shown below, the weight of sphere G is 20 lb and member ABCD has self weight of 2 k/ft. Calculate the force in EB and the reactions at D and F.
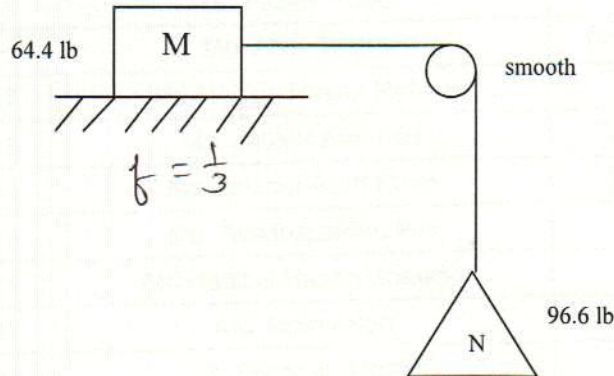
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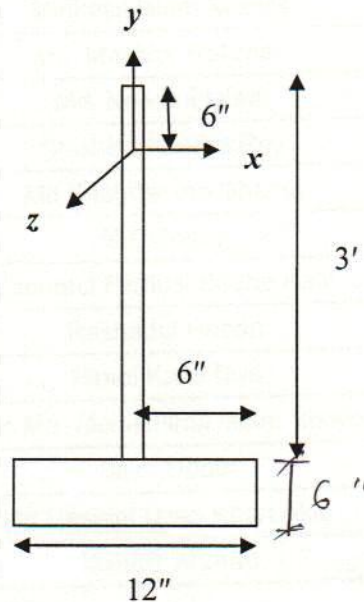## Mid Semester Examination Fall 2014
Program: B.Sc. Engineering (Civil)

Course Title: Engineering Mechanics II   Course Code: CE 103 (A)   Credit: 3.00
Time: 1.0 hour   Full Marks: 30

1. Refer to the following figure, the initial velocity of M is 30 fps towards left, find the time in   (10)
    seconds for M to travel 10 ft.

2. A particle has initial angular velocity of 1200 rpm. If it is decelerating at 100 rpm^2, when it   (10)
    will stop? Find out the number of revolutions of the particle.

3. The wood handle of the mallet of figure is L = 3 ft long, weighs 3.14 lb, and has a uniform   (10)
    cross section. The head, weighing 16.1 lb, is a wood cylinder of diameter 6 in. Find the radius
    of gyration with respect to z axis.

Course Title: Engineering Mechanics II

Course Code: CE 103

Full Marks: 20 $(=6\frac{2}{3} \times 3)$

Time: 1 hours

Answer **any 03 (THREE)** of the following **4 (FOUR)** questions. The figures in the right margin indicate the marks of the questions. Assume reasonable values for missing data only, if any.

1. In FIGURE 1, A 600 lb block with one end tied to a rope rests over a 1800 lb block on a rough surface. Determine the angle θ. $(6\frac{2}{3})$

600#
1800#
$f_s = 1/3$
θ
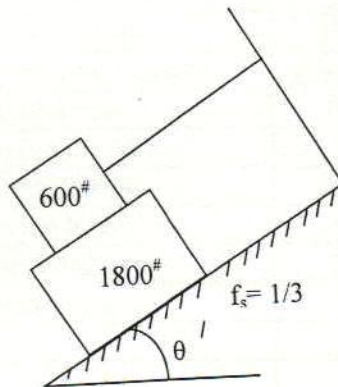
FIGURE 1

2. Referring to FIGURE 2, A horizontal force of P = 100 N is just sufficient to hold the crate from sliding down the plane, and a horizontal force of P = 350 N is required to just push the crate up the plane. Determine the coefficient of static friction between the plane and the crate, and find the mass of the crate. $(6\frac{2}{3})$

P
30⁰

FIGURE 2

3. Determine the mass moment of inertia about Z-Z axis of the sphere shown in FIGURE 3. $(6\frac{2}{3})$

Z
X
Y

FIGURE 3

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Course #: CE 105

Full Marks: 60

Surveying

Time   : 1 hr

There are four questions. Answer any three of them.

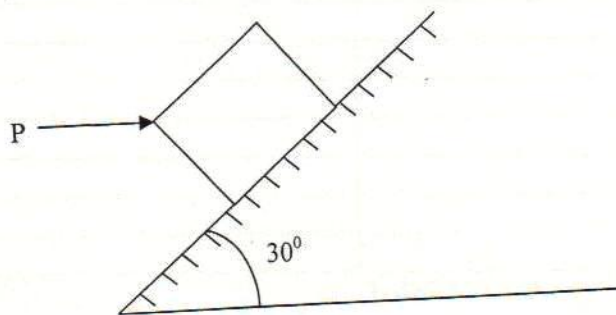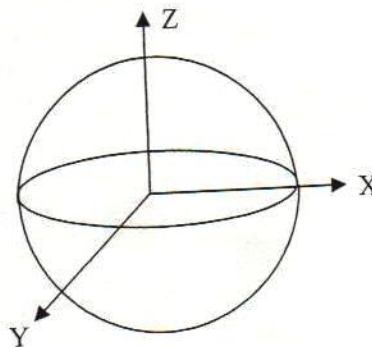1. a) Write short notes on i)Check lines ii)Tie lines. [04]
    b) How you can erect a perpendicular to a Chain Line from a point on it. [06]
    c) A 50m chain was found to be 12cm too long after chaining a distance of 1800m. It was found to be 18cm too long at the end of days work after chaining a total distance of 3500m. Find the true distance if the chain was correct after the commencement of the work. [10]

2. a) Write short notes on i)Magnetic Declination ii)Local Attraction [06]
    b) In a closed traverse ABCDEA the following bearings were observed by a prismatic compass

Line	Fore Bearing	Back Bearing
AB	38°50′	219°15′
BC	98°20′	278°30′
CD	24°37′	204°2′
DE	325°25′	145°25′

Is there any local attraction at any station, if so then correct the bearings and provide necessary check? [14]

3. a) What is closing error? [04]
    b) The following consecutive readings were taken with a level
    5.11, 3.82, 5.02, 7.32, 8.71, 7.53, 6.41, 9.11, 8.12, 6.22, 5.35
    The level was shifted after 3rd, 5th and 8th readings. The R.L. at the first point was 110 ft. Calculate the reduced level of the points and applies proper check. [16]

4. a) Write down the characteristics of Contours. [06]
    b) In leveling across an irrigation canal the following observations were made

Instrument Station	Staff Readings (ft)	
	C	D
C	5.98	9.01
D	3.05	5.27

Distance between C and D=3312.8ft. If the reduced level at C is 414.55ft, calculate the R.L. of D. Also calculate the curvature error, refraction error and collimation error. [14]

Course No.: CE 107, Section - B
Full Marks: 10 x 5 = 50

Course Title: Introduction to Civil and
Environmental Engineering.
Time: 1 hour

Answer any 5 (Five) from the following 6 (Six) sets of questions.

1. a) What are the differences between a typical R.C.C Frame Structure and a Load Bearing (5) Wall Structure.

   b) What are the disciplines of Civil Engineering? List some infrastructures that Civil (5) Engineering mainly focuses on?

2. a) What is procurement? What are the 3 types of procurements? Discuss the process of (6) engaging Consultants for a Bridge Construction Project.

   b) What do you understand by road maintenance? Discuss different types of road (4) maintenance?

3. a) Draw a complete Road Section showing layers and materials. (6)

   b) A rubber is pulled at a stress of 4 MPa to elongate at a strain of 2 in/in. Find out the (4) Modulus of Elasticity of the rubber using Hook's Law.

4. a) What do you understand by sustainability and sustainable construction materials? (6)

   b) What are the modes of transpiration? What are the designs normally required for (4) construction of a road connecting two places.

5. a) Discuss the role of Geotechnical and Environmental Engineers. (5)

   b) Why do we need to construct piles for foundation? What are the other types of (5) foundations for buildings?

6. Write short notes on any 4 of the following (10)
   a) Global warming, b) Soil classification, c) Traffic Engineering,
   d) Construction management, e) Roof truss, f) Road materials.

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Fall 2013
Program: B. Sc. Engineering (Civil)

Course Title: Engineering Materials
Time: 1 Hours

Course Code: CE 201
Full Marks: 35

There are **THREE** Questions. Answer **all of them.**

1. (a) Draw the predicted strain response curve of the elasto-visco-plastic material for the following loading history. (5)
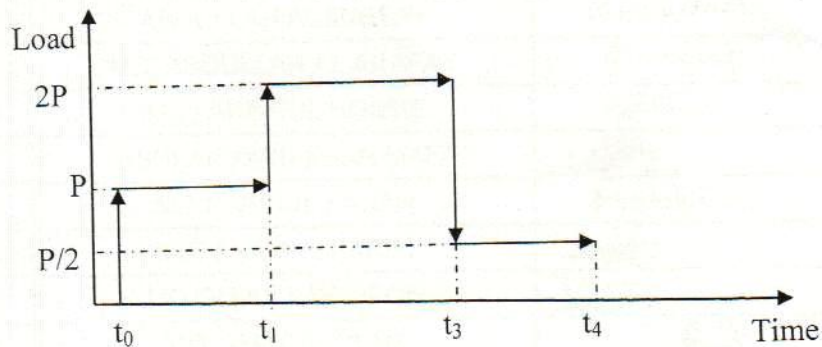
(b) Compare the following (4)
   (i) creep and relaxation
   (ii) Setting and hardening of cement

(c) What is the use of frog mark on brick? (1)

2. (a) The following masses of material are required for production of $1m^3$ of concrete. The stockpiled sand has a total moisture content of 7% and the stone has a total moisture content of 3%. Compute adjusted batch masses for field condition. (6)

Material	Batch mass, kg
Cement	257
Fly Ash	79
SSD sand (absorption 1.5%)	676
SSD stone (absorption 2.3%)	1276
Total mixing water	110

(b) Write a short note on bulking of sand (2)

(c) Durability of bricks depends largely on proper proportioning of alumina and silica- Explain. (2)

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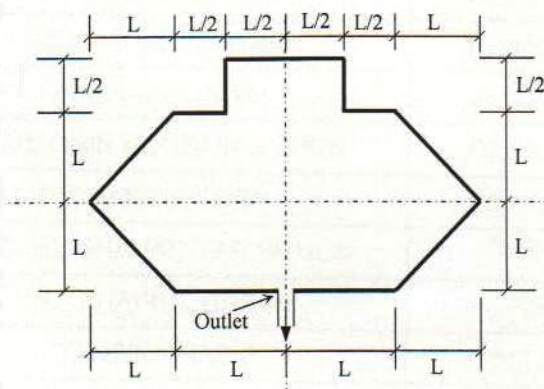Course # : CE-203   Course Title: Engineering Geology & Geomorphology
Full Marks: 40 (10 X 4 = 40)   Time: 1 hour   Credit: 3 hours

Answer any **four (4)** questions of your choice out of the following **five (5)**

1a)	Define geomorphology. Mention the names of different sediments found in nature.	1+1=2
1b)	Draw a schematic diagram of rock cycle and write a short note on any one type of rock.	3+3=6
1c)	Mention the names of principal zones of the earth.	2
2a)	Classify geomorphic processes based on origin. Also classify (mention names only) physical and chemical weathering processes.	3+3=6
2b)	Write short notes on any one type of both physical and chemical weathering processes.	4
3a)	For a circular basin with a diameter of 10 km, calculate the Form Factor (FF) and Compactness Co-efficient of the basin.	3
3b)	Calculate FF and CC of the basin showing in the following figure.	7

4a)	Mention (no description required) the precipitation characteristics affecting runoff.	1.5
4b)	With the aid of sketches define flood hydrograph and time of concentration.	2.5
4c)	With the aid of sketch show different routes of total flow.	3
4d)	Write down the major assumptions used in Rational Formula.	3
5)	Using the information provided, calculate the peak runoff (Q_P) in m^3/s for the following Highway Restaurant Area as bounded as shown below. Use rainfall intensity for the whole area to be 0.5 inch/hr and co-eff. of runoff for concrete, asphalt and grass as 0.8, 0.75 and 0.25, respectively.	10
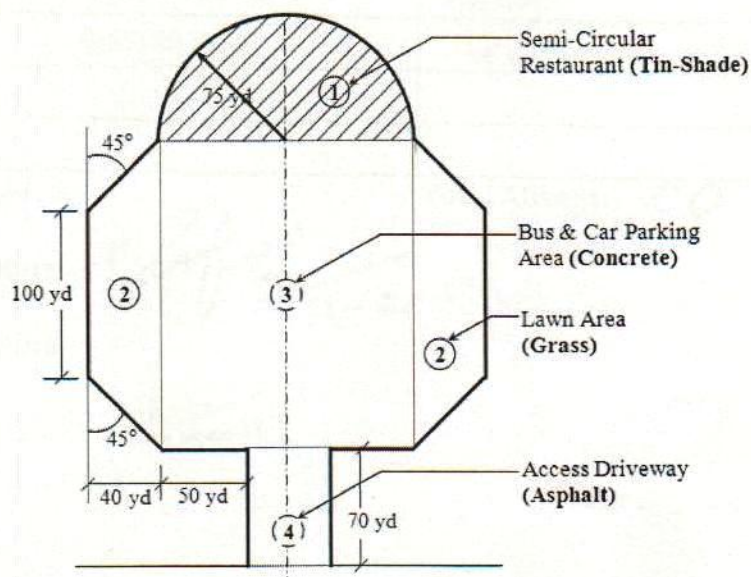
Course #: CE 205   Numerical Analysis and Computer Programming
Full Marks: 60   Time: 1 hr

1. Find the root of the equation $x^3 + 3x - 5 = 0$ by Bisection method. Where [1, 2] and ε = 0.001. [15]

2. Use Gaussian Elimination to solve the following system of linear equation. [15]

$$\begin{aligned} x - 3y + z &= 4 \\ 2x - 8y + 8z &= -2 \\ -6x + 3y - 15z &= 9 \end{aligned}$$

3. Use Cramers Rule to solve the following system of linear equation. [15]

$$\begin{aligned} 2x + y + z &= 3 \\ x - y - z &= 0 \\ x + 2y + z &= 0 \end{aligned}$$

4. Fit the following data to a linear equation and determine x_{14}. [15]

DATA	
x	y
2	2
4	4
6	4
8	5
10	5
12	7
14	

University of Asia Pacific
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Mid-Term Examination Fall 2013

Course Code: CE 211 (A & B)
Course Title: Engineering Mechanics I

Time: 1 (one) Hour
Full Marks: (3x20) = 60

Answer all questions.
Each question carries equal marks

1. Draw Shear force and Bending Moment diagram of the beam shown below.

2. For the beam shown below, derive equations for shear and bending moment using singularity function and also determine shear force at *c* and bending moment at *d*.

3. Calculate the shearing, tearing and bearing stresses in the triple row riveted butt joint (shown below) when subjected to a force P = 42 kip. 0.75″ diameter rivets are in 0.875″ diameter holes. Both the main and cover plate are 0.5″ thick.
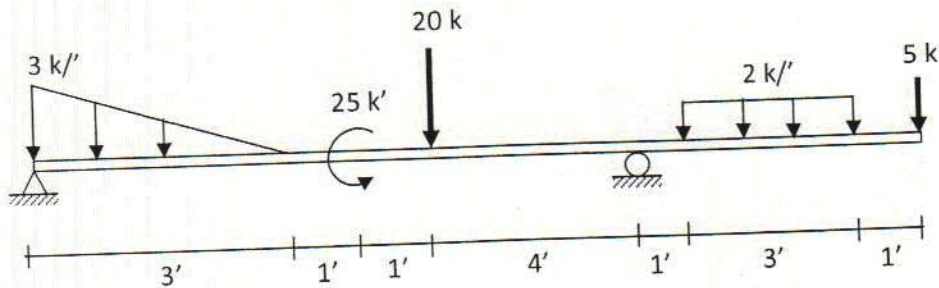
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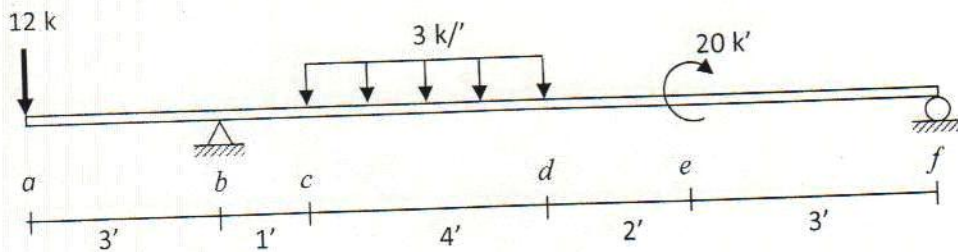Course Code: CE 211 (B)
Course Title: Engineering Mechanics I

Time: 1 (one) Hour
Full Marks: (3x20) = 60

Answer all questions.
Each question carries equal marks

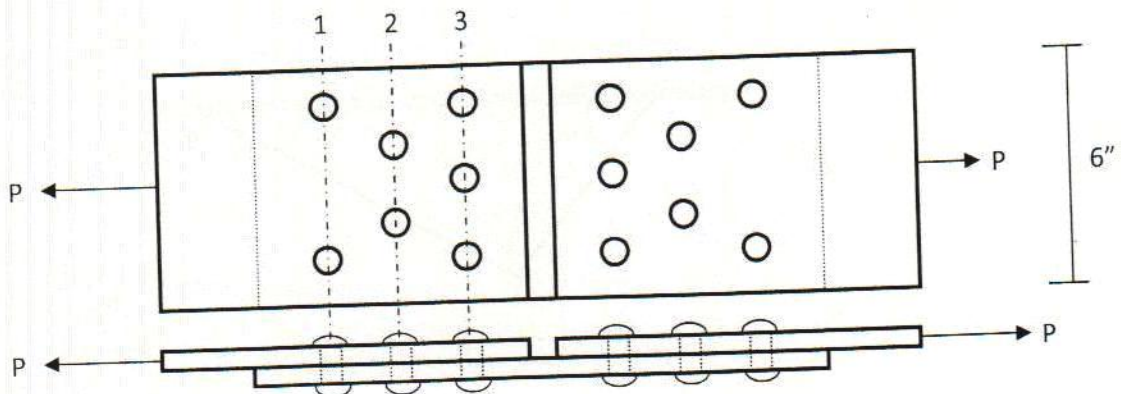1. Draw Shear force and Bending Moment diagram of the beam shown below.
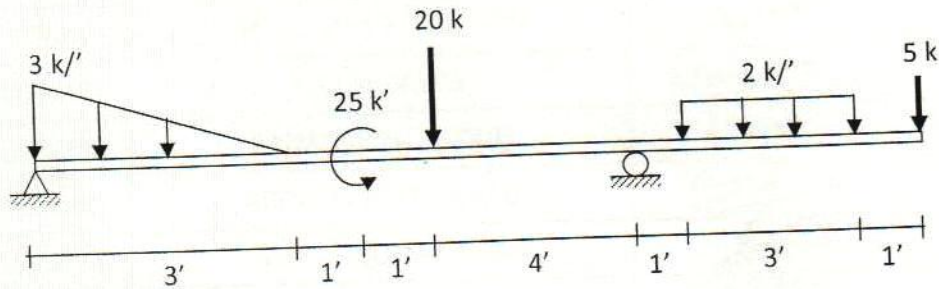
2. For the beam shown below, derive equations for shear and bending moment using singularity function and also determine shear force at c and bending moment at d.
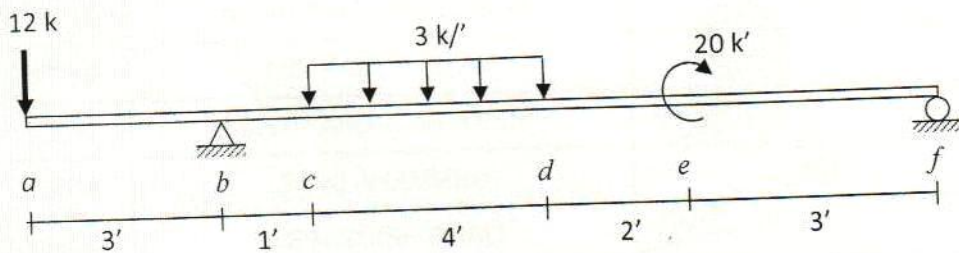
3. A 17.10 kip is supported by two wires AB and AC as shown in the figure below. Determine the diameter of each wire if no wire exceeds a stress of 30 ksi.
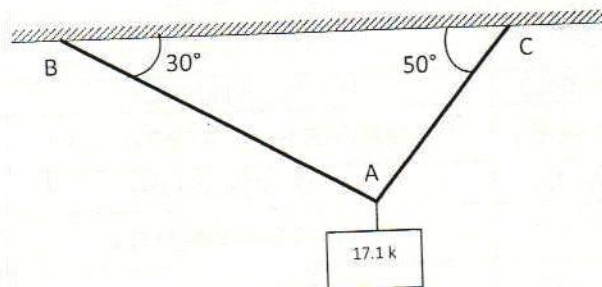
Course Title : Mechanics of Solids II

Time : 1 hour

Course Code: CE 213 (A)

Full Marks : $10 \times 3 = 30$

(There are 3 questions. Answer **all of them.**)

1. Calculate the torsional shear stress and rotation at A of the rectangular beam shown below [Given G = 12000 ksi].

Necessary Formulas: $J = \beta b t^3 G$, $\tau_{max} = \dfrac{T}{\alpha b t^2}$

b/t	1.0	1.5	2.0	3.0	6.0	10.0	∞
α	0.208	0.231	0.246	0.267	0.299	0.312	0.333
β	0.141	0.196	0.229	0.263	0.299	0.312	0.333
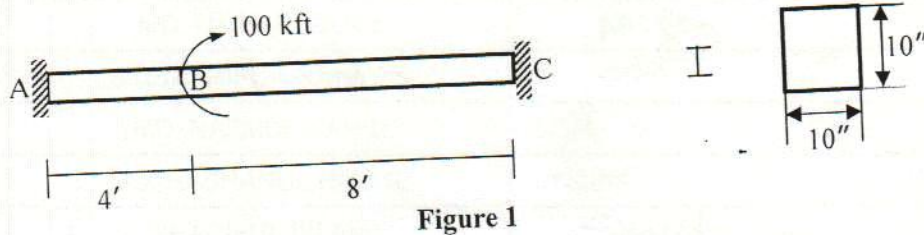
Figure 1

2. A 30-by-40 mm woodenbeam is loaded by an inclined force P=150 N, as shown in the figure. Determine the maximum stress on section ABCD. Also, locate the neutral axis. Neglect the weight of the beam.

Figure 2

Course #: CE 213 (B)   Course Title: Mechanics of Solids II

Full Marks: 40 (= 4 × 10)   Time: 1 hour

1. For the fixed-ended beam ABCDE shown in Fig. 1

   (i) Draw the torque diagram

   (ii) Calculate the maximum
   (a) Torsional shear stress
   (b) Torsional rotation
   in the beam

   [Given: Shear Modulus = 1500 ksi].
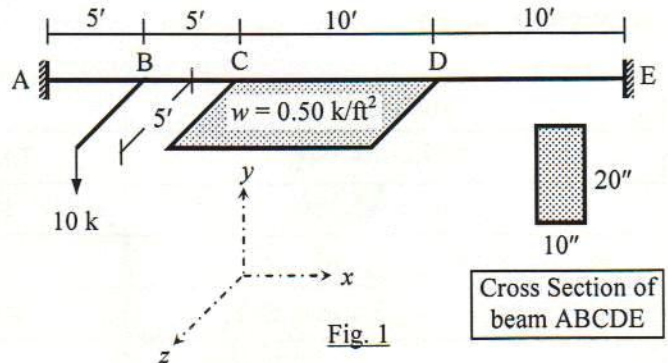
Fig. 1

2. Rigid beams *abcd* are supported by identical helical springs *a, b, c, d* and loaded as shown in Figs. 2(i) and 2(ii). Calculate the deflections of both beams, if $P = 10$ k and each spring has inside diameter = 5″, coil diameter = 1″, number of coils = 8 and shear modulus = 12000 ksi.
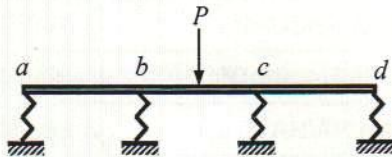
Fig. 2(i)
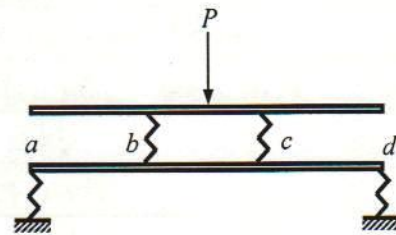
Fig. 2(ii)

3. Fig. 3 shows a rectangular footing *ABCD* resting on soil underneath and supporting the wall *EB*, being subjected to the loads shown.

   Given the horizontal load $p = 0.75$ k/ft, calculate the

   (i) Vertical force V required make the soil pressure at D equal to zero.

   (ii) Normal and shear stresses (σ_{xx}, σ_{yy}, τ_{xy}) on the soil at A [for the forces considered in (i)], as well as the corresponding principal stresses (σ_1, σ_2) and the maximum shear stress (τ_{max}).

Cross-section X-X
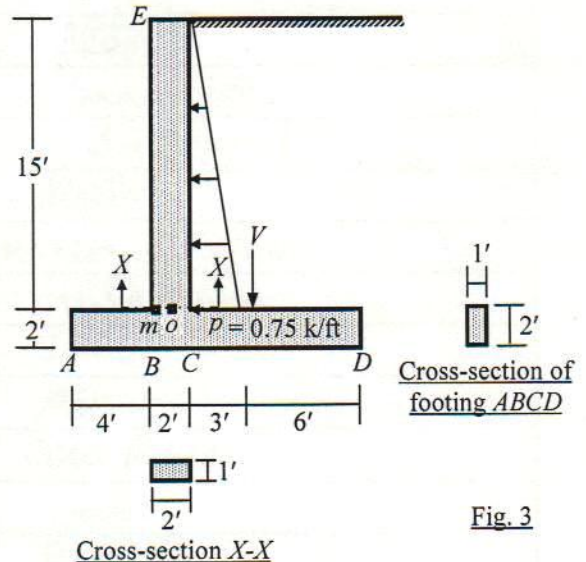
Fig. 3

4. For the wall *EB* loaded as shown in Fig. 3

   (i) Calculate the shear force and bending moment at section *X-X* due to the horizontal (triangular) load shown, as well as the corresponding normal and shear stresses (σ_{xx}, σ_{yy}, τ_{xy}) on element *m* and *o* of the wall (using the given cross-section *X-X*).

   (iii) Show the stresses [calculated in (i)] on the Mohr's Circle of stresses for each element.

Course Title: Fluid Mechanics   Course Code: CE 221

Time : 1 Hour   Full Marks: 40

SECTION-I

(There are **THREE** questions in this section. Answer any **TWO** questions.)

1(a) Define: Viscosity, Specific Volume, Surface Tension.   (3)

(b) Derive Newton's equation of viscosity   (7)

2(a) A flat plate of 0.3 m^2 in area moves edgewise though oil between large fixed parallel planes 15 cm apart. If the velocity of the plate is 0.5 m/s and oil has a kinematic viscosity of 0.45x10^{-4} m^2/s and specific gravity of 0.8, calculate the drag force when (i) the plate is 5.5 cm from one of the planes and (ii) the plate is equidistant from both the planes.   (8)

(b) A liquid compressed in a cylinder has a volume of 1000 cm^3 at a pressure of 2 MN/m^2 and a volume of 995 cm^3 at a pressure of 3 MN/m^2 .Determine the bulk modulus of elasticity.   (2)

3 (a) Explain why the viscosity of a liquid decreases and that of a gas increases with increase in temperature.   (3)

(b) A fluid of absolute viscosity 8 Poise flows past a flat plate and has a velocity distribution v = (1/3)y – y^2 in which 'v' is the velocity in m/s at a distance 'y' meters above the plate. If the contact area is 0.3 m^2 determine the maximum shear stress and shear force.   (7)

SECTION-II

(There are **FOUR** questions in this section. Answer **All** the questions.)

1. Distinguish between the following terms: (2x2=4)
    (i)   Steady and unsteady flow
    (ii)   Uniform and non-uniform flow.

2. Define flow net with a neat sketch. State its use and limitation.   (2+1+1=4)

3. Derive the expression for acceleration in unsteady flow and hence show that in steady uniform flow there is no acceleration.   (5+2=7)

4. A velocity potential for a 2-D flow is given by $\phi = 4x^2 - 4y^2$. Calculate the stream function and also find the flow rate between the streamlines passing through two points A(1,1) and B (1,3).
                                                                                                                  (3+2=5)

Course Title: Structural Engineering II

Course Code: CE 313 (A)

Time: 1 hr

Full Marks: 4x10=40

[Answer all the questions]

1. For the 2-storied frame loaded as shown in *Fig. 1*, (a) Use the Portal Method to determine the value of P if shear at column ef is 16.5 k, (b) Use the Cantilever Method to draw the axial force diagram of the column abc when P = 20 k.
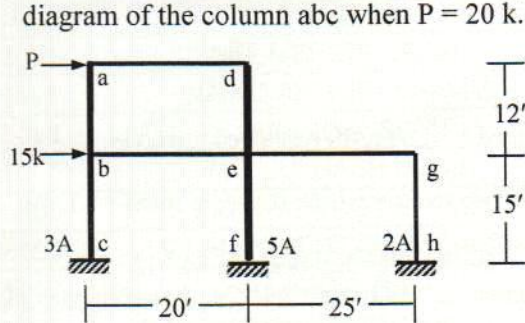
Fig. 1
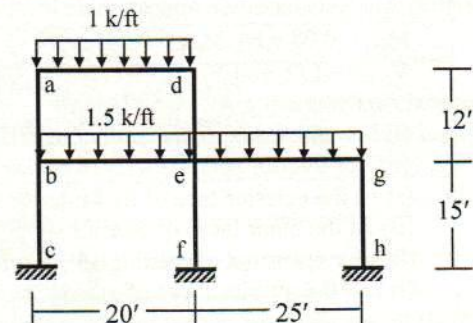
Fig. 2

2. Analyze the 2-storied frame structure loaded as shown in *Fig. 2*, using the approximate location of hinges to draw, (a) shear force and bending moment diagrams of the beams and (b) shear force and bending moment diagram of the column def.

3. In the bridge portal loaded as shown in *Fig.3*, draw the bending moment diagram of the columns.
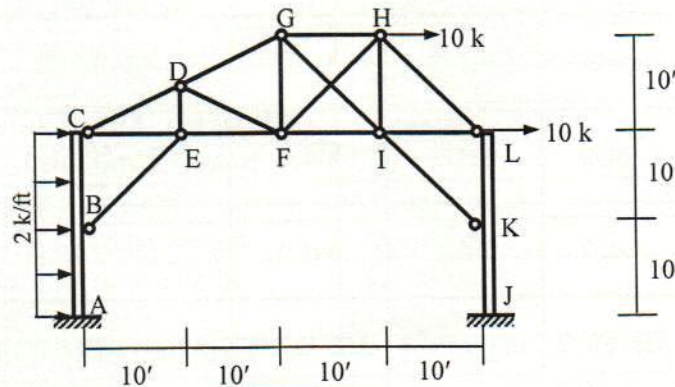
Fig. 3

4. Calculate the vertical deflection at point B of the beam shown in *Fig. 4* using virtual work method [Given EI= 40x10³k-ft²].
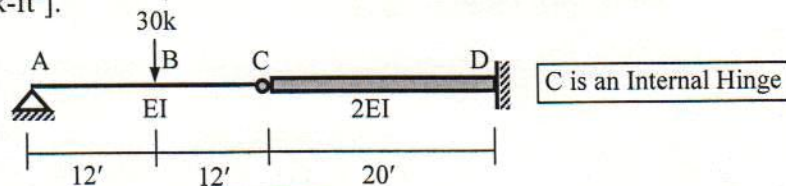
Fig. 4

University of Asia Pacific
Department of Civil Engineering
Mid-Term Examination Fall 2013

Course Code: CE 311 (B)
Course Title: Engineering Mechanics I

Time: 1 (one) Hour
Full Marks: (3x10) = 30

Answer all 3 questions.
Each question carries equal marks

1. Determine the static/geometric stability and statical indeterminacy of the following structures.
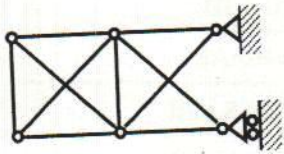
(i)   (ii)
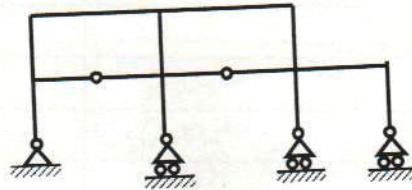
2. For the floor beam system shown, draw influence line for V_{3-4}, V_{4-5}, M_3 and M_4.
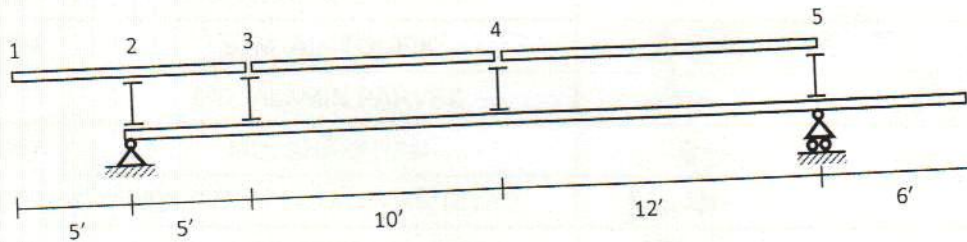
3. For the frame shown below, draw influence line for M_P and M_Q if the unit load moves on AD.
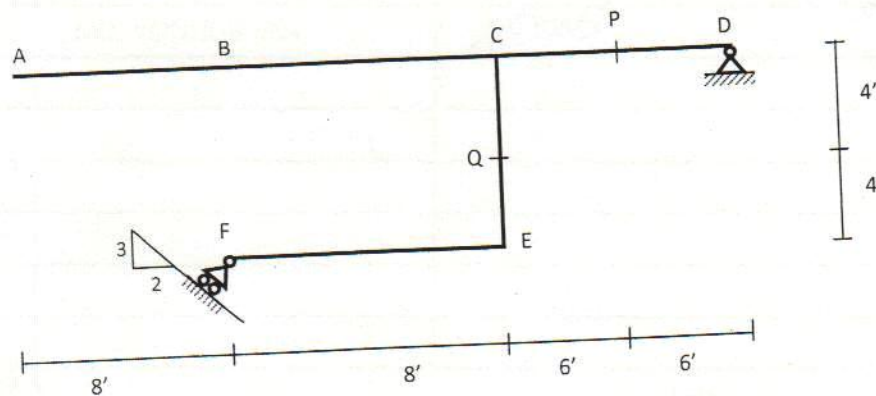
Course Title: Design of Concrete Structure I   **Course Code : CE 315**
Time : 1 hr   **Full Marks : 30**

(There are 3 questions. Answer all of them)

1. Check the **ductility of the beam** shown following. Also, calculate the **design strength** (φM_n) of the beam if it is ductile.   **(10)**

$f_y = 60,000$ psi
$f'_c = 4,000$ psi
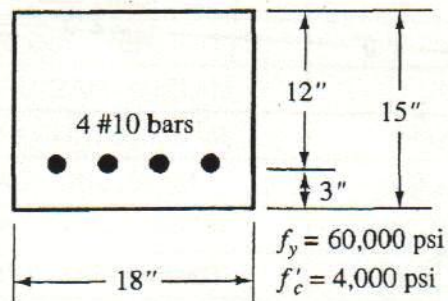
2. A **rectangular beam** is to be designed using $f'_c = 4$ ksi and $f_y = 60$ ksi. **In addition to the beam self weight**, there also exist a **uniformly distributed** DL of 2 k/ft and a **concentrated 20 kip LL. Use, b= 14 and #11 bar.**   (14)

Use $\rho = \dfrac{0.18 f'_c}{f_y}$

(P.T.O)

Course Title: Design of Concrete Structures II   Course Code: CE 317 Ⓐ
Time: 1 hr   Full Marks: 3x15=45

[Answer all the questions]

1. a) What are corner reinforcements in two-way slabs? Mention the ACI provisions for corner reinforcements.

   b) Use WSD to design the following slab system shown in *Fig. 1*, supported by 12"x15" beam all around and 12"x12" column. Also draw neat sketches of reinforcements (plan and one section) [Given, FF = 20 ksf, PW = 30 ksf, LL = 45 ksf, $f_c' = 3$ ksi and $f_y = 50$ ksi, $f_s = 20$ ksi, n = 9, k = 0.378, j = 0.874, R = 223 psi].
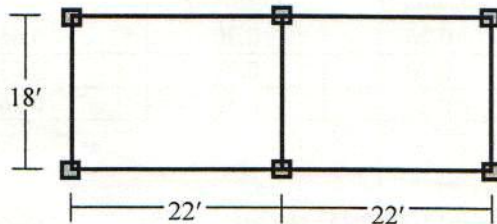
Fig. 1
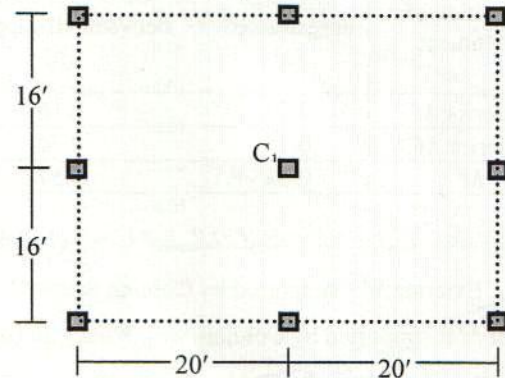
Fig. 2

2. a) What is flat slab? Mention the advantages and disadvantages of flat slabs.

   b) Using WSD, check column C_1 of the slab shown in *Fig. 2* for punching shear and calculate shear reinforcements [Given, slab thickness = 6 inch, FF = 25 ksf, RW = 20 ksf, LL = 40 ksf, $f_c' = 3$ ksi and $f_y = 40$ ksi, $f_{c,all} = 1.35$ ksi and $f_{s,all} = 18$ ksi].

3. a) Mention and justify the maximum and minimum steel ratios specified by ACI for RC columns. Explain why transverse reinforcements are used in RC columns.

   b) For a spiral column of 15 inch diameter select the main reinforcement (also spirals) using interaction diagram when, $P_{DL} = 200k$, $P_{LL} = 125k$, $M_{DL} = 70$ k-ft and $M_{LL} = 90$ k-ft [Given, $\gamma = 0.80$, $f_c' = 4$ ksi and $f_y = 60$ ksi].

Course Code: CE 317
Full Marks: 60

Course Title: Design of Concrete Structures II
Time: 1 hour

Answer all the THREE (3) Questions

1. (a) A slab panel (clear span 20 ft X 20 ft) with continuous edge in all side needs to carry a negative moment of 4300 lb-ft/ft and a positive moment of 2100 lb-ft/ft. The thickness of the slab is 7 inch. Design and distribute the steel for the slab panel in one direction. Consider f_c' as 4 ksi and f_y as 60 ksi.   17

   (b) Name different types of structural slabs   3

2. (a) Distribute the moment in different zone of the slab panel for an interior span having a moment of 350 ft-kips in one direction. Use the Direct Design Method. Consider $l_2/l_1 = 1$ and $\alpha_1 \, l_2/l_1 > 1$. Use the chart if required.   12

   (b) Draw a typical interaction diagram showing different point on it. If the balanced load for a column is found to be 400 kips and the balanced moment is 300 ft-kips, what will be the corresponding eccentricity for the balanced failure (e_b). If e is greater than e_b, what type of failure will occur?   8

3. (a) Design a circular spiral column for carrying a total factored load of 1000 k. Use 2% steel ratio. Also design necessary spiral. ($f_c' = 4$ ksi and $f_y = 60$ ksi).   14

   (b) What are the ACI provisions for the corner reinforcement in slab and tie bar arrangement in column.   6

Formulas:

$$P_u = \alpha\varphi \, [0.85 \, f_c' \, (A_g - A_{st}) + f_y \, A_{st}] = \alpha\varphi \, A_g \, [0.85 \, f_c' \, (1 - \rho_g) + f_y \, \rho_g]$$

$$\rho_s = 0.45(A_g/A_{core} - 1) \, (f_c'/f_y)$$

$$\rho_s = 4A_{sp}/ \, (S^* d_{core})$$

$$M_u = \varphi A_s f_y \, (d - a/2)$$

$$a = (A_s f_y)/(0.85 \, f_c' b)$$

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Fall 2013
Program: B. Sc. Engineering (Civil)

Course Title: Environmental Engineering I   Course Code: CE 331
Time- 1 hour   Full marks: 40

ANSWERS ALL THE QUESTIONS BELOW

1. (a) Write down the general considerations (at least five vital points) for planning and design   (5)
         of a low-cost water supply scheme in developing countries

    (b) Why a well should be completed to the bottom of the aquifer ?   (3)

2. (a) A 20 ft long, 14-pipe size, continuous –slot stainless steel screen is to be installed in a well.   (15)
         The width of the outside wrapping wire used to fabricate the screen is 0.156 in and the
         recommended slot size is 0.065 in. The anticipated yield is 2000 gpm. Justify the design of
         a well.

         [On a 36-in diameter screen, the wire face width would have to be increased to 0.215 in to
         maintain adequate strength]

    (b) A fully penetrating well in a confined sandy aquifer has a maximum transmitting capacity   (4)
         of 1200 l/min. the aquifer is overlain and underlain by impervious formations. The
         thickness of the aquifer is 20 m. Design the length of the well screen, assuming the
         percentage of open area in the available strainer to be 15% and bore hole dia as 15 cm.
         [Assume safe entrance velocity 2 cm/sec, since k for sands is usually 0.04 cm/sec]

    (c) Find out the slot size of the screen and intake areas of screen openings for the defined slot   (5)
         openings of a well from the following data:
         Thickness of the aquifer   = 60 ft;   Discharge   = 334 gpm
         Entrance velocity = 0.1 fps ; Well diameter = 2 inch ; Length of the screen = 43 ft.

    (d) Design the transmission main and the pumping unit from the following data: (8)

         Water supply rate = 40 gpcd

         Estimation population = 1,00,000

         Ground R.L. = at the pump house = 102.50 ft.

         Treatment plant R.L.= 193.00 ft

         Velocity through pipes = 8 fps

         Pumping time = 8 hrs. daily

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Fall 2013
Program: B.Sc. Engineering (Civil)

Course Title: Environmental Engineering II   Course Code: CE 333
Time- 1 hour   Full marks: 60

Answer all of the questions below
Assume reasonable value for any missing data (if applicable)

1. (a) Compare the advantages of single pit and twin pit VIP latrines.   (5)

    (b) What are the modified features of pour-flush sanitation technology that provide   (2)
         hygienic solution for excreta disposal?

    (c) Design a leach pit for both single and alternating twin off-set pit pour-flush latrines   (13)
         serving a family of ten members living in a sub-urban area. Wastewater flow is 20
         lpcd and the soil is the type of sandy loam. [$A_i = Q / I$, $V_i = A_i D/4$, $V_s = C \times P \times N$]

2. (a) Compare separate and combined sewerage systems with respect to their advantages   (3+3)
         and disadvantages.

    (b) Estimate the maximum daily design flow from a composite area with the given land   (14)
         use pattern and condition as follows:
         (i) an residential area of 20 hectares, occupied by 100 people/ha having an average
         waste water generation rate of 70 lpcd. Consider the infiltration rate to be 200 lpd per
         meter over the sewer length of 20 m, including the house connections.
         (ii) an industrial park, with an area of 10 hectares, producing daily waste water flow of
         60 l/ha.
         (iii) Again, time of concentration for the composit area is 25 minutes and the runoff
         coefficient can be taken as 0.80. The rainfall curve is given by: I (cm/hr) = 101.6/ (t +
         20). [Q = FCIA; $Q_{max (design)} = Q_{max (sewage)}$ + Infiltration + Storm Inflow]

3. (a) What are the technical advantages of small bore sewerage system over the   (5)
         conventional sewerage system?

    (b) Define self-cleansing and non-scouring velocity.   (2)

    (c) Using the Nomogram, given in Fig. 1, determine the required sewer pipe diameter for   (13)
         discharging the maximum domestic sewage flow, generated by 10000 people having
         an average water supply of 120 lpcd. The pipe is to be laid on the slope of 0.004 and
         the Manning's coefficient is to be considered as 0.013.

$$[\frac{Q_{max}}{Q_{ang}} = \frac{18+\sqrt{P}}{4+\sqrt{P}}]$$

Course Title: Geotechnical Engineering I   **Course Code:** CE 341
Time: 1 hour   **Full Marks:** 20

Answer all the questions.   **(4x5=20 marks)**

1. a) Classify the following soil. The properties of the subgrade soil are found as follows.   3
     Percent finer than 0.075 mm = 65%
     Percent finer than 0.425 mm = 67%
     Percent finer than 0.6 mm = 70%
     Percent finer than 4.75 mm = 75%
     Liquid limit = 52%
     Plastic limit = 35%

   b) Draw typical shear stress vs shear displacement curves for dense sand and loose sand, obtained from direct shear test. Also show the peak shear strength and the ultimate shear strengths.   2

2. a) The stress on the soil is increased from 250 to 600 kPa. Given that, void ratio under 250 kPa effective stress is found 0.55. The void ratio is found 0.44 under 600 kPa of effective stress. The sample is unloaded from 600 kPa to 350 kPa. (i) Calculate the compression index for the given saturated clay soil (normally consolidated). (ii) Calculate the overconsolidation ratio when the stress on the soil was 350 kPa (on unloading path).   3

   b) What are the effective size, uniformity coefficient and coefficient of curvature for the given soil? Given that, Percent finer than 0.075 mm = 3%; Percent finer than 0.425 mm = 31%; Percent finer than 0.6 mm = 39%; Percent finer than 4.75 mm = 60%   2

3. a) Derive the relation between void ratio and porosity.   2
   b) In a CU Triaxial test, applied confining pressure is 250 kPa. The sample fails under 200 kPa deviator stress. Pore water pressure is measured 90 kPa when deviator stress was applied. Draw the Mohr circles (at failure condition) for both total and effective stresses. Also show the coordinates on the axis of normal stress.   2
   c) Name four identification tests of fine grained soil.   1

4. (a) Calculate total stress, effective stress and pore water pressure at the top and the middle of the saturated clay layer. (Fig 1).   3
   (b) What are the shear strength parameters? Which parameter can be determined from direct shear test for what type of soil and how?   2

Ground Surface
6 m $\gamma_d = 16.5$ kN/m^3 Sand
   $\gamma_{bulk} = 17.1$ kN/m^3 Ground Water Table

8 m $\gamma_d = 17.2$ kN/m^3
   $\gamma_. = 20$ kN/m^3 Clay

Figure 1

Course Code: CE 341
Full Marks: 20

Course Title: Geotechnical Engineering I
Time: 1 hour

(4x5=20 marks)

Answer all the questions.

3

1. a) Classify the following soil. The properties of the subgrade soil are found as follows.
   Percent finer than 0.075 mm = 65%
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   Percent finer than 0.6 mm = 70%
   Percent finer than 4.75 mm = 75%
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2

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3

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2

2

3. a) Derive the relation between void ratio and porosity.
   b) In a CU Triaxial test, applied confining pressure is 250 kPa. The sample fails under 200 kPa deviator stress.
   Pore water pressure is measured 90 kPa when deviator stress was applied. Draw the Mohr circles (at failure
   condition) for both total and effective stresses. Also show the coordinates on the axis of normal stress.

2

   c) Name four identification tests of fine grained soil.

1

4. (a)   Calculate total stress, effective stress and pore water pressure at the top and the middle of the
saturated clay layer. (Fig 1).

3

   (b)   What are the shear strength parameters? Which parameter can be determined from direct shear test for
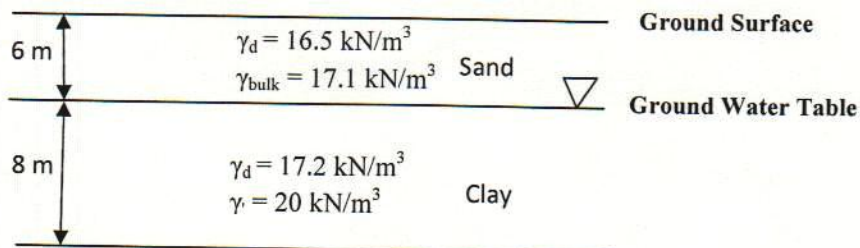what type of soil and how?

2

Ground Surface

6 m

γ_d = 16.5 kN/m^3 Sand
γ_{bulk} = 17.1 kN/m^3 ▽   Ground Water Table

8 m

γ_d = 17.2 kN/m^3
$\gamma_.$ = 20 kN/m^3 Clay

Figure 1

UNIVERSITY OF ASIA PACIFIC
Department of Civil Engineering
FALL 2013
CE 351: TRANSPORTATION AND TRAFFIC ENGINEERING
MIDTERM EXAMINATION

Time: 1 hour   Full Marks: 45

There are **Three** questions. Answer all of them

1. a) The following data were observed for 5vehicles traversing 4 mile segment of a   7
    highway. Calculate the Time Mean Speed and the Space Mean Speed of the
    vehicles.

Vehicle	Time (min)
1	3.7
2	2.8
3	3.6
4	2.9
5	3.3

    b) What are the different types of Delays? Discuss any one of them.   8

2. a) Design a two-phase signal of a cross-junction for the data given below: 9

    Amber   3 sec
    Red-amber   2 sec

	N-S	E-W
Inter green, sec	8	7
Lost time, sec	3	2

	Approaches			
	North	South	East	West
Flow, veh/hr	720	750	855	780
Saturation flow veh/hr	2210	2190	2540	2410

    Draw the phase diagram.

    b) Write short note on any two: 6
        I.   Park and ride system
        II. Traffic Control Device
        III. Space-mean speed

3. a) Compare angular and parallel method of parking.   8
    b) Calculate the AADT for the following data. Data was collected on Wednesday in June.   7
    MEF for June is 0.578.

Hour	Volume
6:00-7:00 a.m.	500
7:00-8:00 a.m.	665
8:00-9:00 a.m.	820
9:00-10:00 a.m.	680
10:00-11:00 a.m.	600

University of Asia Pacific
Department of Civil Engineering
Mid-Term Examination Fall 2013

Course #: CE 363
Full Marks: 60

Course Title: Engineering Hydrology
Time: 1hr

There are **Eight (8)** questions and answer **all** the questions

1. Distinguish between: (a) Depression storage and interception   (3×4=12
   (b) Actual and Potential Evapotranspiration
   (c) Recording and non-recording rain gauge
   (d) Field Capacity and Permanent Wilting Point

2. (a) Explain the Consistency test for rainfall records and necessary correction   (5)

   (b) A catchment area has seven rain gauge stations. In a year the annual rainfall recorded by the   (8)
   gauges are as follows:

Station	P	Q	R	S	T	U	V
Rainfall(cm)	130	142.1	118.2	108.5	165.2	102.1	146.9

   For a 10% error in the estimation of the mean rainfall, calculate the optimum number of stations in
   the catchment area.

3. (a) Define Pan coefficient.   (2)
   (b) Why pan coefficient need to be introduced to correct the evaporation data observed from evaporimeters?   (3)

4. (a) Calculate the Potential Evapotranspiration from an area having the following data,   (5)
   The slope of saturation vapor pressure vs temperature curve at the mean air temperature is 1.4mm of
   Hg/°C
      Net radiation of evaporable water per day is 7.573mm of water/day
      Psychrometric constant = 0.49mm of Hg/°C
      Parameter including wind velocity and saturation deficit=1.88 mm/day.

5. Rain gauge station D was inoperative for part of the month since the rain gauge bottle was broken.   (5)
   At that month the rainfall recorded in the three surrounding stations A, B and C were 9.4, 5.3 and
   6.7 cm. if the average annual rainfalls for the stations are 80, 65, 85 and 95 cm. Estimate the rainfall
   at station D.

University of Asia Pacific
Mid Term Examination
Department of Civil Engineering
Course Name: Project Planning and Management Course Code: CE401
Time: 1Hour Full Marks: 20

Name. ……………………………………… Registration No. ……………………

Roll No. ………………………… Year……………… Semester ……………………

……………………………………
Signature of invigilator and Date

1. What is meant by management? What things do you need to manage in a project? (2)

2. What are the three most attributes in project management? As a project manager, how you manage those attributes? Is there any other attributes to be considered in today's reality? (2)

Answer any **5 (Five)** questions

1.
a) Briefly describe PMBOK. How many processes and knowledge groups are identified in project management according to PMBOK?   [2+1]
b) What preparations does a contractor need to take for submitting a tender?   [5]

2.
a) What is DPP?   [1]
b) What are three stages of DPP?   [3]
c) What are the conditions if controlling/line ministry has to revise a DPP?   [4]

3.
a) In a diagram show institutional linkages of Bangladesh Planning Commission.   [4]
b) Write at least 4(four) functions of Bangladesh Planning Commission.   [4]

4.
a) What is a Project? Briefly mention some of the reasons of taking a project.   [1+1]
b) What are the characteristics of a project?   [3]
c) Graphically show cost and staffing levels across project lifecycle.   [3]

5.
a) What are the essential elements of a contract?   [2]
b) What are the main aspects of cost reimbursement contracts?   [2]
c) In what type of situation cost reimbursement contract is suitable?   [2]
d) What is the basic difference between contract risk and responsibility?   [2]

6.
a) What is MDG?   [1]
b) Write down eight goals of MDG.   [4]
c) How are Public Procurement regulations expected to improve Public Procurement?   [3]

Course Title: Structural Engineering III

Course Code: CE 411 (A)

Full Marks: 4x10=40

Time: 1 hr

[Answer all the questions below]

1. For the truss shown below in *Fig 1*, ignore the zero-force members and apply the boundary conditions to determine the horizontal and vertical deflections at joint D [Given, EA/L = constant = 1000 kip/ft].

Fig. 1
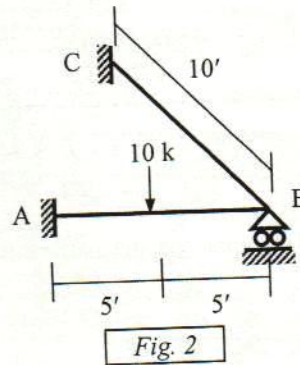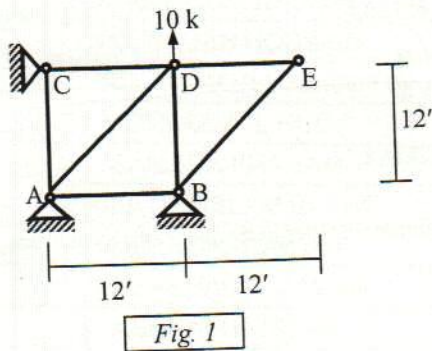
Fig. 2

2. Use stiffness method to calculate the rotations at joint B for the grid shown in *Fig. 2* [Given, EI = 40x10³ k-ft², GJ = 30x10³ k-ft²].

3. For the beam shown below in *Fig. 3*, determine P and w when joint A settles 0.0085 ft and joint B rotates 0.0008 rad clockwise [Given, EI = constant = 40x10³ k-ft²].

Fig. 3
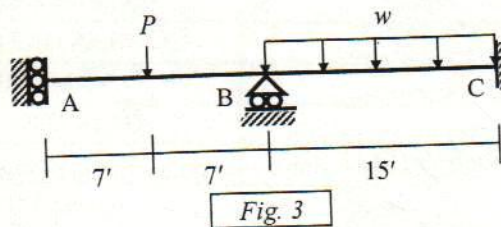
4. Assemble the global stiffness matrix and write the global load vector of the three dimensional truss shown in *Fig. 4*. Also write the boundary conditions [Given, EA/L = constant = 500 kip/ft].
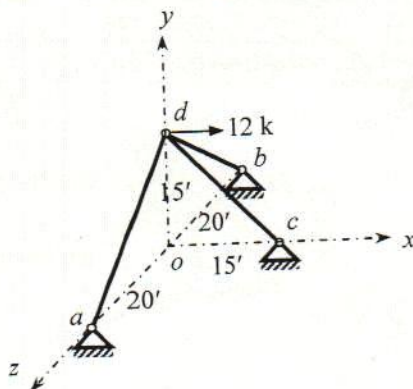
Nodal Coordinates (ft)
o (0, 0, 0), a (0, 0, 20), b (0, 0, −20), c (15, 0, 0), d (0, 15, 0)

Fig. 4

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Fall 2013 (Set A)

Course #: CE 411 (B)
Full Marks: 40 (= 4 × 10)

Course Title: Structural Engineering III
Time: 1 hour

1. Use Stiffness Method to calculate the

    (i) Horizontal and vertical deflections at joints b and e

    (ii) Force in member be

    of the truss $abcde$ loaded as shown in Fig. 1

    [Given: S_x = constant = 500 kip/ft].
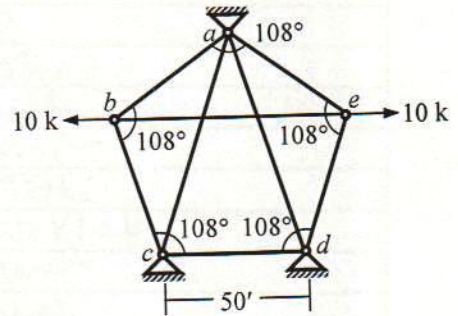
Fig. 1

2. For the frame $abcde$ shown in Fig. 2

    (i) Determine the size of the stiffness matrix (considering boundary conditions also).

    (ii) Determine the size of the stiffness matrix if axial deformations are neglected.

    (iii) Use the Stiffness Method (neglecting axial deformations) to calculate the bending moment at joint a, b and c if the frame is loaded as shown

    [Given: EI = constant = 40,000 k-ft²].

c is a Guided Roller
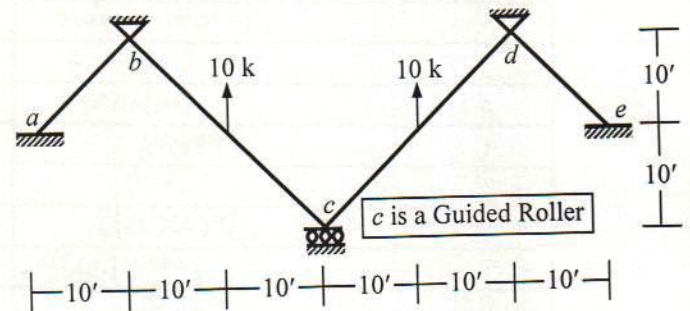
Fig. 2

3. Use Stiffness Method to calculate the forces P applied on the truss $oabcde$ shown in Fig. 3 (with given nodal coordinates), if they cause the joint e to move 0.03 m rightwards.

    Also calculate the deflections along the y- and z-axes

    [Given: S_x = constant = 7500 kN/m].

    Nodal Coordinates (m)
    o (0, 0, 0), a (−10, 0, 0), b (0, 0, 5), c (10, 0, 0), d (0, 0, −5), e (0, −5, 0)
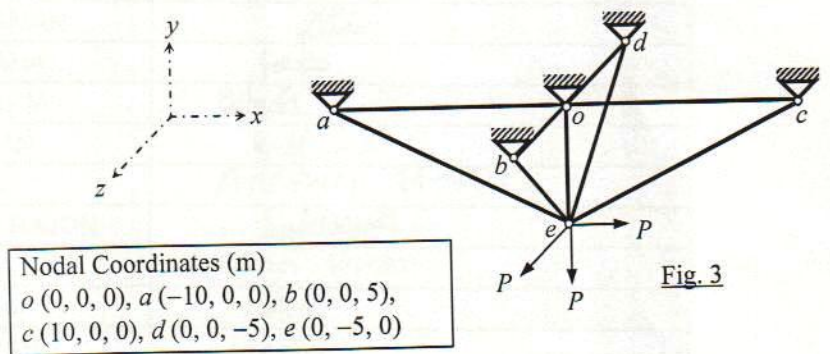
Fig. 3

4. (i) Determine the degree of kinematic indeterminacy (doki) of the 3D frame $oabcd$ shown in Fig. 4(i), considering boundary conditions and neglecting axial deformations.

    (ii) Formulate the stiffness matrix of the grid $oabcd$ shown in Fig. 4(ii), considering symmetry about x-axis and using boundary conditions [Given: EI = 25 × 10³ kN-m², GJ = 20 × 10³ kN-m²].
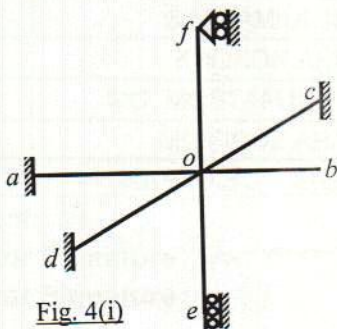
Fig. 4(i)
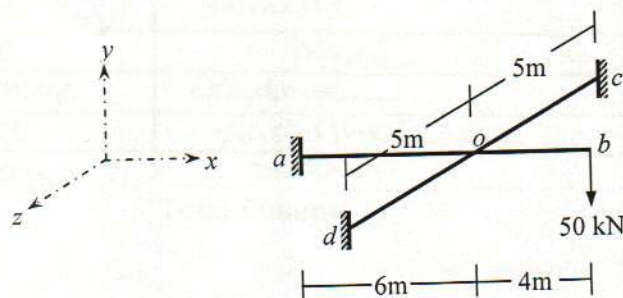
50 kN

Fig. 4(ii)

1. Write down the principle of prestressed concrete. What is post tensioning? Describe   (10)
    the applications, benefits, advantages and construction procedure of post tensioning.

2. Explain different types of losses considered in prestressed concrete.   (10)

3. Describe bonded and unbonded post tensioned concrete. What are the advantages/   (10)
    disadvantages of these types of prestressed concrete?

Course No. & Title: CE 417 Structural Engineering VI (Design of Steel Structures)
Full Marks: 20   Time: 1 hour
The figures in the margin indicate full marks.
Notations convey their usual meanings. Assume reasonable values for any missing data.
There are FOUR questions. <u>Answer any THREE questions.</u>

1.   (a) What is nominal strength? How it differs from design strength?   2
       (b) How yield strength is defined for steels not exhibiting yield strength?   2
       (c) Explain strain aging.   2 ⅔

2.   The long leg of a single angle L5″x3½″x¾″ is to be welded to a ⅞″ thick gusset
       plate to transmit a dead load force of 46 kips and a live load force of 70 kips as
       shown in Fig. 1. Adopting AISC/ASD method, design the weld using fillet welds
       deposited manually with E70XX electrodes. AISC specified minimum weld size
       for the given case is 5/16". Given: Allowable stress for fillet weld for shear on
       effective area = 0.3 times the nominal tensile strength of weld metal. Annexure-1
       is provided to facilitate the design.   6⅔
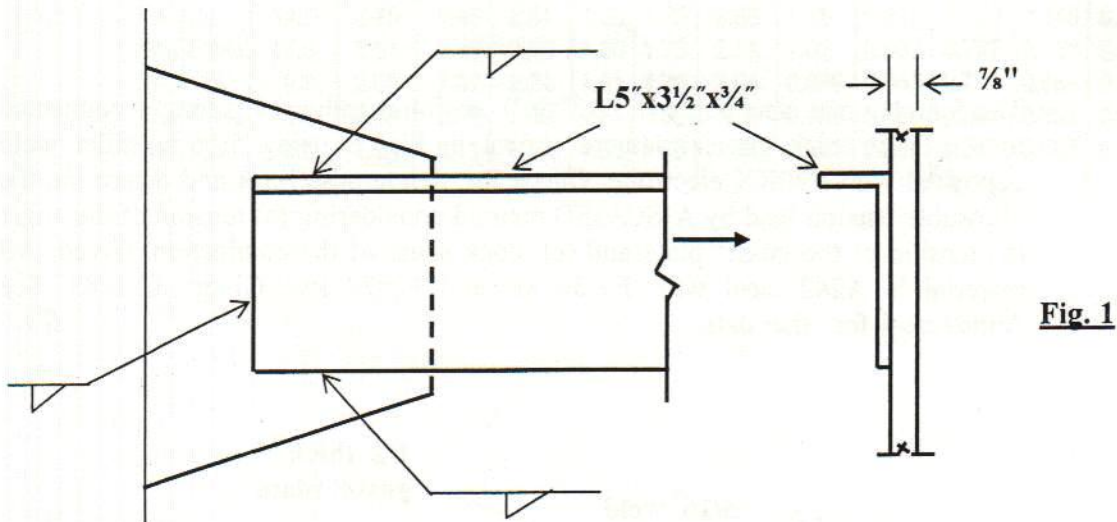
Fig. 1

3.   Using AISC/LRFD method, determine the number of bolts required, and an
       appropriate layout, to transmit a dead-load force of 80 kips and a live-load force
       of 240 kips through two C10x30 to a 1-in gusset plate (Fig. 2). All material is
       A36. Bolts are ¾" A325 (standard holes) in a bearing-type connection with
       threads excluded from the shear planes. Use three lines of bolts across the web of
       the channel. If the end distance is maintained at 1¼", but the center to center
       distance of bolts is reduced to 2" (less than 3d), what will be the capacity

Course No: CE 423
Course Title: Structural Engineering IX
  (Earthquake Resistant Design and Retrofitting)

Time: 1 Hour
Full Marks: 30

*There are **four** questions. Answer any **three**.*
(3 ×10 = 30)

1. a) Derive the equation for the displacement response of a viscously damped (7)
    SDOF system subjected to free vibration.
    b) Define undamped, critically damped and overdamped systems. (3)

2. Derive the equation for the displacement response of a viscously damped SDOF (8+2)
    system subjected to sinusoidal force, and mark the transient and steady state
    components.

3. a) Draw schematic plot of Deformation Response Factor (R_d) vs. Frequency (6)
    Ratio (β) and explain it.
    b) Write short notes on TMD and TLD. (2+2)

4. Derive the equation for the displacement response of a viscously damped SDOF (10)
    system subjected to arbitrary force.

Course Title: Environmental Engineering III   Course Code: CE 431 (B)

Time- 1 hour   Full marks: 60

Answer all the questions below:

1. (a) Describe the differences between developing and developed country regarding solid waste management. (5)

   (b) What are the risks involved in poor solid waste management system ? (5)

   (c) What are the functional steps to be followed for an effective solid waste management system? (5)

2. (a) What are the factors that affect the solid waste generation rate? (3)

   (b) Estimate the energy content for the organic portion of a solid waste sample with the composition given below: (12)

Component	Percent by mass
Food wastes	20
Paper	30
Cardboard	15
Wood	5
Plastics	15
Tin cans	10
Garden trimmings	5

3. (a) Differentiate between the hauled container system and stationary container system in solid waste management with necessary figures. (1.5+1.5)

   (b) Write down the benefits of establishing transfer station in solid waste management system and also explain the future prospect of establishing it in Dhaka city in the context of existing solid waste management condition. (5+4)

   (c) Do an economic analysis of refuse collection and also give an economic decision about what size truck makes sense for the following job. (18)
   Solid wastes from Mirpur area to be collected using a stationary container collection system having 5 cubic meter containers. Suppose the annualized cost of purchasing , fueling and maintaining a compactor truck is given by the following expression:

Course Code: CE 431 (A)
Full marks: 60

Course Title: Environmental Engineering III
Time- 1 hour

Answer all the questions below:

1. (a) Describe the differences between developing and developed country regarding solid waste management. (5)

   (b) What are the risks involved in poor solid waste management system ? (5)

   (c) What are the functional steps to be followed for an effective solid waste management system ? (5)

2. (a) What are the factors that affect the solid waste generation rate ? (3)

   (b) Estimate the energy content for the organic portion of a solid waste sample with the composition given below: (12)

Component	Percent by mass
Food wastes	20
Paper	30
Cardboard	15
Wood	5
Plastics	15
Tin cans	10
Garden trimmings	5

3. (a) Differentiate between the hauled container system and stationary container system in solid waste management with necessary figures. (1.5+1

   (b) Write down the benefits of establishing transfer station in solid waste management system and also explain the future prospect of establishing it in Dhaka city in the context of existing solid waste management condition. (5+4)

   (c) Do an economic analysis of refuse collection and also give an economic decision about what size truck makes sense for the following job. (18)
   Solid wastes from Mirpur area to be collected using a stationary container collection system having 5 cubic meter containers. Suppose the annualized cost of purchasing ,

Course Title: Environmental Engineering IV   Course Code: CE 433
Time- 1 hour   Full marks: 60

Answer all of the questions below
Assume reasonable value for any missing data (if applicable)

1. (a) Define the criteria pollutants along with their names. Also define critical pollutant.   (5)

    (b) On January, 15, 2014, the following air quality data was recorded at Shangshad   (15)
         Bhaban CAMS in Dhaka.
         $PM_{2.5}$ = 100 $\mu g/m^3$ (24 hr)
         PM_{10} = 300 $\mu g/m^3$ (24 hr)
         O_3 = 0.080 ppm (8 hr)
         O_3 = 0.200 ppm (1 hr)
         Identify the critical pollutant based on AQI. Also mention the respective sensitive
         groups.

2. (a) Define primary and secondary pollutants along with examples.   (3)

    (b) A power plant consumes 150 tons of coal (containing 12% sulfur) each day. 15% of   (17)
         this sulfur is emitted as SO_2. A stack emitting SO_2 from the plant has an effective
         height of 100m. The wind speed is 4 m/s at 10 m on a cloudy night. Estimate the
         ground level SO_2 concentration –
         (a) at a point downwind where SO_2 is maximum
         (b) at a point located 3 km downwind and 1 km of cross-downwind axis

3. (a) Explain the particle deposition mechanisms with relevant figures.   (8)

    (b) Calculate the total deposition fraction for a particle of 0.02 μm. Also identify the most   (12)
         vulnerable region regarding the regional deposition for this particle.

University of Asia Pacific
Department of Civil Engineering
Midterm Examination Fall 2013
Program: B.Sc. Engineering (Civil)

Course code: CE 439
Course title: Environmental Engineering VII (Environmental Impact Assessment)

Time: 60 Minutes   Full marks: 20

Answer ALL questions

1. Define the following: **(6)**
   - Environmental Impact Assessment (EIA)
   - Screening
   - Initial Environmental Examination
   - Scoping
   - Baseline Study
   - Impact analysis

2. Write four long time objectives of EIA   **(1)**

3. Draw the flow diagram of EIA process and parallel studies   **(4)**

4. According to Article 7 of the Bangladesh Environmental Conservation Rules (1997), write the procedures to obtain environmental clearance certificate for a read category factory?
                                                       (3)

5. Government is proposing to construct a new export promotion zone (EPZ) in an area covering 267 Acres. After completion, the EPZ will have 250 industrial plots. The area proposed for the new EPZ is located in a rural area mainly used for agriculture and there is a river nearby. For this project, write the benefits of public participation during EIA process for the following stakeholder groups: **(3)**

   - The proponent/supporter
   - The decision-maker
   - Affected communities

   (Write three benefits for each stakeholder group)

6. Briefly write the three steps of Scoping process?   **(2)**

7. What are the common formal methods used for impact identification in an EIA process? (Write four)   **(1)**

University of Asia Pacific
Department of Civil Engineering
Mid-Term Examination, Fall 2013

Course # CE 441
Full Marks: 45 (15 x 3 = 45)

Course Title: Geotechnical Engineering II
Time: 1 hour

Answer any **three (3)** of the following **four (4)** questions

1. (a) What is geotechnical subsurface exploration? Compare on the extent and significant depths up to which exploration is generally intended from the perspective of geotechnical engineering with other types of exploration as such in the field of agricultural and petroleum engineering. — 6

 (b) Mention any three major purposes of geotechnical subsurface exploration. Mention (names only) the steps/phases of a geotechnical subsurface exploration program. — 5

 (c) Mention four observations that should be noted by a good geotechnical engineer while visually inspecting the site as a part of reconnaissance phase of a subsurface exploration program. — 4

2. (a) Mention (names only) the steps of field investigation phase of a geotechnical subsurface exploration program. Write down any two general guidelines used for selection of number and depth of boreholes. — 4

 (b) Write down the names of any five (5) in-situ testing performed in the field under the field investigation phase of a sub-surface exploration (SSE) program. Which one is most commonly used and why? — 4

 (c) Write short notes on (any two): — 3.5 x 2=7

 (i) Pressure meter test (ii) Vane shear test (iii) Cone penetration test

3. (a) The outside and inside diameters of a split spoon sampler are 2 inches and 1-3/8 inches, respectively. The degree of disturbance (DOD) of a Shelby tube sampler is one-twelfth the DOD of the split spoon sampler. If the inside diameter of the Selby tube sampler is 73 mm, determine its outside diameter. — 3

 (b) Information obtained from a geotechnical site investigation conducted at a site in Bangladesh is summarized below. Determine cohesion and angle of internal friction at corresponding depths as applicable for the cohesive and cohesionless deposits, respectively, based on the available data (use empirical correlations as provided in Appendix). Use hammer efficiency as 45%. — 12

Subsurface Soil Stratigraphy
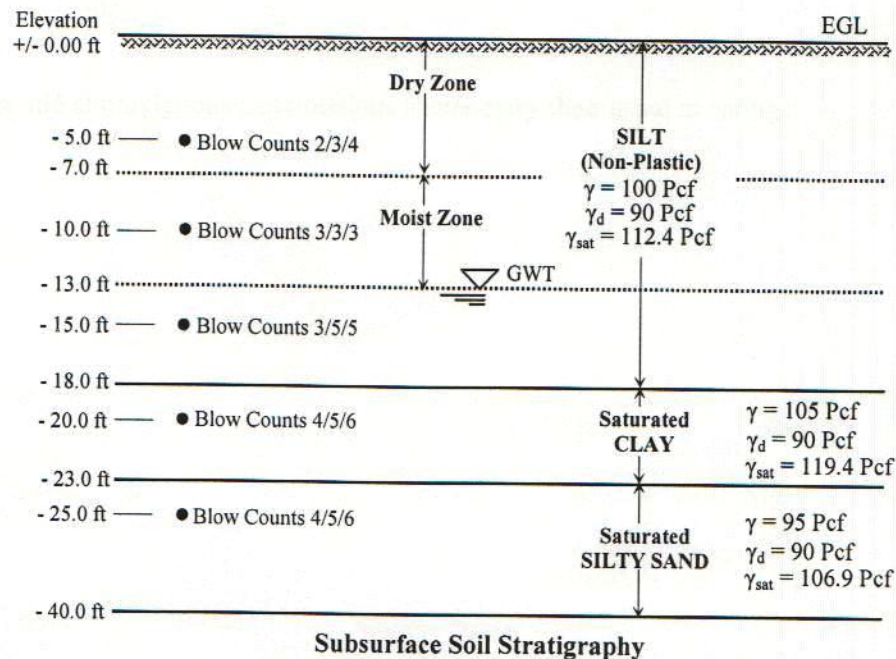
4. (a) Write a very short note on the degree of disturbances that are inherent during sampling. — 4.5

 (b) Sketch with brief description the shear failure mechanisms of shallow foundation system for various types of soils. — 10.5

Course Title: Transportation Engineering II: Highway Design & Railways   Course Code: CE 451
Time: 1 hour   Full Marks: 60

Answer all the **THREE (3)** Questions

1. (a) Write down the types of the pavement. Define reliability. What should be the   2 + 3 + 5
      desirable characteristics of the pavement?

   (b) What is ESAL?   10
      A road has to be designed for a design period of 12 years considering a growth
      rate of 10 percent per annum. The number of the commercial vehicle (CV) on the
      road is expected to be 1000 per day in both directions after the construction of
      the road. The lane distribution factor is considered to be 0.45. Calculate the
      design traffic after the design period on the road. The vehicle damage factor is
      3.0 for this terrain.

2. (a) What are the functions of the surface course? What should be the important   4 + 4 + 4
      properties of the aggregate for constructing highway? Write down the difference
      between tar and asphalt.

   (b) What does it mean by CMS-2h?   8
      From a California Bearing Ratio (CBR) test the load against the penetration of
      0.1 in. and 0.2 in. was found to be 150 lb and 250 lb respectively. If the diameter
      of the penetrating piston is 1.95 in. then calculate the CBR value for the sub-
      grade soil sample.

3. (a) What is the serviceability?   4 + 6
      If an interstate highway is expected to accommodate 8,000 vehicles in the first
      year of its service on the design lane, what should be the design thickness of the
      pavement considering full depth asphalt concrete for both the surface and the
      base? The sub-grade resilient modulus is 15000 $lb/in.^2$ (Consider Truck Factor as
      1.2 and Growth Factor as 2). Use the chart if necessary.

   (b) Write down the basic assumed conditions behind Asphalt Institute Method.   5 + 2 + 3
      Name the laboratory test for determining consistency of the bituminous material.
      What are the uses of Asphalt?

Course code: CE 461
Course title: Irrigation and Flood Control
Time: 60 Minutes

Total marks: 20

Answer all questions

1. What are the different sources of water to supply moisture into the soil? **(0.5)**

2. Write the benefits of irrigation and the harmful effects of excess irrigation. **(1.5)**

3. a) What are the different methods of irrigation water distribution? **(0.75)**

    b) Explain *border flooding* method. **(0.75)**

4. Draw the schematic diagram of soil-water-plant relationship. **(1)**

5. a) What is the classification of irrigation water having the following characteristics:

    Concentration of Na, Ca and Mg are 30, 2 and 2.5 milli-equivalents per liter respectively, and the

    electrical conductivity is 300 μmhos/cm at 25° C? **(1)**

    b) What problems might arise in using this water for irrigation? **(1)**

    c) What remedies do you suggest to overcome this trouble? **(1)**

6. Determine the time required to irrigate a strip of land of 600 m² in area from a tube-well with a discharge of 0.05 m³/second. The infiltration capacity of the soil may be taken as 1 millimeter/minute and the average depth of flow on the field as 200 millimeter. **(2.5)**

7. a) Draw the average monthly discharge hydrographs for Ganges River (at Hardinge Bridge) and Brahmaputra River (at Bahadurabad) for the period 1956-1979. **(2)**

    b) Based on the hydrographs for the Ganges and Brahmaputra, explain the flood-prone season for Ganges and Brahmaputra rivers basins. **(1.5)**

    c) Write five reasons why transboundary cooperation is needed for mitigating and minimizing floods hazards along the Ganges and Brahmaputra basins inside Bangladesh. **(1.5)**

8. Explain the delta formation process and how delta formation process relates to flood. **(2)**

9. Write six reasons of floods in Bangladesh. **(1.5)**

10. What are the structural and non-structural measures of flood control and management in Bangladesh? **(1.5)**

Course Title: Chemistry   Course Code: CHEM 111
Time: 1 Hours   Full Marks: 40

There are FIVE Questions. Answer any **FOUR.**

1   (a) What are the sub-atomic particles?   5.0
         An atom 'Q' has atomic number 92 and atomic weight 238.029.
         Find the numbers of sub-atomic particles in 'Q'.
    (b) Define isotope. Name and symbolize the isotopes of H. Find the   5.0
         number of neutron in each H isotopes.

2   (a) What is meant by Balmer series? How it differ from the other   5.0
         spectral series of Hydrogen? Draw the Balmer series showing all
         the spectral lines.
    (b) State Hund's rule and Pauli exclusion principle. How these two   5.0
         concepts can be applied to the electronic distribution of N and O
         atoms?
                                                                               5.0
3   (a) What is orbit? Describe the energy of an electron in an orbit and
         express it mathematically in terms of wavelength.
    (b) Distinguish between principal quantum number and azimuthal   5.0
         quantum number.

4   (a) What is ionic bond ? Explain why the following compounds form   5.0
         ionic bonds: $NaCl$, $MgCl_2$ and K_2S.
    (b) Discuss why ionic compounds exhibit isomorphism and high   5.0
         dielectric constant.

5   (a) What is molecular orbital? Discuss the formation of molecular   5.0
         orbital by combining atomic orbitals.
    (b) Discuss the formation of sp hybrid bond in $BeCl_2$ and also justify 5.0
         the formation of B_2 molecule.

The University of Asia Pacific
Department of Civil Engineering
Mid-Semester Examination, Fall - 2013
Program: B. Sc Engineering (2rdYear/1st Semester)

Course Title: Basic Electrical Engineering   Course No. ECE 201   Credit Hours: 3.00

Time: 1.00 Hours   Full Marks:60

[There are **Four** questions. Answer any **Three**. Figures in the right margin indicate marks]

1.   a.   If R_{eq}=50Ω in the circuit shown in Figure 1(a), find R   [10]
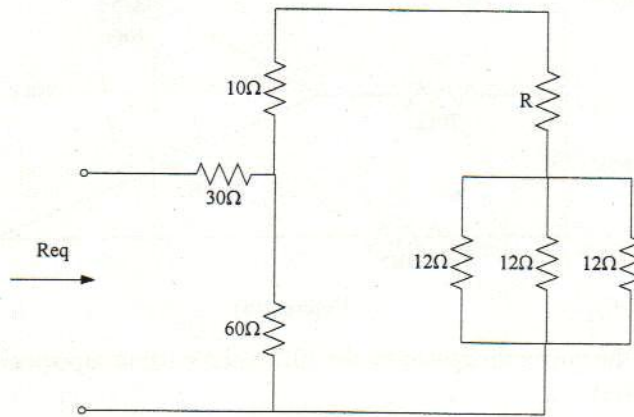
Figure 1(a)

   b.   Determine currents I_4 , I_s and voltage V_{ab} shown in Figure 1(b)   [10]
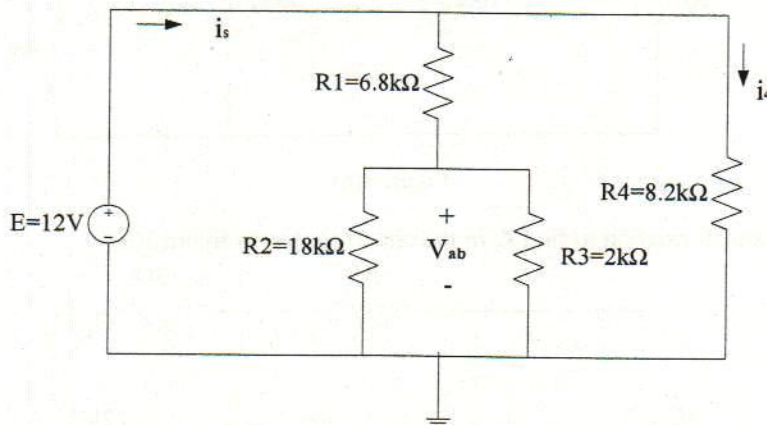
Figure 1(b)

2.   a.   Obtain V_1 and V_2 in the circuit shown in Figure 2(a) using nodal analysis   [10]

University of Asia Pacific
Department of Civil Engineering
Mid-Term Examination, Fall-2013
Program: B.Sc Engineering (Civil)

Course Title: Principle of Economics   Course Code: ECN 201   Credit: 2.00

Full Marks: 20

Time: 1 Hour

Answer any **four** from the following questions:

1. (a) Explain the law of demand graphically. (3)

    (b) Find the equilibrium price and quantity from the following markets : (2)

    Qd= -30+4P , Qs= 100-3P

2. (a) How the demand curves will look like if value of price elasticity of demand is : (2)

    E_d= 1, E_d < 1, E_d > 1

    (b) Find the cross price elasticity of demand between chicken and beef (3)

	Before		After	
	Price [Tk]	Quantity [Units/month]	Price [Tk]	Quantity [Units/month]
Chicken	160	45	270	10
Beef	250	15	250	50

3. (a) Write short note on : Production Possibility Frontier (3)

    (b) Given the demand function, P_d=41-Q^2 and supply function, P_s= $(Q+1)^2$ (2)

    Find the Consumers' Surplus and Producers' Surplus.

4. (a) What is returns to scale . Explain different kinds of returns to scale graphically. (3)

    (b) Explain the Diminishing law of marginal rate of substitution. (2)

5. Diagrammatically show the relationship between Marginal cost and Total cost. (5)

University of Asia Pacific

Mid-Semester Examination Fall-2013

Programmes: B. Arch/B. Sc Engineering /BBA

Year: 1st   Semester: 1st

Course Code: HSS 101   Course Title: English Language I

Time: 1 Hour   Full Marks: 20

*Marks are indicated in the right margin

Name:--

Registration No: -- Date: ----------------------------------

Department:---

Invigilator's Signature:---

(Answer all the questions on a separate Answer Script)

1. Read the following extract and complete the questions.   5x0.5=2.5

Detective stories tend to glorify crime. Murderers, gangsters and crooks of all kinds are described as tough, cunning and courageous individuals who know how to take care of themselves and how to get what they want. In James McCain's movie *The Postman Always Rings twice*, for instance the villain is much more an impressive character than his victim. He is casual, brave, smart and successful with women. It is true that he finally gets caught. But he is punished for a crime that he did not commit, so that his conviction is hardly a triumph of justice. Besides, looking back over the exciting life of the criminal, the reader might conclude that it was worth the risk.

    a.   What_____?

    b.   How_____?

    c.   _____James McCain?

    d.   How_____ villains represented_____?

    e.   What conclusions_____?

2. Complete <u>any five</u> of the following sentences with negatives.   5x0.5=2.5

    a.   A patriot _____ like _____.

    b.   She is trying to read a book, please _____.

    c.   He _____ because of the recent strikes declared across the country.

    d.   Economics _____.

    e.   Time and tide _____.

    f.   In a crowd you _____.

University of Asia Pacific
Department of Architecture/ Business Admin/ CE/ CSE
Mid-term Examination: Fall 2013
Program: B Arch/ BBA/ B. Sc Engineering

Course Title: English Language II   Course Code: HSS 103   Credit: 3.00
Time: 1.00 Hour   Full Marks: 20

1. Rewrite *any six (06)* of the following sentences correctly: 03
   (a) Rice and fish, my favorite dish, (remind/reminds) me of my native.
   (b) (It's/ its) a long way from home.
   (c) Neither Helen nor her brother (do/does) the shopping.
   (d) The manager, along with the teachers, (was/were) present at the meeting.
   (e) The number of unemployed citizens (is/are) rising day by day.
   (f) The staff (was/were) shocked by the news of their boss.
   (g) The committee (lead/leads) very different lives in private..
   (h) Shahed, together with his teammates, (presents/ present) a formidable opponent on the basketball court.

2. Change the form of Voice of *any six (06)* of the following sentences: 03
   (a) I know him.
   (b) Please help me.
   (c) Who teaches you English?
   (d) The clown was being laughed at by them.
   (e) Sohana was writing a letter to her father.
   (f) The teacher punished the boys who had not done their homework.
   (g) My uncle promised me a present.
   (h) His pocket has been picked.

3. Complete any *four (04)* of the following sentences using correct conditional structures: 02
   (a) If Rafiq goes to Europe, ...
   (b) ...., we will have to start the meeting without him.
   (c) If he lost his job tomorrow,...
   (d) If I were you,...
   (e) ....if you hadn't gone to university
   (f) If I won the lottery,...
   (g) ...., she would tell us.
   (h) If you don't see him this afternoon,...

4. Change the forms of speeches of any *six (06)* of the following sentences: 03
   (a) Jane said, "How often do you play sport?"
   (b) "Please buy some bread on your way home," said mother.
   (c) "Don't park in my place," Mr. Ahmed told me.
   (d) "We painted the hall last weekend," she told me this week.
   (e) "He was thinking of buying a new car next month," she said.
   (f) "We are doing exercises now," he explained.
   (g) "I shall appreciate it," he said.
   (h) He said, "I have never been to Spain."

University of Asia Pacific
Department of Basic Sciences and Humanities
Mid Semester Examination, Fall - 2013
Programme: B.Sc Engineering (CIVIL)
2nd year 1ˢᵗ semester

Course Title: Bangladesh Studies: History   **Course Code: HSS 211(b)**
Credit: 2.00

Time: 1 Hour   **Full Marks: 40**

<u>There are **FIVE** questions below. Answer **ANY FOUR**</u>   (4 x 10)

1. What were the *Janapads*? Identify the present location of different *Janapads* of ancient Bengal.

2. What do you know about the *origin of the name of Bangladesh*?

3. Explain *Matsyanyam*.

4. Write about *five major social impacts* brought in Bengal with the arrival of Islam.

5. Describe the achievements of *Shamsuddin Iliyas Shah*.

University of Asia Pacific
Department of Basic Sciences and Humanities
Mid Semester Examination, Fall 2013
Program: BSc Engineering (Civil)
2nd Year 1st Semester

Course Title: Bangladesh Studies: Society and Culture   **Course Code: HSS 211(a)**
Credit: 2.00

Time: 1 Hour   **Full Marks: 40**

There are **FIVE** questions in this section. Answer **ANY FOUR**   (4x10)

1. Define Sociology. Discuss the subject matter of Sociology.   2+8

2. Briefly discuss any two basic social processes.   5+5

3. Define social structure. Discuss the functional pre-requisites of a society.   2+8

4. What is the relationship between society and culture? Briefly narrate the characteristics of a culture.   3+7

5. Name the major branches of sociology. Discuss the subject matter of any two branches of sociology.   2+4+4

Name. .... Registration No. ....

Roll No. .... Year.................. Semester ....

....
Signature of invigilator and Date

1. What do you understand my management? What are the most essential tasks that a manager need to perform? (2)

2. What is meant by planning? What are the benefits of planning? (2)

University of Asia Pacific
Department of Basic Sciences and Humanities
Mid-Semester Examination Fall-2013
Program: B. Sc Engineering (Civil, 1st Year/1st Semester)

Course Title: Mathematics I   Course Code: MTH 101   Credits: 3.00
Time: 1 hour   Full Marks: 60

There are **four** questions. Answer any **three**. All questions are of equal value.   Marks

1. (i) Evaluate   10

$$\lim_{x \to 0} \frac{\sin x - x}{x^3}$$

   (ii) Find the first three **non-zero** terms in the Maclaurin series of $f(x) = \ln(1 - x + x^2)$.   10

2. (i) Verify Rolle's theorem for the function $f(x) = e^x + e^{-x}$ on $[-1, 1]$.   10

   (ii) State and prove the Mean Value theorem.   2+8

3. Examine the following functions for maxima and minima:

   (i) $f(x) = 2x^3 - 21x^2 + 36x - 20$ 10

   (ii) $f(x) = \dfrac{x}{\ln x}$ 10

4. Let $u(x, y) = x^3 + 3x^2y + 3xy^2 + y^3$.

   (i) Find $u_{xx}, u_{xy}, u_{yx}, u_{yy}$.   10

   (ii) Prove that $u(x, y)$ is a homogeneous function of degree 3.   10

Course Title: Mathematics II   Course Code: MTH 103   Credit:3.00
Time: 1 hr   Full Marks: 60

Answer any **three** of the following questions: $3\times20 = 60$

1. (a) Find the angle between the planes $2x - y + z = 6$ and $x + y + 2z = 7$.   8

   (b) Find the equation of the plane passing through the line of the intersection of the two
   planes $2x - y = 0$ and $3z - y = 0$ and perpendicular to the plane
   $4x + 5y - 3z + 11 = 0$.   12

2. (a) Find in symmetrical form of the equation of a line
   $x + y + z + 1 = 0 = 4x + y - 2z + 2$ and find its direction cosines.   12

   (b) Show that the lines
   $\frac{x-5}{4} = \frac{y-7}{4} = \frac{z+3}{-5}$ and $\frac{x-8}{7} = \frac{y-4}{1} = \frac{z-5}{3}$ are coplaner.   8

3.   Find the equation of the sphere which passes through the circle
   $$x^2 + y^2 + z^2 - 2x + 2y + 4z - 3 = 0, 2x + y + z - 4 = 0$$
   and touches the plane $3x + 4y - 14 = 0$.   20

4. (a) Show that if the origin be shifted to the point (α, β, γ), the axes remaining parallel to their
   original direction then the equation of any surface is obtained by writing
   $$x = x' + \alpha, y = y' + \beta \text{ and } z = z' + \gamma.$$ 15

   (b) Find the equations of the plane $2x + 3y + 4z = 7$ referred to the point $(2, -3, 4)$
   as origin, directions of the axes remaining the same.   5

Course Title: Mathematics III   Course Code: MTH 201

Time: 1 hr

Credit: 3.00

Full Marks: 60

Answer any **three** of the following questions:

$3 \times 20 = 60$

1. (a) Define a system of linear equations. How to represent it in a matrix form?   5
    (b) Solve the following system using matrix method: 15
    $$2x + 3y + z = 9$$
    $$x + 2y + 3z = 6$$
    $$3x + y + 2z = 8$$

2. (a) Define a subspace of a vector space.   5
    (b) Determine whether the vectors $v_1 = (1, -2, 3)$, $v_2 = (5, 6, -1)$, $v_3 = (3, 2, 1)$ form a linearly dependent set or a linearly independent set.   15

3. What is basis? Determine whether $(1,1,1,1), (1,2,3,2), (2,5,6,4), (2,6,8,5)$ form a basis of $\mathbb{R}^4$. If not, find the dimension of the subspace they span.   5+15

4. Consider the basis $S = \{v_1, v_2, v_3\}$ for $\mathbb{R}^3$, where $v_1 = (1,1,1)$, $v_2 = (1,1,0)$ and $v_3 = (1,0,0)$. Let $T: \mathbb{R}^3 \to \mathbb{R}^2$ be the linear transformation such that $T(v_1) = (1,0), T(v_2) = (2,-1), T(v_3) = (4,3)$. Find a formula for $T(x_1, x_2, x_3)$; then use this formula to compute $T(2, -5, 8)$.   20

Course Title: Mathematics IV
Time: 1 hour

Course Code: MTH 203
Full Marks: 60

Answer any **Three** of the followings:

1. (a) Define exact equation. (5)

   (b) Solve the equation $(2x\cos y + 3x^2 y)dx + (x^3 - x^2 \sin y - y)dy = 0$. (15)

2. (a) What is Bernoulli equation? (4)

   (b) Determine the solution of the equation $x\dfrac{dy}{dx} + y = -2x^6 y^4$. (16)

3. Obtain the complementary function and particular solution of

   $$\frac{d^4 y}{dx^4} + \frac{d^2 y}{dx^2} = 3x^2 + 4\sin x - 2\cos x.$$ (20)

4. Find the general solution of the equation $x^2 \dfrac{d^2 y}{dx^2} - 2x\dfrac{dy}{dx} + 2y = x^3$. (20)

Course Title: Physics I   Course Code: PHY-101   Credit: 3.00
Time: 1.00 Hour   Full Mark: 60

N.B- There are **Four** Questions. Answer any **Three**. All questions are of equal value. Figures in the right margin indicate marks.

1. (a) State and explain the laws: Zeroth law of thermodynamics, First law of thermodynamics, Second law of thermodynamics.   15

   (b) When a system is taken from the state A to state B along the path ACB, 80 joules of heat flows into the system and the system does 30 joules of work (fig. below).   5
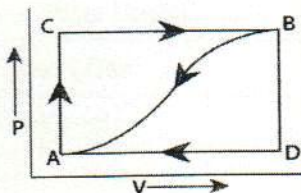

   (i) How much heat flows into the system along the path ADB, if the work done is 10 joules?
   (ii) The system is returned from the state B to the state A along the curved path. The work done on the system is 20 joules. Does the system absorb or liberate heat and how much?
   (iii) If $U_A = 0$, $U_D = 40$ joules, find the heat absorbed in the process AD and DB.

2. (a) Show that when a gas is allowed to expand adiabatically, work done by it is $W = \frac{1}{1-\gamma}[RT_2 - RT_1]$, where the symbols have their usual meanings.   15

   (b) A motor car tyre has a pressure of 2 atmospheres at room temperature of 27^0C. If the tyre suddenly bursts, find the resulting temperature.   5

3. Find out the expression for fringe width in Young's double slit experiment and prove that $\beta_1 = \beta_2$, where the symbols have their usual meanings.   20

4. (a) Using Brewster's law, prove that the reflected and refracted rays are at right angles to each other.   10

   (b) Derive the Mauls' law $I \propto \cos^2\theta$, where the symbols have their usual meanings.   10

5. What you understand by simple structure of an organization? What are its advantages and disadvantages? (2)

6. Write the strengths and weakness of group decision making in a tabular form. (2)

7. Describe Herzberg's Two Factor Theory and state whether hygiene factor can motivate an employee in an organization? (2)

8.   What skills does a manager need? Describe the management skill mixes at
      different level of management from the diagram below: (2)
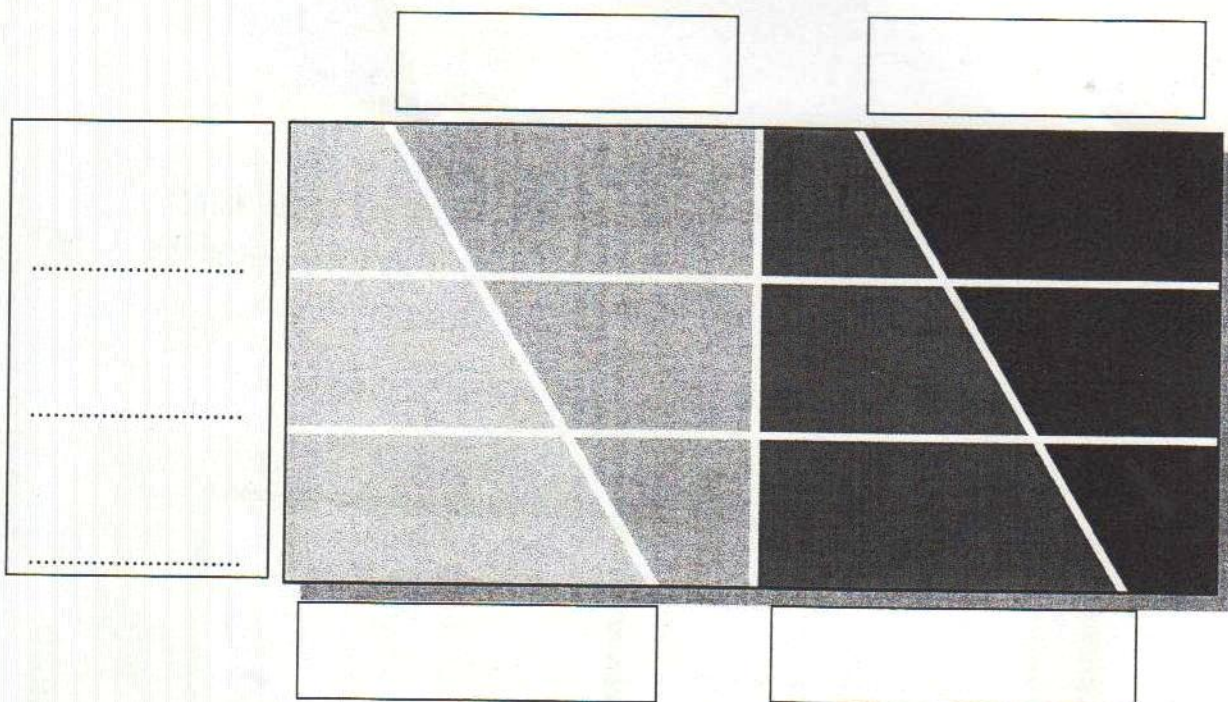
9. Fill in the gaps of the following diagram of 'Decision making process'. (2)
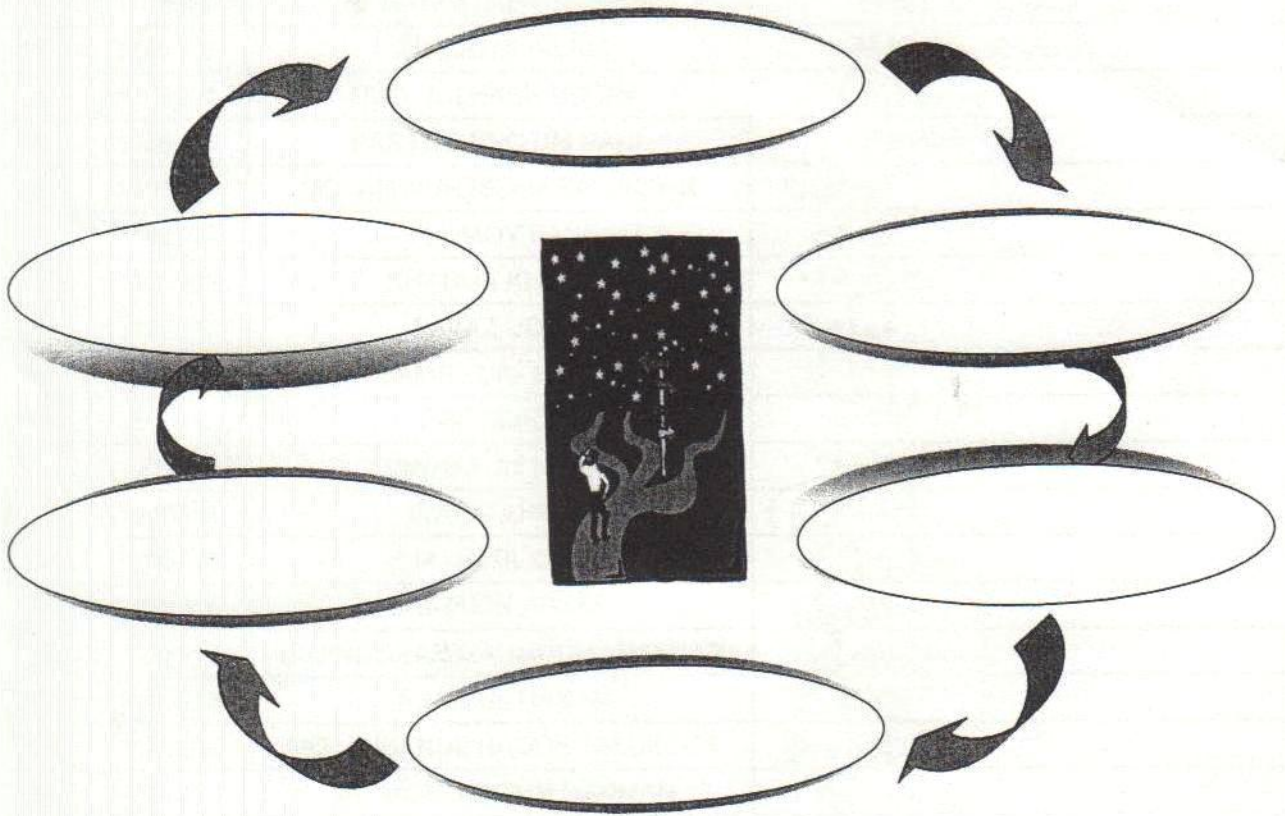
10. Why is motivation important for an organization? What do you understand by Theory X and Theory Y managers? (2)

3. Calculate the **Effective flange width** of both **L-shaped** beam at the left and **T-shaped** beam at middle (Figure shown below). Given, Beam span = 18 ft. Also, calculate the value of β_1, if f'_c = 4500 psi. (6)
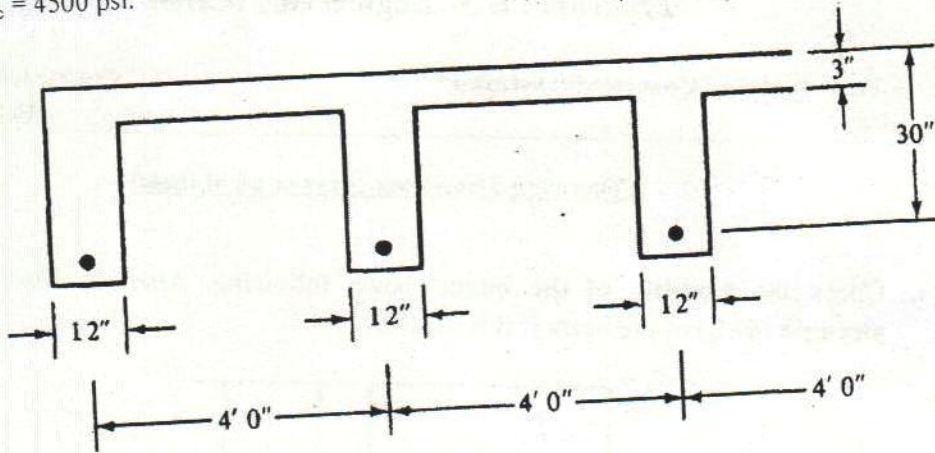
Formula's Given:

$$\phi M_n = M_u = \phi A_s f_y d\left(1 - \frac{1}{1.7}\frac{\rho f_y}{f'_c}\right)$$

$$\rho = \frac{0.85 f'_c}{f_y}\left(1 - \sqrt{1 - \frac{2R_n}{0.85 f'_c}}\right)$$

$$\phi = 0.65 + (\varepsilon_t - 0.002)\left(\frac{250}{3}\right)$$

$$R_n = \frac{M_u}{\phi b d^2} = \rho f_y\left(1 - \frac{1}{1.7}\frac{\rho f_y}{f'_c}\right)$$

Course Title: Surveying   Course Code: CE 105
Time : 1 Hour   Full Marks: 40

There are **Five** questions. Answer any **Four**

1.(a) Define the following terms with neat sketches :   3X2 = 6

Celestial Horizon, Relief Displacement ,Celestial Equator.

(b) Distinguish between Horizon Co-ordinate System and Independent Equatorial Co-ordinate
System with neat sketches.   3

(c) Why Trapezoidal formula is not applicable for estimating the volume of pyramids?   1

2. Determine the declination of a star from following data: 10

  i.   Altitude of the star = 22°36′
  ii.   Azimuth of the star = 42° W
  iii. Latitude of the observer = 40° N

3. (a) A tower structure is located at point P .Readings are taken with two theodolite from two points
A and B 90 ft apart. The R.L. of instrument centre at A & B are 25.0ft and 22.0ft respectively. The
vertical angle readings from A and B to top of the tower at P are 30° and 25° respectively.
Determine R.L. of top of tower and the distance of the tower.   8
   (b) Explain why Apparent Solar Day are not of constant length.   2

4. (a)Two points A and B having elevations of 500 m and 300 m respectively above datum appear on
the vertical photograph having focal length of 10 cm and flying altitude of 2500 m above datum
.Their corrected photographic co-ordinates are following :   8

$x_a = +2.65$ c.m. , $y_a = +1.36$ c.m.
$x_b = -1.92$ c.m. , $y_b = +3.65$ c.m.

Determine the length of the ground line AB.
   (b) Why curvature correction is required in calculating volume using prismoidal and trapezoidal
formulae ?.   2

5.The following offsets were taken from a chain line to an irregular boundary line: 10

Chainage(m)	0	10	20	30	40	60	80	110
Offstes(m)	6.5	9.5	12.8	13.0	10.9	8.5	8.0	7.5

Calculate the area between the survey line , irregular boundary line and end offsets by Trapezoidal
rule and Simpson's rule .

Necessary Formulas for Spherical Triangle

$$\cos P = \frac{\cos p - \cos a * \cos b}{\sin a * \sin b}$$

3. (a) What changes are necessary in the composition of cement to impart quick setting and rapid hardening property? (3)

(b) Write down the field test of bricks. (2)

(c) What is Vitrified brick? What are its advantages and disadvantages? (3)

(d) Compare flash and false setting. (3)

(e) Compare Absolute, Apparent and Bulk specific gravity of aggregate. (2)

(f) What is the engineering importance of efflorescence test? (2)

3.   Fill the diagram that describes the four functions of management.   (2)
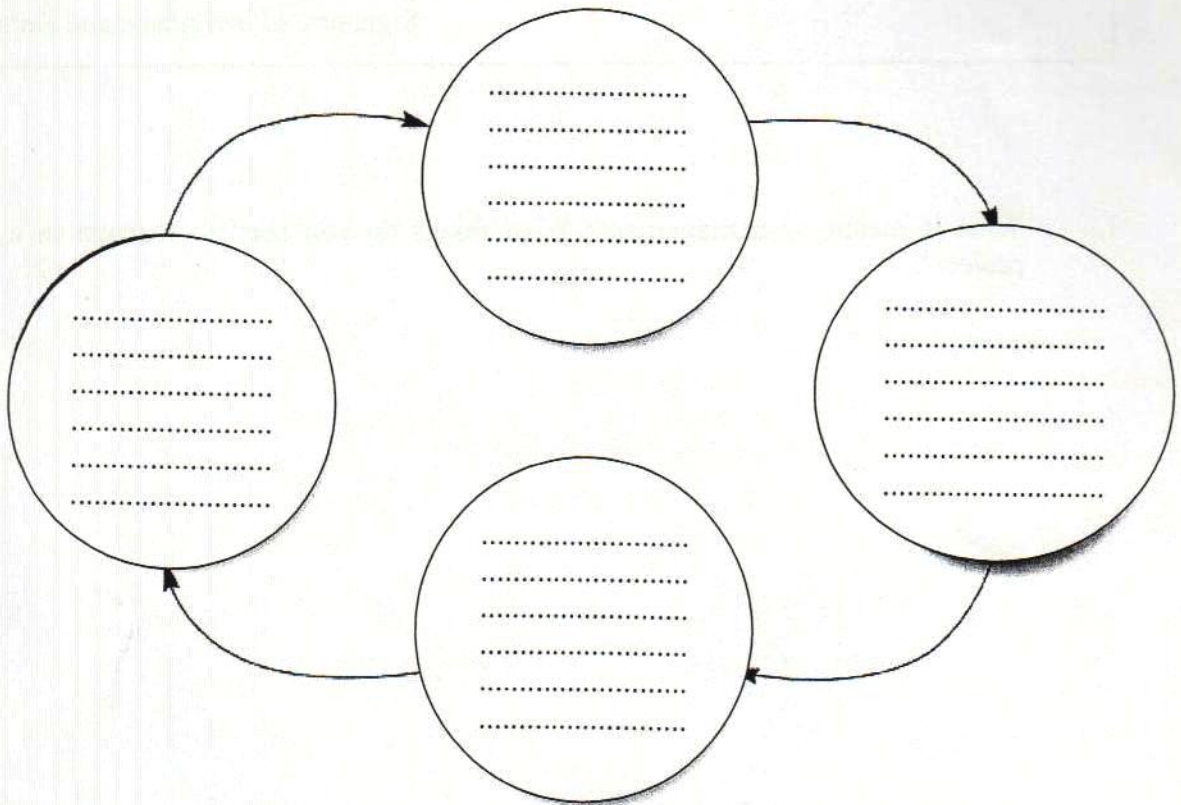
4.   What is meant by planning? Why planning is important?   (2)

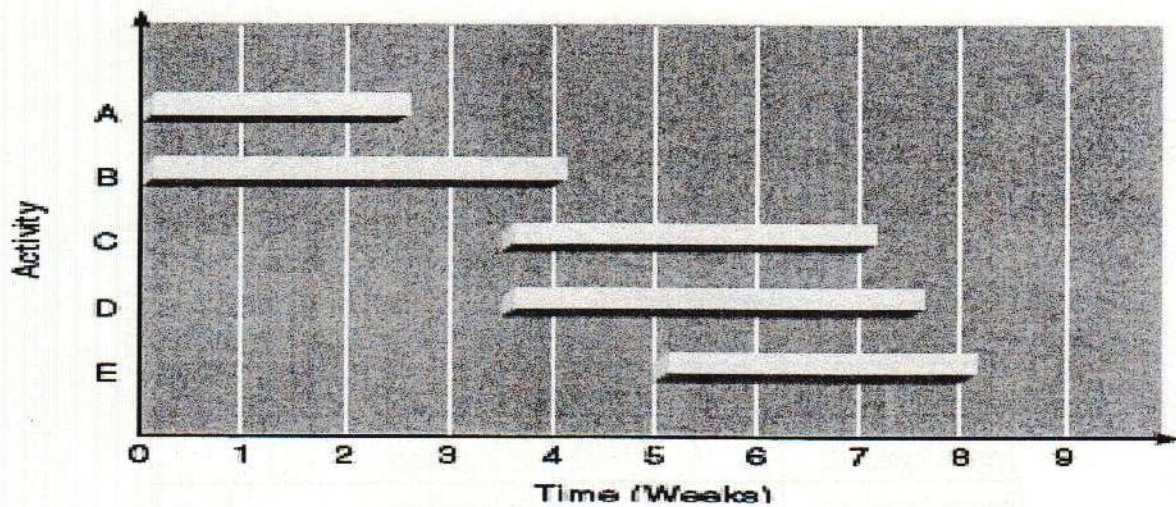5. What is a project? Define the characteristics of a project?   (2)

6. What is the name of the following diagram? What do you understand from this
    diagram? What are the drawbacks of this diagram?   (2)

7. What are the elements of a legal contract? What do you understand by counter contract? What are the documents that form a contract? (2)

8. Find the completion time and critical path for the following activities.

(4)

Activity	Duration (mins)	Predecessor
Make Menu	30	-
Shop for Ingredients	60	Make Menu
Prepare Ingredients	60	Shop for Ingredients
Prepare Appetizers	60	Shop for Ingredients
Cook Food	30	Prepare Ingredients
Wash Tableware	45	Make Menu
Set Table	15	Wash Tableware
Serve Dinner	0	Set Table, Cook Food, Prepare Appetizers

9. Fill in the gaps of the following 'Invitation for Tender' notice: (2)

....	Ministry of Home Affairs
....	Government of Bangladesh
....	Open Tendering Method (OTM)
....	Civil, Sanitary Electrification and Ancillary Works
....	11 February 2014
....	12 February 2014 12.00 pm
....	12 February 2014 03.00 pm
....	The invitation for tender is open to all eligible tenderers as mentioned below: (a) Having experience in successful completion/execution of at least one number of similar nature of building construction work including civil, sanitary and electrical works worth not less that Tk 150 lac only in single tender in govt/semi govt./autonomous organization of Bangladesh (b)The tenderer shall have a minimum average annual construction turnover of 300 lac during the last 3 yrs
....	Tk 1500.00
....	Tk 750,000.00
....	12 months
....	Md. Uzir Ali Executive Engineer PWD Division, Rajshahi

Total length of pipe = 3500 ft.

Friction factor = 0.01

Efficiency = 65%

The necessary equations/data are given below:

1. 1 gallon = 3.785 L = 0.003785 m^3 = 0.134 ft^3 ;   2. 1 m^3 = 1000L

2.

Nominal Screen size (ID) inch	Intake areas in sq inch per linear foot of screen			
	Slot No. 10 (0.01″)	Slot No. 20 (0.02″)	Slot No. 40 (0.04″)	Slot No. 60 (0.06″)
1¼—TS	10	16	26	32
1½ PS	13	22	36	45
2—PS	14	25	41	50
3—TS	15	26	42	52
2½ – PS	17	30	48	59
3—PS	20	34	54	68
4—TS	21	35	56	71
4—PS	23	44	68	86

3. For the infinitesimal stress block diagram use Mohr's circle to calculate the
   a) Normal and shear stresses at the plane indicated in figure.
   b) Principal stresses and their plane.
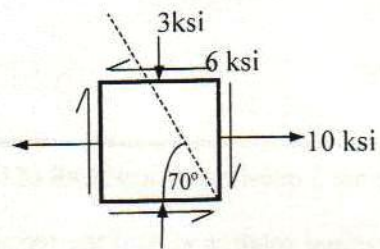

Figure 3

5. Make sentences with any *two (02)* of the following pairs of words: 02

    (a) Discover   (b) Crime   (c) Bookish
        Invent   Sin   Learned

6. Write one synonym and one antonym of any *two (02)* of the following words and make sentences
with those synonyms and antonyms: 04

    (a) Assist
    (b) Brutal
    (c) Conceal

7. Make sentences with any *six (06)* of the following phrases: 03

    (a) In black and white
    (b) Fight tooth and nail
    (c) To have a cold feet
    (d) The blink of an eye
    (e) Keep an eye on
    (f) Fish out of water
    (g) Play with fire
    (h) To save one's skin

6. Using Meyer's formulae, determine the average daily evaporation from a reservoir having area of   (5)
   250 hectares. For the reservoir following data were found,

   The saturated vapor pressure=17.54 mm Hg

   Relative humidity= 60%

   Wind velocity at 1m above ground=16 km/hr

7. Five rain gauges located within a rectangular area with four corners at (0,0),(20,0),(0,20) and   (7)
   (20,20) have the following coordinates and rainfall;

Rain-gauge location	Rainfall(cm)
(0,0)	20
(0,20)	15
(20,0)	30
(10,10)	15
(20,20)	10

   All coordinates are expressed in kilometer. Calculate the average precipitation in the area by
   Theissen polygon method.

8. A storm with 15cm precipitation produced a direct runoff of 6 cm. Given the time distribution of   (8)
   storm as bellow, estimate Ø-index of the storm,

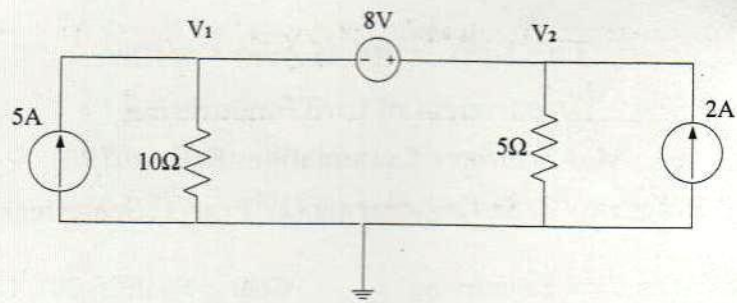 | Time (h) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
   | --- | --- | --- | --- | --- | --- | --- | --- | --- |
   | Incremental rainfall in each hour (cm) | 0.5 | 2 | 2.5 | 3 | 2.5 | 2 | 1.9 | 0.6 |

Figure 2(a)

b. Use mesh analysis to find V_{ab} and i_o in the circuit shown in figure 2(b)   [10]
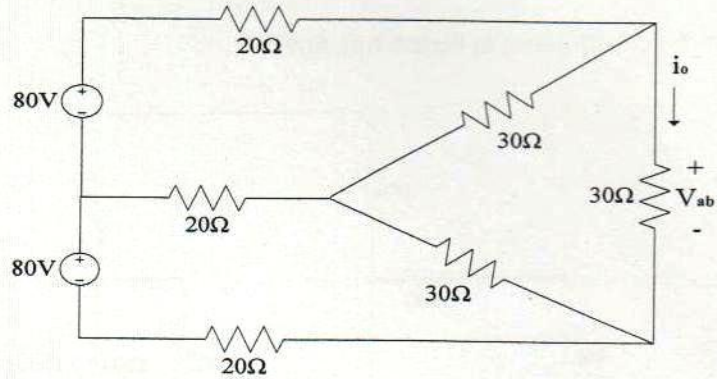

Figure 2(b)

3. a. Calculate i_x and the power dissipated by the 10Ω resistor using superposition for the circuit shown in figure 3(a)   [10]
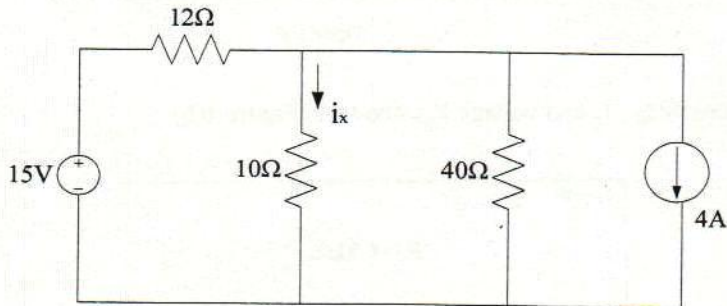

Figure 3(a)

b. Use source transformation to find V_o in the circuit shown in figure 3(b)   [10]
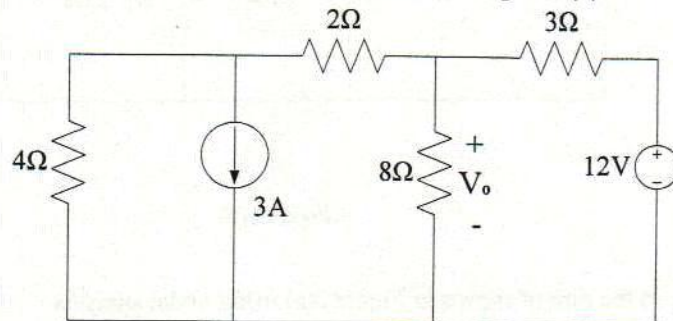

Figure 3(b)

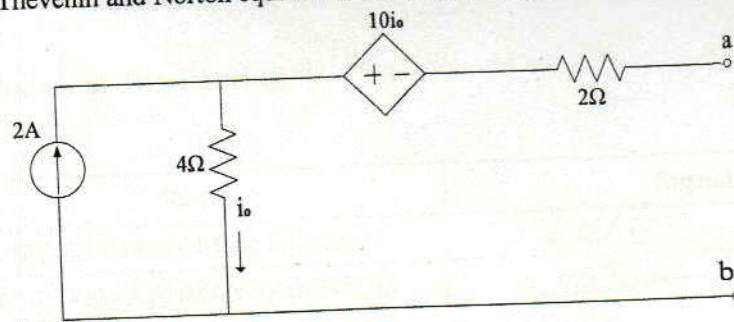Determine the Thevenin and Norton equivalent circuits for circuit shown in Figure 4(a)   [10]

Figure 4(a)

[10]

b.   Write Short notes on the following terms,
     i.   KCL
     ii. KVL
     iii. Short Circuit
     iv. Node

reduction in bearing against channel and against gusset plate? Given: Thickness of web of the C10x30 channel=0.673". Resistance Factor φ=0.75 & Nominal Shear Strength of bolts=60 ksi. Resistance Factor φ=0.75 & Nominal Strength in Bearing of bolts=2.4F_u , if end distance 1.5d and center to center distance of bolts is maintained at 3d. End distance for sheared edge is required to be 1¼" minimum.   6⅔
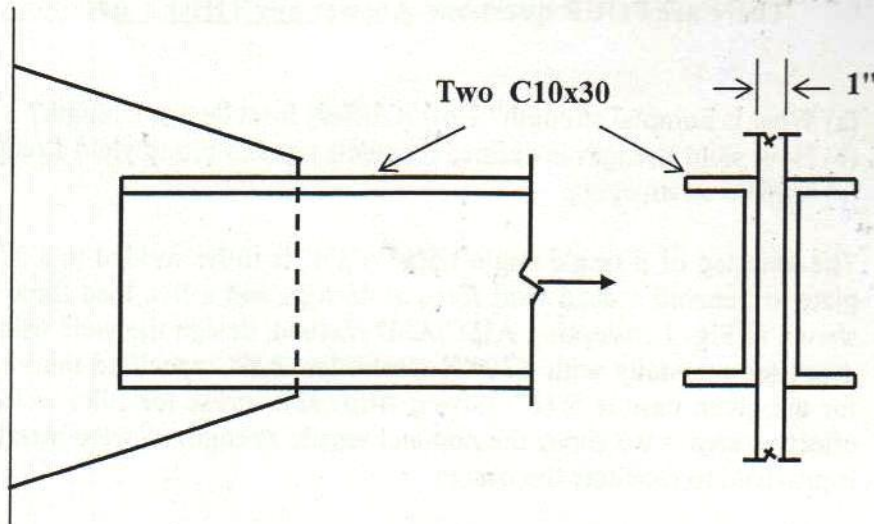

Two C10x30 $\leftarrow$ 1"

Fig. 2

4.   The 5-in. leg of a steel angle (L5″x3″x⅜″) tension member 15 ft long is connected to the ½-in. thick gusset plate as shown in Fig. 3 using 5/16-in. fillet weld deposited with E70XX electrode. Check for slenderness limit and determine the allowable tension load by AISC/ASD method considering (a) tension of the angle (b) tension of the gusset plate and (c) block shear of the connection. Given: All material is A242 steel with F_y=50 ksi and F_u=70 ksi. Given: U=0.85. See Annexure-1 for other data.   6 ⅔

A   5/16″ weld

1/2″ thick
gusset plate

8″

P

6″

A

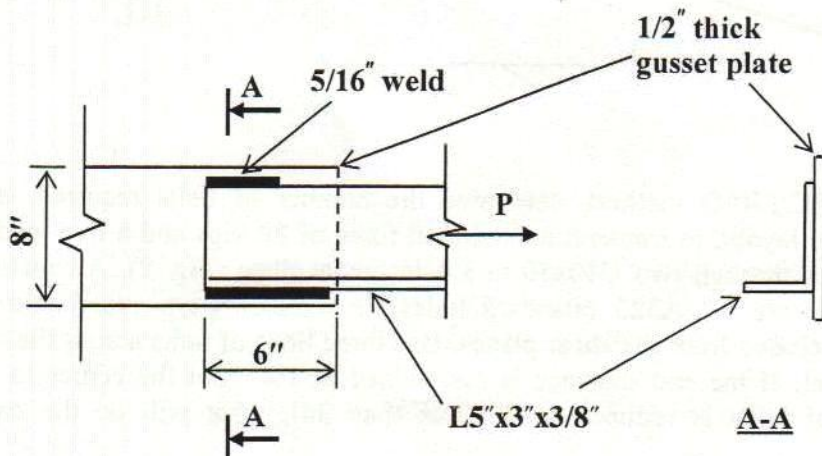L5″x3″x3/8″   A-A   Fig. 3

3.   There are two types of decisions - programmed and non-programmed. Define those with examples.

(2)

4.   Fill in the gaps of the following diagram and give examples of each cluster.

(2)

EFFICIENCY

	LOW	HIGH
HIGH	.... Example:..............................	.... Example:.............................. ....
LOW	.... Example:..............................	.... .Example:............................. ....

EFFECTIVENESS