# Department of Civil Engineering
# Midterm Examination Fall 2015

Course # : CE-203 | Course Title: Engineering Geology & Geomorphology
Full Marks: 45 (4 X 15 = 45) | Time: 1 hour

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

**1a)** What is geomorphology? Distinguish between sediment and sedimentary rock. 5

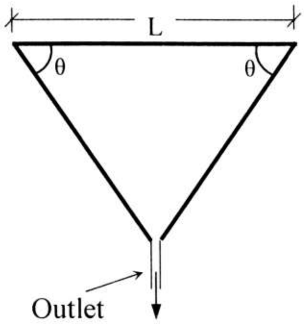
**1b)** Classify principal zones of the earth from geologic point of view. Write down the thicknesses (no sketch required) of different parts of lithosphere. 5

**1c)** Give two examples of each type of primary rock and sediment. 2

**1d)** Mention (names only) different geomorphic processes based on origin. 3

**2a)** Distinguish between physical and chemical weathering processes. Also distinguish between weathering and erosion. 3+3=6

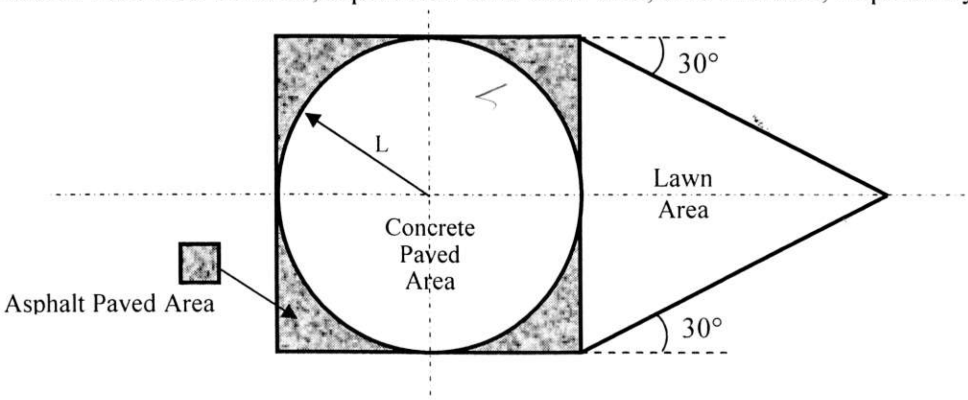
**2b)** For the following basin, find the value of $\theta$ that would create maximum runoff. Also calculate the FF and CC of the basin. 9




**3a)** Write down (no description required) the factors affecting runoff. 4

**3b)** Define precipitation and percolation. 2

**3c)** Calculated Peak runoff ($Q_p$) for the conditions of the following facility is 4.15 $m^3$/min. Calculate L (L is in yard). Consider intensity of rainfall for the whole area 1.25 in/hr and coefficient of runoff for concrete, asphalt and lawn areas 0.85, 0.75 and 0.25, respectively. 9




**4a)** Write down any three assumptions used in Rational Formula. 3

**4b)** What is diastraphism? Write brief notes on different rock structures produced by diastraphic forces. 5

**4c)** With the aid of a neat sketch show different parts of a typical fold geometry. 4

**4d)** Classify fold and draw a neat sketch of any one of them. 3

**University of Asia Pacific**
**Department of Civil Engineering**
**Mid Semester Examination Fall 2015**
**Program: B. Sc. Engineering (Civil)**

Course Title: Numerical Analysis & Computer Programming — Course Code: CE 205
Time: 1 hour — Full Marks: 40 (= 10 × 4)

---

Answer **any 4 (FOUR)** of the following questions.

1. Find the cube root of 54 by Newton-Raphson Method using the initial approximation of $x_0 = 2$. Use the accuracy of 0.0001. 10

2. Find the root of the equation $x^3 - 3x + 1 = 0$ between the interval $[1, 2]$ by Iteration Method using the accuracy of 0.0001. 10

3. Solve the following system of equations using Jacobi Method. Assume the initial values are $x = 0$, $y = 0$ and $z = 0$. Perform up to 12 iterations. 10

$$\begin{aligned} 5x + 2y + z &= 8 \\ 2x + 5y + 2z &= 1 \\ x + 3y - 5z &= 25 \end{aligned}$$

4. Fit a straight line ($y = a + bx$) to the following data using Principle of Least Squares. 10

| $x$ | 1 | 3 | 4 | 5 | 6 | 8 |
|---|---|---|---|---|---|---|
| $y$ | 2 | 6 | 11 | 21 | 34 | 65 |

5. The following table gives the distances in nautical miles of the visible horizon for the given heights in feet above the earths surface. 10

| $x$ = height | 100 | 150 | 200 | 250 | 300 | 350 | 400 |
|---|---|---|---|---|---|---|---|
| $y$ = distance | 10.63 | 13.03 | 15.04 | 16.81 | 18.42 | 19.90 | 21.27 |

Find the value of $y$, when $x = 218$. Use Newton's Forward Difference Method.

# University of Asia Pacific
# Department of Civil Engineering
# Mid Semester Examination Fall 2015 (Set A1)

Course #: CE 213 — Course Title: Mechanics of Solids II

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

1. Fig. 1 shows the frame system *abcdefghi* supporting the top of a classroom chair, which carries uniformly distributed load 1 lb/in$^2$.

   Frame *abcd* supports the load on the area $A_1$ only.

   Calculate the maximum torsional rotation of member *cd* if the cross-section of *abcd* is

   (i) Section 1 and

   (ii) Section 2 (with small slit)

   [Given: $G$ = 12000 ksi]..

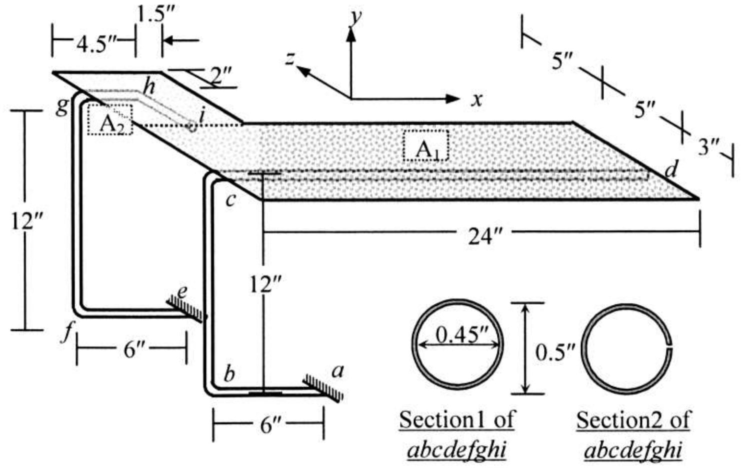



Fig. 1

2. For the frame system supporting the top of a classroom chair carrying uniformly distributed load 1 lb/in$^2$ (as shown in Fig. 1), the frame *efghi* supports load on area $A_2$ only.

   Calculate the maximum normal stress in the member *fg* if the cross-section of *efghi* is Section 1.

3. Fig. 2 shows a rigid beam *abc* supported on helical springs *a*, *b* and subjected to uniformly distributed load 1 k/ft and concentrated force *P* at distance *x* from *a*.

   (i) Determine the values of force *P* and distance *x* to ensure that the springs *a* and *b* deflect the same amount

   (ii) Calculate the corresponding deflection and combined shear stress in the springs

   [Given: Springs *a* and *b* have the same coil diameter = 1″, mean radius of spring = 3″, number of coils = 5, shear modulus = 12000 ksi].

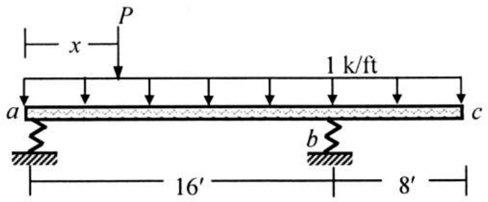



Fig. 2

4. Fig. 3(i) shows a group of Mohr's circles with the same value of principal stress $\sigma_2$. If they represent elements at various depths in water [Fig. 3(ii)] subjected to hydrostatic pressure $\sigma_{xx} = \sigma_{yy} = -\gamma h$ (for various values of $h$) as well as shear stress ($\tau_{xy}$), determine the
   (i) Principal stress $\sigma_1$ and (ii) Radius of Mohr's circle.

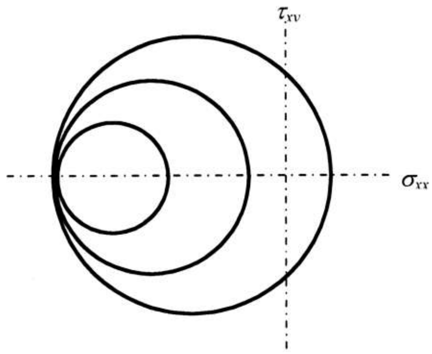



Fig. 3(i)

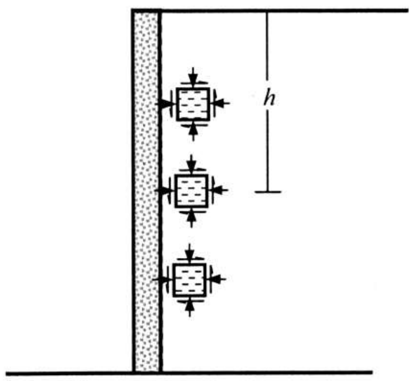



Fig. 3(ii)

# List of Useful Formulae for CE 213

* Torsional Rotation $\phi_B - \phi_A = \int(T/J_{eq}G)\,dx$, and $= (TL/J_{eq}G)$, if T, $J_{eq}$ and G are constants

| Section | Torsional Shear Stress | $J_{eq}$ |
|---|---|---|
| Solid Circular | $\tau = Tc/J$ | $\pi d^4/32$ |
| Thin-walled | $\tau = T/(2A\, t)$ | $4A^2/(\int ds/t)$ |
| Rectangular | $\tau = T/(\alpha bt^2)$ | $\beta bt^3$ |

| b/t | 1.0 | 1.5 | 2.0 | 3.0 | 6.0 | 10.0 | $\infty$ |
|---|---|---|---|---|---|---|---|
| $\alpha$ | 0.208 | 0.231 | 0.246 | 0.267 | 0.299 | 0.312 | 0.333 |
| $\beta$ | 0.141 | 0.196 | 0.229 | 0.263 | 0.299 | 0.312 | 0.333 |

* Normal Stress (along x-axis) due to Biaxial Bending (about y- and z-axis): $\sigma_x(y, z) = M_z\, y/I_z + M_y\, z/I_y$
* Normal Stress (along x-axis) due to Combined Axial Force (along x-axis) and Biaxial Bending (about y- and z-axis): $\sigma_x(y, z) = P/A + M_z\, y/I_z + M_y\, z/I_y$
* Corner points of the kern of a Rectangular Area are (b/6, 0), (0, h/6), (−b/6, 0), (0, −h/6)

* Maximum shear stress on a Helical spring: $\tau_{max} = \tau_{direct} + \tau_{torsion} = P/A + Tr/J = P/A\,(1 + 2R/r)$
* Stiffness of a Helical spring is $k = Gd^4/(64R^3N)$

* $\sigma_{xx}' = (\sigma_{xx} + \sigma_{yy})/2 + \{(\sigma_{xx} - \sigma_{yy})/2\}\cos 2\theta + (\tau_{xy})\sin 2\theta = (\sigma_{xx} + \sigma_{yy})/2 + \sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}\cos(2\theta - \alpha)$
  $\tau_{xy}' = -\{(\sigma_{xx} - \sigma_{yy})/2\}\sin 2\theta + (\tau_{xy})\cos 2\theta = -\sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}\sin(2\theta - \alpha)$
  where $\tan\alpha = 2\tau_{xy}/(\sigma_{xx} - \sigma_{yy})$
* $\sigma_{xx(max)} = (\sigma_{xx} + \sigma_{yy})/2 + \sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}$; when $\theta = \alpha/2,\ \alpha/2 + 180°$
  $\sigma_{xx(min)} = (\sigma_{xx} + \sigma_{yy})/2 - \sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}$; when $\theta = \alpha/2 \pm 90°$
* $\tau_{xy(max)} = \sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}$; when $\theta = \alpha/2 - 45°,\ \alpha/2 + 135°$
  $\tau_{xy(min)} = -\sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}$; when $\theta = \alpha/2 + 45°,\ \alpha/2 - 135°$

* Mohr's Circle: Center $(a, 0) = [(\sigma_{xx} + \sigma_{yy})/2, 0]$ and Radius $R = \sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}$

* Maximum Normal Stress Theory (Rankine): $|\sigma_1| \geq Y$, or $|\sigma_2| \geq Y$
* Maximum Normal Strain Theory (St. Venant): $|\sigma_1 - \nu\sigma_2| \geq Y$, or $|\sigma_2 - \nu\sigma_1| \geq Y$
* Maximum Shear Stress Theory (Tresca): $|\sigma_1 - \sigma_2| \geq Y$, $|\sigma_1| \geq Y$, or $|\sigma_2| \geq Y$
* Maximum Distortion-Energy Theory (Von Mises): $\sigma_1^2 + \sigma_2^2 - \sigma_1\sigma_2 = Y^2$

$\boxed{\text{To cause yielding}}$

# University of Asia Pacific
# Department of Civil Engineering
# Mid Semester Examination [redacted] 2015 (Fall)
# Program: B.Sc. Engineering (Civil)

**Section B (Set 2)**

Course Code: CE 213 — Course Title: Mechanics of Solids II

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

---

1. Calculate the combined normal stresses at the four corners (a, b, c and d) of the fixed end section at A of the beam loaded as shown in ***Figure 1***. Also calculate the combined shear stress for the spring. [Given: Coil diameter = 40 mm, Average spring radius = 100 mm, Number of coils = 10 and Shear modulus = 84 GPa.]

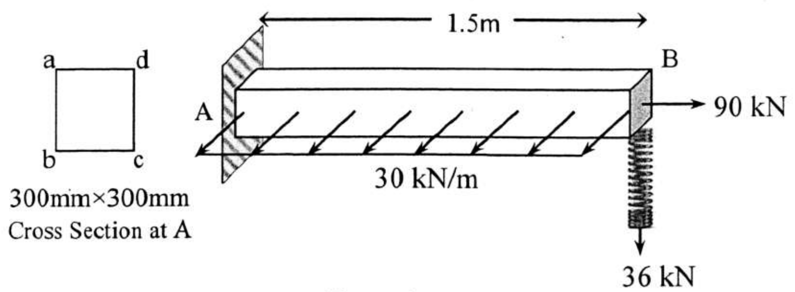



***Figure 1***

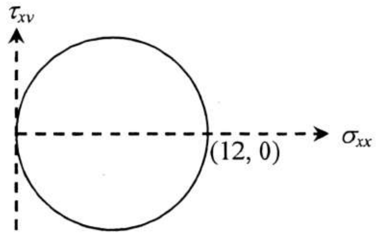



***Figure 2***

2. ***Figure 2*** shows a Mohr's circle of stress (kN/m$^2$). Calculate
   (a) Principal stresses
   (b) $\sigma_{xx}$ and $\tau_{xy}$ if $\sigma_{yy} = 4$ kN/m$^2$
   (c) Normal and shear stresses ($\sigma_{xx}'$ *and* $\tau_{xy}'$) acting on a plane defined by $\theta = 45°$

3. A compound shaft consisting of a steel segment and an aluminium segment is acted upon by two torques as shown in ***Figure 3***. Determine the maximum permissible value of T subject to the following conditions: $\tau_{steel} \leq 12$ ksi, $\tau_{aluminium} \leq 8$ ksi, and the angle of rotation of the free end is limited to 6°. For steel, G = 12,000 ksi and for aluminium, G = 4,000 ksi.

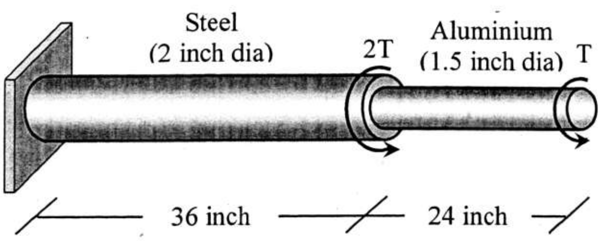



***Figure 3***

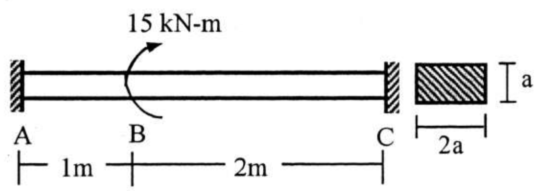



***Figure 4***

4. Calculate the required dimension 'a' of the rectangular rod ABC shown in the ***Figure 4*** if allowable shear stress is 140 MPa. For the dimension 'a', calculate the maximum angle of twist in the rod [G = 84 GPa].

## List of Useful Formulae for CE 213

* Torsional Rotation $\phi_B - \phi_A = \int (T/J_{eq}G)\, dx$, and $= (TL/J_{eq}G)$, if T, $J_{eq}$ and G are constants

| Section | Torsional Shear Stress | $J_{eq}$ |
|---|---|---|
| Solid Circular | $\tau = Tc/J$ | $\pi d^4/32$ |
| Thin-walled | $\tau = T/(2 A\, t)$ | $4 A^2/(\int ds/t)$ |
| Rectangular | $\tau = T/(\alpha b t^2)$ | $\beta b t^3$ |

| b/t | 1.0 | 1.5 | 2.0 | 3.0 | 6.0 | 10.0 | $\infty$ |
|---|---|---|---|---|---|---|---|
| $\alpha$ | 0.208 | 0.231 | 0.246 | 0.267 | 0.299 | 0.312 | 0.333 |
| $\beta$ | 0.141 | 0.196 | 0.229 | 0.263 | 0.299 | 0.312 | 0.333 |

* Normal Stress (along x-axis) due to Biaxial Bending (about y- and z-axis): $\sigma_x(y, z) = M_z\, y/I_z + M_y\, z/I_y$
* Normal Stress (along x-axis) due to Combined Axial Force (along x-axis) and Biaxial Bending (about y- and z-axis): $\sigma_x(y, z) = P/A + M_z\, y/I_z + M_y\, z/I_y$
* Corner points of the kern of a Rectangular Area are (b/6, 0), (0, h/6), (–b/6, 0), (0, –h/6)

* Maximum shear stress on a Helical spring: $\tau_{max} = \tau_{direct} + \tau_{torsion} = P/A + Tr/J = P/A\,(1 + 2R/r)$
* Stiffness of a Helical spring is $k = Gd^4/(64R^3N)$

* $\sigma_{xx}' = (\sigma_{xx} + \sigma_{yy})/2 + \{(\sigma_{xx} - \sigma_{yy})/2\} \cos 2\theta + (\tau_{xy}) \sin 2\theta = (\sigma_{xx} + \sigma_{yy})/2 + \sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]} \cos (2\theta - \alpha)$
  $\tau_{xy}' = -\{(\sigma_{xx} - \sigma_{yy})/2\} \sin 2\theta + (\tau_{xy}) \cos 2\theta = -\sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]} \sin (2\theta - \alpha)$
  where $\tan \alpha = 2\tau_{xy}/(\sigma_{xx} - \sigma_{yy})$
* $\sigma_{xx(max)} = (\sigma_{xx} + \sigma_{yy})/2 + \sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}$; when $\theta = \alpha/2,\ \alpha/2 + 180°$
  $\sigma_{xx(min)} = (\sigma_{xx} + \sigma_{yy})/2 - \sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}$; when $\theta = \alpha/2 \pm 90°$
* $\tau_{xy(max)} = \sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}$; when $\theta = \alpha/2 - 45°,\ \alpha/2 + 135°$
  $\tau_{xy(min)} = -\sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}$; when $\theta = \alpha/2 + 45°,\ \alpha/2 - 135°$
* Mohr's Circle: Center $(a, 0) = [(\sigma_{xx} + \sigma_{yy})/2, 0]$ and Radius $R = \sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}$

$$\left.\begin{array}{l}
\text{* Maximum Normal Stress Theory (Rankine): } |\sigma_1| \geq Y, \text{ or } |\sigma_2| \geq Y \\
\text{* Maximum Normal Strain Theory (St. Venant): } |\sigma_1 - \nu\sigma_2| \geq Y, \text{ or } |\sigma_2 - \nu\sigma_1| \geq Y \\
\text{* Maximum Shear Stress Theory (Tresca): } |\sigma_1 - \sigma_2| \geq Y,\ |\sigma_1| \geq Y, \text{ or } |\sigma_2| \geq Y \\
\text{* Maximum Distortion-Energy Theory (Von Mises): } \sigma_1^2 + \sigma_2^2 - \sigma_1\sigma_2 = Y^2
\end{array}\right\} \boxed{\text{To cause yielding}}$$

University of Asia Pacific
**Department of Civil Engineering**
**Mid Semester Examination ~~Spring~~ 2015 (Fall)**
**Program: B.Sc. Engineering (Civil)**

**Section B (Set 1)**

Course Code: CE 213 | Course Title: Mechanics of Solids II
Full Marks: 40 (= 4 × 10) | Time: 1 hour

1. A compound shaft consisting of a steel segment and an aluminium segment is acted upon by two torques as shown in ***Figure 1***. Determine the maximum permissible value of T subject to the following conditions: $\tau_{steel} \leq 84$ MPa, $\tau_{aluminium} \leq 55$ MPa, and the angle of rotation of the free end is limited to 6°. For steel, G = 84 GPa and for aluminium, G = 28 GPa.

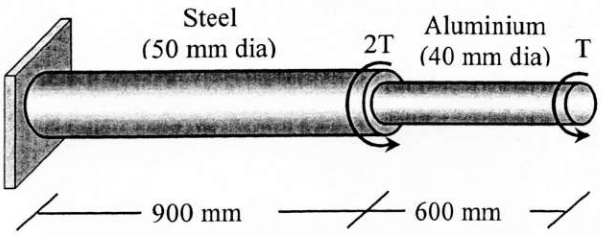



***Figure 1***

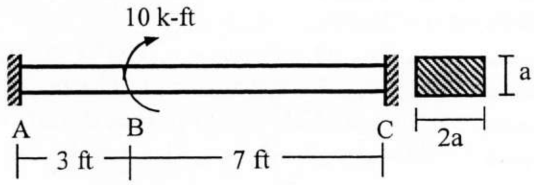



***Figure 2***

2. Calculate the required dimension 'a' of the rectangular rod ABC shown in the ***Figure 2*** if allowable shear stress is 20 ksi. For the dimension 'a', calculate the maximum angle of twist in the rod [G = 12000 ksi].

3. Calculate the combined normal stresses at the four corners (a, b, c and d) of the fixed end section at A of the beam loaded as shown in ***Figure 3***. Also calculate the combined shear stress for the spring. [Given: coil diameter = 1.5 in, average spring radius = 4 in, number of coils = 10 and shear modulus = 12000 ksi.]

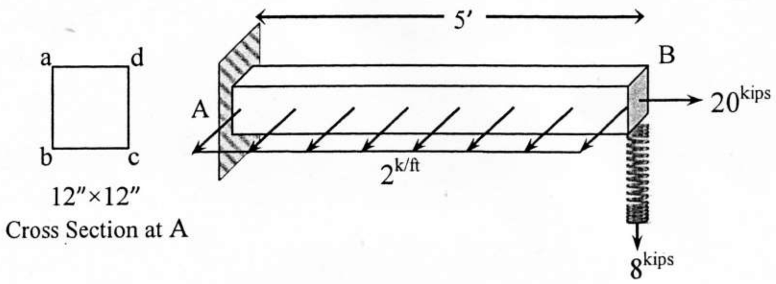



***Figure 3***

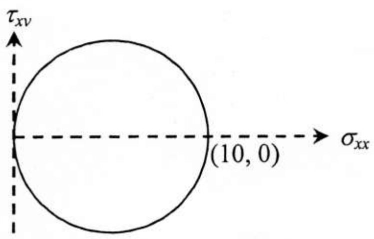



***Figure 4***

4. ***Figure 4*** shows a Mohr's circle of stress (ksi). Calculate
   (a) Principal stresses
   (b) $\sigma_{xx}$ and $\tau_{xy}$ if $\sigma_{yy} = 3$ ksi
   (c) Normal and shear stresses ($\sigma_{xx}'$ *and* $\tau_{xy}'$) acting on a plane defined by θ = 30°

# List of Useful Formulae for CE 213

* Torsional Rotation $\phi_B - \phi_A = \int (T/J_{eq}G)\,dx$, and $= (TL/J_{eq}G)$, if T, $J_{eq}$ and G are constants

| Section | Torsional Shear Stress | $J_{eq}$ |
|---|---|---|
| Solid Circular | $\tau = Tc/J$ | $\pi d^4/32$ |
| Thin-walled | $\tau = T/(2A\,t)$ | $4A^2/(\int ds/t)$ |
| Rectangular | $\tau = T/(\alpha b t^2)$ | $\beta b t^3$ |

| b/t | 1.0 | 1.5 | 2.0 | 3.0 | 6.0 | 10.0 | $\infty$ |
|---|---|---|---|---|---|---|---|
| $\alpha$ | 0.208 | 0.231 | 0.246 | 0.267 | 0.299 | 0.312 | 0.333 |
| $\beta$ | 0.141 | 0.196 | 0.229 | 0.263 | 0.299 | 0.312 | 0.333 |

* Normal Stress (along x-axis) due to Biaxial Bending (about y- and z-axis): $\sigma_x(y, z) = M_z\, y/I_z + M_y\, z/I_y$
* Normal Stress (along x-axis) due to Combined Axial Force (along x-axis) and Biaxial Bending (about y- and z-axis): $\sigma_x(y, z) = P/A + M_z\, y/I_z + M_y\, z/I_y$
* Corner points of the kern of a Rectangular Area are (b/6, 0), (0, h/6), (−b/6, 0), (0, −h/6)
* Maximum shear stress on a Helical spring: $\tau_{max} = \tau_{direct} + \tau_{torsion} = P/A + Tr/J = P/A\,(1 + 2R/r)$
* Stiffness of a Helical spring is $k = Gd^4/(64R^3N)$
* $\sigma_{xx}' = (\sigma_{xx} + \sigma_{yy})/2 + \{(\sigma_{xx} - \sigma_{yy})/2\}\cos 2\theta + (\tau_{xy})\sin 2\theta = (\sigma_{xx} + \sigma_{yy})/2 + \sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}\cos(2\theta - \alpha)$
  $\tau_{xy}' = -\{(\sigma_{xx} - \sigma_{yy})/2\}\sin 2\theta + (\tau_{xy})\cos 2\theta = -\sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}\sin(2\theta - \alpha)$
  where $\tan\alpha = 2\tau_{xy}/(\sigma_{xx} - \sigma_{yy})$
* $\sigma_{xx(max)} = (\sigma_{xx} + \sigma_{yy})/2 + \sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}$; when $\theta = \alpha/2,\ \alpha/2 + 180°$
  $\sigma_{xx(min)} = (\sigma_{xx} + \sigma_{yy})/2 - \sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}$; when $\theta = \alpha/2 \pm 90°$
* $\tau_{xy(max)} = \sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}$; when $\theta = \alpha/2 - 45°,\ \alpha/2 + 135°$
  $\tau_{xy(min)} = -\sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}$; when $\theta = \alpha/2 + 45°,\ \alpha/2 - 135°$
* Mohr's Circle: Center (a, 0) = $[(\sigma_{xx} + \sigma_{yy})/2,\ 0]$ and Radius $R = \sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}$

$$\left.\begin{array}{l}
\text{* Maximum Normal Stress Theory (Rankine): } |\sigma_1| \geq Y, \text{ or } |\sigma_2| \geq Y \\
\text{* Maximum Normal Strain Theory (St. Venant): } |\sigma_1 - \nu\sigma_2| \geq Y, \text{ or } |\sigma_2 - \nu\sigma_1| \geq Y \\
\text{* Maximum Shear Stress Theory (Tresca): } |\sigma_1 - \sigma_2| \geq Y,\ |\sigma_1| \geq Y, \text{ or } |\sigma_2| \geq Y \\
\text{* Maximum Distortion-Energy Theory (Von Mises): } \sigma_1^2 + \sigma_2^2 - \sigma_1\sigma_2 = Y^2
\end{array}\right\} \boxed{\text{To cause yielding}}$$

# University of Asia Pacific
# Department of Civil Engineering
# Mid-Term Examination Fall 2015
# Program: B.Sc. Engineering (Civil)

Course Title: Fluid mechanics | Course Code: CE 221
Time: 1 hour | Full Marks: 60

---

There are **four** questions. Answer any **three**.

1. (a) Briefly explain the application of fluid mechanics in Civil Engineering. [05]

   (b) A certain fluid weights 80 kN and occupies 10 $m^3$. Determine unit weight and specific gravity of the fluid. [05]

   (d) A fluid is confined between two plates. Upper plate is moving and lower plate is at rest. Thickness of the fluid is 4ft. Velocity distribution of the fluid is expressed as $V = 80\text{-}k(4\text{-}y)^2$ where y is distance from lower plate in feet and V is velocity in ft/s. Find velocity gradient and shear stress at upper and lower plate. The fluid has dynamic viscosity of 1.5 stoke and specific gravity of 1.25. [10]

2. (a) Prove that hydrostatic pressure at a point is same in all directions. [08]

   (b) Draw the hydrostatic pressure variation on the inclined surface AB shown in figure 2(b). Also find the value and location of total hydrostatic force on that inclined Surface. All values in the figure 2(b) are in meter. [Unit weight of fluid=12.0 kN/$m^3$, width of AB is 10 m. [12]

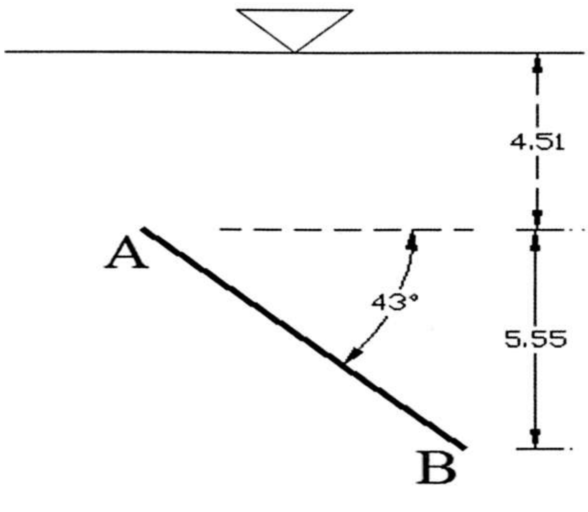



**Figure 2(b)**

3. (a) Prove that center of pressure of a submerged plane surface is independent of unit weight of the liquid. [07]

   (b) Gage pressure of point A is 175 $kN/m^2$. Find the absolute pressure of point B. Use the manometer reading shown in figure 3(b). [10]

   (c) Define absolute and gage pressure. Differentiate between them. [03]

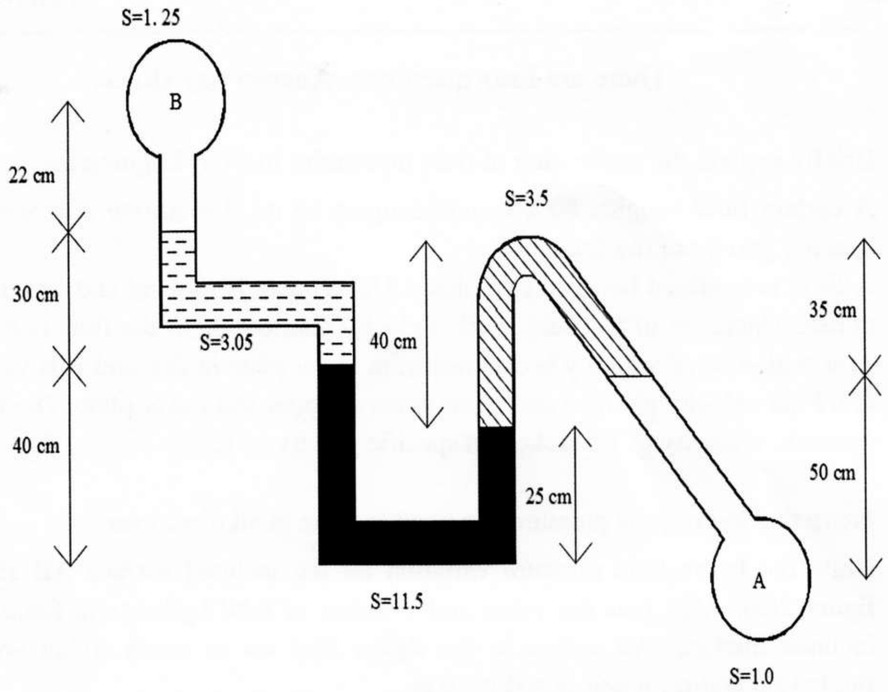



**Figure 3(b)**

4. (a) What is flow net? Draw a typical flow net diagram. [05]

   (b) Differentiate between [05]

      i. Steady and Unsteady flow

      ii. Uniform and Non-uniform flow

   (c) In a flow, the velocity vector is expressed by V= -6xi-9yj+3zk. Determine the equation of the streamline. Streamline passes through a point A (4, 5, 12). [10]

# University of Asia Pacific
## Department of Civil Engineering
## Mid-Term Examination Fall-2015
## Program: B.SC Engineering (2nd year/2nd Semester)

Course Title- Principles of Economics | Course Code: ECN 201 | Credits: 2.00

Time- 1 Hour | Full Marks- 30

Answer any three from the following four questions. Figures in the right margin indicate marks.

1. (a) What is market demand? Explain with the help of Curve. (2)
   (b) Explain the determinants of market demand. (8)

2. (a) Define market equilibrium with the help of diagram. (5)
   (b) Write down the effects of Surplus and Shortage with examples. (5)

3. Jenny's Utility Maximization Table: (4+3+3)

| Consumption of Coffee (Price $1) | | | | Consumption of Biscuits (Price $2) | | | |
|---|---|---|---|---|---|---|---|
| Units | Total Utility | Marginal Utility | Marginal Utility per $ | Units | Total Utility | Marginal Utility | Marginal Utility per $ |
| 0 | 0 | - | - | 0 | 0 | - | - |
| 1 | 12 | - | - | 1 | 16 | - | - |
| 2 | 20 | - | - | 2 | 28 | - | - |
| 3 | 24 | - | - | 3 | 36 | - | - |
| 4 | 26 | - | - | 4 | 40 | - | - |

   (a) Copy and complete the table, showing the utility Jenny gains from both products.
   (b) Find the combination of Coffee and Biscuits that maximizes Jenny's utility if her total expenditure on these two products is $4. Explain your answer using the utility maximizing rule and diagram.
   (c) If Jenny's total expenditure on products Coffee and Biscuits rises to $9 while the prices of Coffee and Biscuits remain unchanged, what is her new utility maximizing combination of Coffee and Biscuits? Explain your answer and show the resulted diagram.

4. Write short Notes: (2x5=10)
   (a) Economics
   (b) Opportunity Cost
   (c) Positive economics
   (d) Ceteris Paribus
   (e) Command Economy

# University of Asia Pacific
## Department of Basic Sciences & Humanities
## Mid Semester Examination, Fall-2015
## Program: B.Sc. Engineering (Civil)
## $2^{nd}$ Year / $2^{nd}$ Semester

| | | |
|---|---|---|
| Course Title: Mathematics-IV | Course No. MTH 203 | Credit: 3.00 |
| Time: 1.00 Hour | | Full Mark: 60 |

N.B: There are Four questions. Answer any **Three (3)** of the following:

1. (a) Define differential equation. Find the differential equation of — 10

$$y = e^x(Acosx + Bsinx)$$

   (b) Solve :$(x^2 + y^2 + x)dx + xy\, dy = 0$ — 10

2. (a) Define Integrating Factor and solve the differential equation — 10

$$\frac{dy}{dx} + \frac{1-2x}{x^2} y = 1$$

   (b) Solve the differential equation$(D^3 - D^2 - 6D)y = 1 + x^2$ — 10

3. (a) Define Cauchy-Euler equation and solve $(x^2D^2 - 3xD + 4)y = 0$ — 10

   (b) Solve : $p^2 + 2pycotx - y^2 = 0$ — 10

4. (a) Define Bernoulli's equation and solve — 10

$$\frac{dy}{dx} + x\sin 2y = x^3 \cos^2 y$$

   (b) Define Laplace transform. If $F(t) = t^n, then\ \mathcal{L}\{F(t)\} = \frac{n!}{s^{n+1}}$ — 10