2-2

UNIVERSITY OF ASIA PACIFIC
Department of Civil Engineering
Mid Term Exam, spring 2016

Course Code – ECN 201 | **Total Marks: 20**
Course Title – Principles of Economics | **Time: One Hour**
Section: A & B

Answer the following Questions:

1) Explain the individual demand and market demand of a commodity with an example. 4
2) Suppose that X & Y are the only two commodities available and Px=$2 while Py= $1; the individual's income is $12 per time period and is all spent.

Q	1	2	3	4	5	6	7	8
MU_x	16	14	12	10	8	6	4	2
MU_y	11	10	9	8	7	6	5	4

Find Out:

i. The best combination of goods that a consumer will purchase in equilibrium.
ii. The total utility from the best combination. 8

Answer any one from the following: **8**

3) Draw a circular money flow with savings and investment in an economic environment.
4) Distinguish between positive & normative economics. With example.

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Spring 2016
Program: B.Sc. Engineering (Civil)

Course Title: Numerical Analysis and Computer Programming — Course Code: CE 205

Time- 1 hour — Full marks: 20

Answer any 4 among the 6 questions.

1. Using Bisection method, determine the root of the following equation. (5)
   $x^3 -2x^2-5=0$. (Correct up to four decimal places) ($X_0=2$)

2. Using Iterative method to find the real root of following equation. (Correct up to four decimal places) ($X_0=1.5$) (5)
   $\sin^2 x=x^2-2$

3. Fit a function of the form $y= ae^{bx}$ to the following data (5)

x	1	2	3	4	5
y	1.6	4.5	13.8	40.2	125

4. For the following table of values of x and f(x),determine f(0.27) and f(0.10) (5)

x	0.2	0.22	0.24	0.26	0.28
f(x)	1.6596	1.6698	1.6804	1.6912	1.7024

5. Fit a Lagrange polynomial of 3rd Order to the following data. Also find y when $x = 3.5$ (5)

x	1	2	3	5
y	0	1	24	126

6. Find the best values of a_0, a_1, a_2 So that the parabola $y=a_0+a_1x+a_2x^2$ fits the data. (5)

x	1	1.5	2	2.5	3
y	1.1	1.2	1.5	2.6	2.8

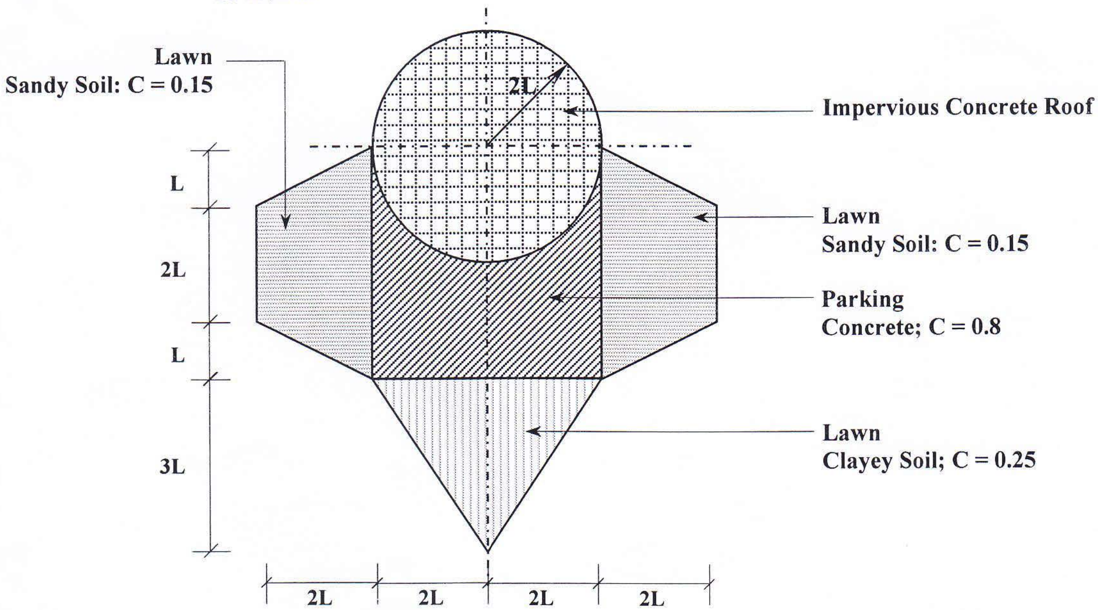
University of Asia Pacific
Department of Civil Engineering
Midterm Examination Spring 2016

Course # : CE-203 | Course Title: Engineering Geology & Geomorphology
Full Marks: 45 (3 X 15 = 45) | Time: 1 hour

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

1a)	With the aid of a schematic diagram show thicknesses of different parts of Lithosphere.	3
1b)	Draw a schematic diagram of the rock cycle and discuss (in brief) sedimentary rock according to the cycle.	5+4=9
1c)	Give three examples of each types of major rocks.	3
2a)	Define geomorphology. Classify geomorphic processes based on origin.	1.5+3=4.5
2b)	Distinguish between weathering and erosion.	3
2c)	Classify (mention names only) physical and chemical weathering processes. Discuss, in brief, any one of each process.	7.5
3a)	Define precipitation, infiltration and percolation. Write short notes on different types of runoffs. With the aid of sketch show occurrences of all these phenomena.	3+3+3=9
3b)	Distinguish between infiltration and percolation.	3
3c)	Mention (no description required) the factors affecting runoff.	3
4a)	Write short notes on one of each precipitation and basin factors affecting runoff.	3
4b)	Using the information provided below, calculate L for the catchment area as shown below.	12

Intensity of Rainfall: **1.0 inch/hour**
Q_p: **20 m^3/min**



University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Spring 2016
Program: B.Sc. Engineering (Civil)

Course Title: Fluid Mechanics — Course Code: CE 221

Time- 1 hour — Full marks: 60

Answer any 3 among the 4 questions.

1. (a) Discuss the relationship between viscosity and temperature in case of fluid. [3]
   (b) Derive the formula for Newton's equation of viscosity with net sketch. [7]
   (c) Define Specific gravity of a gas. [2]
   (d) A fluid has a dynamic viscosity of 1 poise. Calculate the velocity gradient and the intensity of shear stress at the boundary if the fluid is filled between two parallel plates 0.25m apart and one plate is moving at a velocity of 2m/s, other plate is stationary. Assume that distribution of velocity is $U=250-k(5-y)^2$ [8]
   [1 poise=$N \cdot s\ m^{-2}$]

2. (a) A pressurized vessel contains water with some air above it.as shown in figure 1. A multi manometer system is used to determine the pressure at the air-water interface, point F. Determine the gage pressure at point F in Kpa.

   Given data: h_1=0.24m,h_2=0.35m and h_3=0.52m [8]
   Assume the fluid densities are water :1000 kg/m^3, oil:790 kg/m^3 and mercury (Hg):13600 kg/m^3

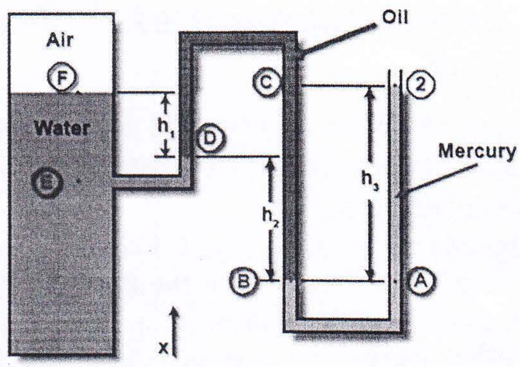
   (c) Define (i) Centre of Pressure (ii) Barometer. [4]
   (d) Prove mathematically that center of pressure and center of gravity is not same for a submerged plane surface. In which cases it becomes identical? [8]

3. (a) Discuss general types of fluid flow with their characteristics and mathematical expression. [7]
   (b) 'In steady uniform flow there is no acceleration'. Prove mathematically. [7]
   (c) What is stream line? What are the important characteristics of streamline? [4]
   (d) Define Stagnation point. [2]

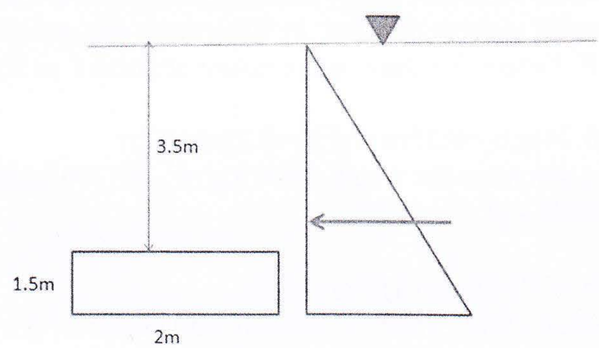
4. (a) In a flow the velocity vector is given by v= $(x^2y-xy)i+(y^2x-yx)$.determine the equation of the streamline passing through a point (5,3). [5]
   (b) A rectangular gate has a base width 2 m and 1.5 m height is in a vertical plane. This gate is immerged vertically downwards, the top side being at a depth of 3.5 m below the free surface. Find the force exerted by the oil on the gate and the position of the center of pressure.[Figure2] [7]
   (c) A certain liquid weights 75 kN and occupies $7m^3$ .Determine its specific weight, [5]

mass density and specific gravity.

(d) Write down the drawbacks of piezometer. [3]



[Figure 1] [Question 2(a)]



[Figure 2][Question 4(b)]

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Spring 2016
Program: B. Sc. Engineering (Civil)
Section B (Set 1)

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

1. In the **Fig-1** shown below, a simply supported beam EF is subjected to a uniformly distributed load and connected with a 5m long column at E with a spring support. Column is supported at base with a square footing ABCD and subjected to a concentrated load (100kN). Calculate (i) the vertical deflection of the spring E (ii) Combined normal stresses at each corner of the footing ABCD [Given: shear modulus of spring material = 12000 ksi, coil diameter = 2″, inside diameter of spring = 9″, number of coils = 10].

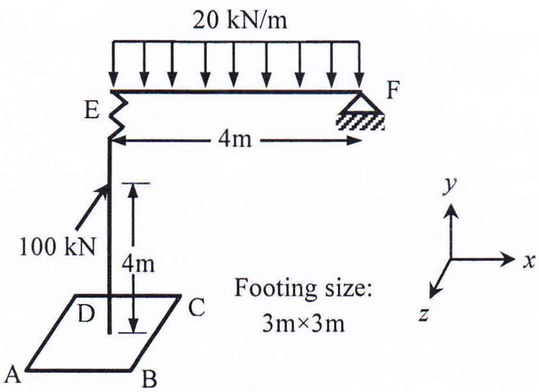


Fig-1

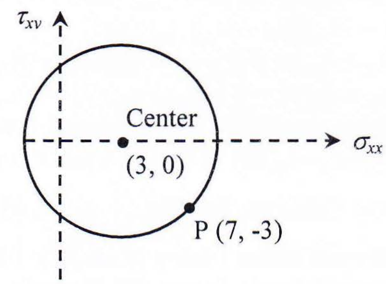


Fig-2

2. **Fig-2** shows a Mohr's circle of stress (ksi). If P is a given point on the circle. Calculate
   (a) Principle stresses
   (b) σ_{yy} and τ_{xy} if $\sigma_{xx} = 7$ ksi
   (c) normal and shear stresses (σ_{xx}' and τ_{xy}') acting on a plane defined by $\theta = 30°$

3. Considering the statically indeterminate torsional problem shown in **Fig-3**, calculate (i) the required diameters of the solid circular section (d and 2d), if maximum allowable shear stress is 10 ksi [Given: G = 12000 ksi].

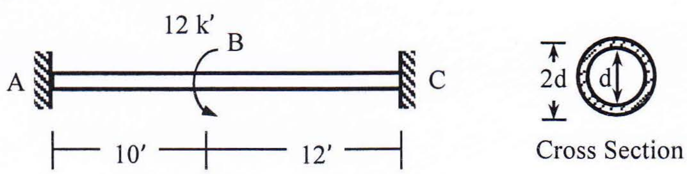


Fig-3

4. Calculate the required dimensions (b and 2b) of the rectangular section shown in **Fig-4** if the allowable shear stress in ABC is 10 ksi and the allowable angle of twist is 3° [Given: G = 12000 ksi].

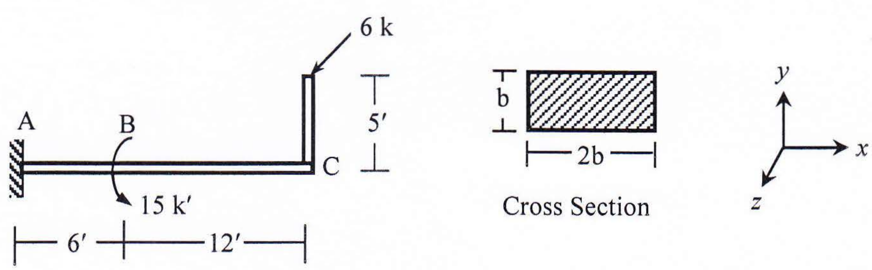


Fig-4

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	$\tau = T/(2Ⓐ\,t)$	$4Ⓐ^2/(\int ds/t)$
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	∞
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

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

} To cause yielding

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Spring 2016
Program: B. Sc. Engineering (Civil)
Section B (Set 2)

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

---

1. Calculate the required dimensions (b and 2b) of the rectangular section shown in **Fig-1** if the allowable shear stress in ABC is 12 ksi and the allowable angle of twist is 1° [Given: G = 12000 ksi].

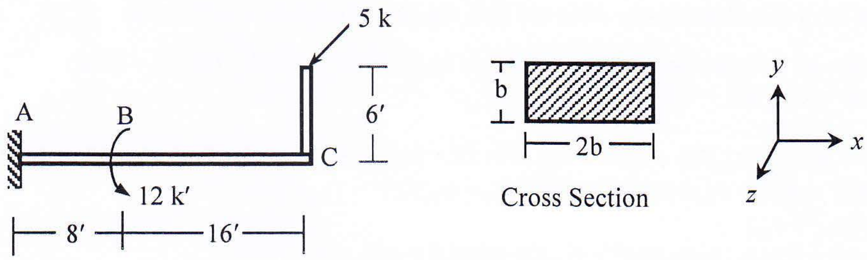


Fig-1

2. Considering the statically indeterminate torsional problem shown in **Fig-2**, calculate (i) the required diameters of the solid circular section (d and 2d), if maximum allowable shear stress is 75 MPa [Given: G = 84 GPa].

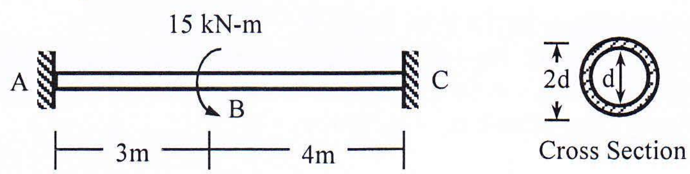


Fig-2

3. In the **Fig-3** shown below, a simply supported beam EF is subjected to a uniformly distributed load and connected with a 15 ft long column at E with a spring support. Column is supported at base with a square footing ABCD and subjected to a concentrated load (20k). Calculate (i) the vertical deflection of the spring E (ii) Combined normal stresses at each corner of the footing ABCD. [Given: shear modulus of spring material = 84 GPa, coil diameter = 40 mm, inside diameter of spring = 200 mm, number of coils = 10].

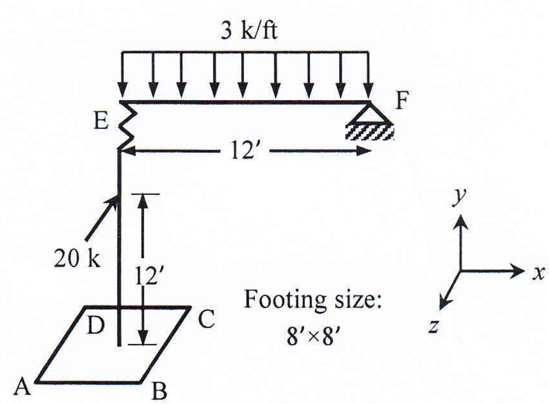


Fig-3

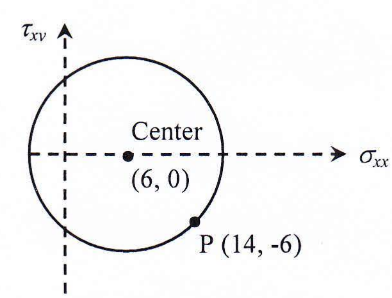


Fig-4

4. **Fig-4** shows a Mohr's circle of stress (ksi). If P is a given point on the circle. Calculate
   (a) Principle stresses
   (b) σ_{yy} and τ_{xy} if σ_{xx} = 15 ksi
   (c) normal and shear stresses (σ_{xx}' and τ_{xy}') acting on a plane defined by $\theta = -15°$

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	$\tau = T/(2\textcircled{A}\,t)$	$4\textcircled{A}^2/(\int ds/t)$
Rectangular	$\tau = T/(\alpha bt^2)$	βbt^3

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

* 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): $\sigma_1^2 + \sigma_2^2 - \sigma_1\sigma_2 = Y^2$

} To cause yielding

University of Asia Pacific
Department of Basic Sciences & Humanities
Mid Semester Examination, Spring-2016
Program: B.Sc. Engineering (Civil)
2nd Year / 2nd 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 : $x(x+y)dy = y(x-y)dx$ **10**

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

$$\cos x \frac{dy}{dx} + y \sin x = 1$$

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

3. (a) Define Bernoulli's equation and solve **10**

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

(b) Solve : $p(p^2 + xy) = p^2(x + y)$ **10**

4. (a) Define Cauchy-Euler equation and solve $(x^2D^2 - 6xD + 6)y = 0$ **10**

(b) Solve: $(D^2 - 8D + 16)x = 5cos3t$ **10**