University of Asia Pacific
Department of Basic Sciences & Humanities
Mid Semester Examination, Fall-2016
Program: B.Sc. Engineering (Civil)
2nd Year /2nd Semester

Course Title: Mathematics IV | Course Code: MTH 203 | Course credit: 3.00
Time: 1 hr | Full Marks: 60

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

1. Solve the following differential equations: **8+6+6**

(i) $x(x+y)dy = y(x-y)dx$
(ii) $(\sin y - y\sin x)dx + (\cos x + x\cos y - y)dy = 0$
(iii) $x\sqrt{1-y^2}dx + y\sqrt{1-x^2}dy = 0$

2. (a) Solve Bernoulli's equation: **10**

$$\frac{dy}{dx} = y(xy^3 - 1)$$

(b) Solve the differential equation: $(D^2 - 2D)y = e^{2x}sinx$ **10**

3. (a) Solve Cauchy-Euler equation: $(x^2D^2 - 6xD + 6)y = 0$ **10**

(b) Solve the differential equation: $(D^2 - 1)y = x^3 + x + e^{2x}$ **10**

4. (a) When a cake is removed from an oven, its temperature is measured at $190^\circ C$. Five minutes later its temperature is $150^\circ C$. What will be the temperature of the cake after 1hr? How long will it take for the cake to cool off to a temperature of $60^\circ C$? Here room temperature is $28^\circ C$. **12**

(b) Solve: $p(p^2 + xy) = p^2(x + y)$ **8**

University of Asia Pacific

Department of Civil Engineering

Mid-Semester Examination, Fall – 2016

Program: B. Sc Engineering (Second Year/ Second Semester)

Course Title: Principles of Economics Course Code: ECN 201 Credit: 2
Time: 1 hour Full Marks: 20

(Question 1 is compulsory to answer and answer any two from the question 2-4)

1. Market demand and supply schedule for apples:

Price (Tk. per kg)	Quantity Demanded (Millions of kg)	Quantity Supplied (Millions of kg)
160	3	11
140	5	9
120	7	7
100	9	5
80	11	3

i. Draw the demand and supply curve for apples.
ii. Point out the market equilibrium level of apples in the graph.
iii. What will be the effect of changes in demand and supply on equilibrium? 8 (2+1+5)

2. Production possibilities schedule for pizza and sandwich:

Production scenario	Pizza	Sandwich
a	10	0
b	9	1
c	6	2
d	0	3

i. Draw the production possibilities curve putting production of sandwich on the horizontal axis & putting production of pizza on the vertical axis.
ii. What is the opportunity cost of producing 1st pizza?
iii. Is it possible to produce 3 sandwiches and 4 pizzas? Justify your answer. 6 (2+2+2)

3.

i. Annual purchases of smart phones in a certain market are 5000 at a price of Tk. 25,000; 7000 at a price of Tk. 20000 & 8000 at a price of 15,000. So calculate producer's total revenue at each price. 3 (1+1+1)

ii. "In elastic demand a percentage change in a product's price causes a larger percentage change in quantity demanded." – Justify the statement with an example. (3)

4.

i. The increase in the price of sports shoes in the market causes a decrease in the quantity of sports shoes purchased by people in the market.

a) What are the two variables in the above statement?

b) Which is the independent variable and which is the dependent variable?

c) What is the relationship between these two variables? 3(1+1+1)

ii. "In inelastic demand a percentage change in a product's price causes a smaller percentage change in quantity demanded." – Justify the statement with an example. (3)

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

Course Title: Fluid Mechanics | Course Code: CE 221

Time: 1 hour | Full Marks: 60

[Answer any **Four** (04) out of following **Five** (05) questions]

1. (a) Define Absolute pressure and Gage pressure. What is the relation between these? [05]

   (b) Find the pressure difference between A and B. (Figure 1) [10]

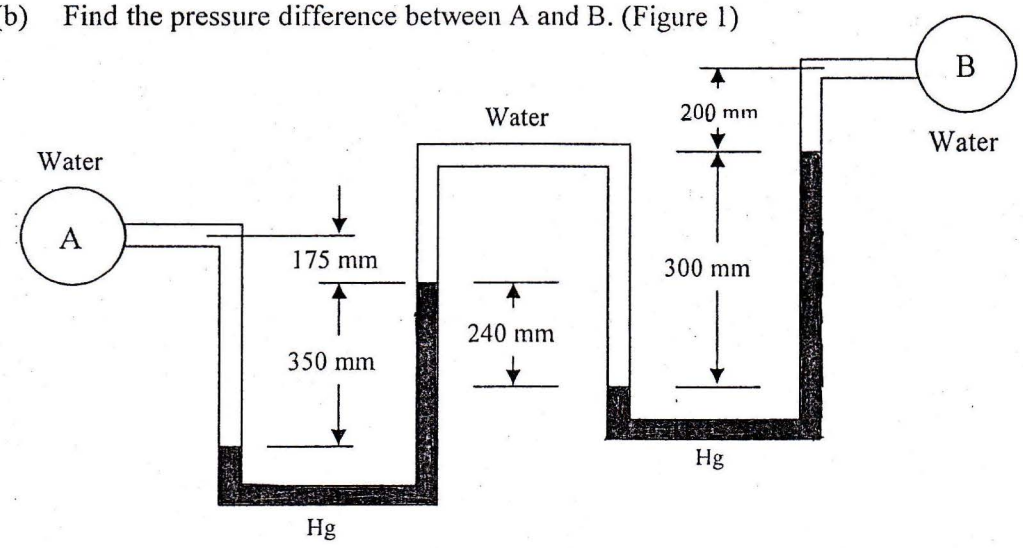


Figure 1

2. (a) Derive the expression of total pressure force on submerged plane surface. [08]

   (b) The internal diameter of a capillary tube is 6mm which is dipped into water at 20°C. The wetting angle $\theta = 30°$ and the height of capillary rise is 4.3 mm. Determine the value of surface tension. (At 20°C the density of water is 998 kg/m^3) [07]

3. (a) State and proof Bernoulli's Equation. [10]

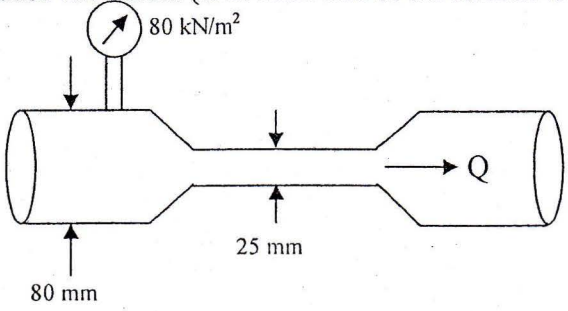
   (b) Define Laminar flow. A pipe flowing water at a velocity of 230 cm/s has a Reynold's Number of 1800. What is the diameter of the pipe? [05]

4. (a) What is Pressure Head? The diameter of a pipe changes from 0.42 m at a section 650 cm above from datum to 0.08m above the same datum. The pressure of water at the first section is 5 N/m^2. If the velocity at the first section is 1 m/s, determine the pressure head at the second section. [10]

   (b) Derive the equation of stream line. [05]

5. (a) Define: (i) Hydraulic grade line (iii) Cavitation. [06]

   (b) Water is flowing in a conduit shown in the following figure with a vapor pressure of 30 kN/m^2. Atmospheric pressure is 65 cm Hg. Find the maximum flow rate (Q) that will cause cavitation. (total head loss of the conduit is 2.5 m) [09]



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

Course # : CE-203 | Course Title: Engineering Geology & Geomorphology
Full Marks: 60 (3 X 20 = 60) | Time: 1 hour

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

1a) Mention the principal zones of the earth from geologic point of view. Describe any one. 7

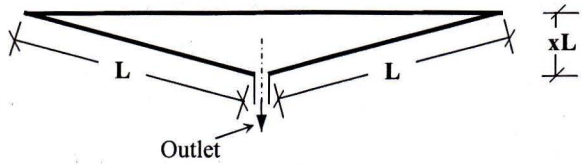
1b) Draw a schematic diagram of the rock cycle and provide two examples of each type of rock. 7

1c) Classify (mention names only) geomorphic processes based on origin. Also classify (mention names only) physical and chemical weathering processes. 6

2a) Write short notes on flood hydrograph, axial length and time of concentration. 7.5

2b) Define percolation and infiltration. 3

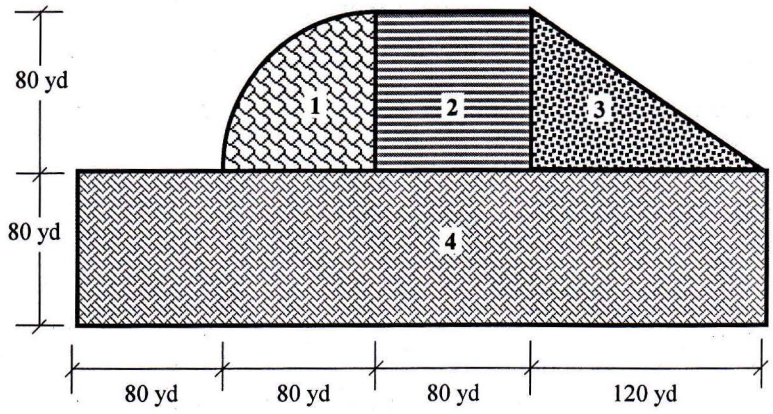
2c) In the following basin, for what value of x, the flow rate (Q) or runoff will be the maximum? Also calculate the form factor for maximum/peak runoff (Q_p). 9.5



3a) Mention the factors affecting runoff. Discuss, in brief, any one of them. 6

3b) Write down the assumptions used in rational formula. 4

3c) For the drainage area as shown below, calculate peak runoff in m^3/s. Use $C_1 = 0.8$, $C_2 = 1.0$, $C_3 = 0.5$ and $C_4 = 0.7$ and I = 0.05 cm/min. 10



4a) What is diastraphism? Draw a neat sketch of a typical fold geometry showing its different components. 6

4b) Classify folds (mention names only) based on their origin. Draw neat sketches of any two types of folds. 6

4c) Define fault and joint. Classify fault (mention names only) according to net slip. Draw a neat sketch of an oblique fault. 8

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

Course Title: Numerical Analysis & Computer Programming — Course Code: CE 205 (A)
Time: 1 hour — Full Marks: 30

Answer **any 5 (FIVE)** of the following questions.

1. Find the root of the equation $x^3 + 2x - 14 = 0$ by the Secant method between the interval $[2, 3]$. Use the accuracy of 0.0001. (6)

2. Find the root of the equation $x^3 - 3x + 1 = 0$ between the interval $[1, 2]$ by the Iteration method using the accuracy of 0.0001. (6)

3. Solve the following system of linear equations using the Jacobi method. Assume the initial values are $x = 0$, $y = 0$ and $z = 0$. Perform up to 12 iterations. (6)

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

4. Fit a straight line ($y = a + bx$) to the following data using the Principle of Least Squares. (6)

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

5. From the following data, determine the value of y, when $x = 2$. Use the Gregory-Newton Forward Difference method. (6)

x	1	3	5	7	9	11	13
y	5	7	11	141	18	26	35

6. For the data given in the following table, determine the value of y, when $x = 3$ using the Lagrange interpolating polynomial. (6)

x	1	2	4	7
y	2	12	86	422

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

Course Title: Numerical Analysis and Computer Programming Course Code: CE 205
Time: 1 hour Full marks: 20 **(Section B)**

[Answer any **04 (Four)** of the following **05 (Five)** questions]

1. (a) Mention two limitations of Newton-Raphson Method. (1)

(b) Solve $x^3+2x^2+10x-20=0$ by Newton-Raphson Method. Use x= 1.2156 as your initial guess. Correct the result up to two significant figures. Use the value of x up to four decimal places. (4)

2. (a) Define Numerical Method. (1)

(b) Use Lagrange's interpolation formula to find the value of y when x=4, if the values of x and y are given as below. (4)

x	0	2	3	5
y	648	704	729	792

3. Derive Gregory-Newton's forward interpolation formula. (5)

4. (a) Gauss Seidel Method is similar in Principle to Jacobi Method. Then what is the difference between them. (1)

(b) Apply Gauss Seidel method to solve following systems of linear equations

$9x+5y+15z=-6$
$4x+12y+z=18$
$13x+4y-5z=6$ (4)

use x=0, y=1, z=0 as approximate solutions. Show minimum 4 iterations.

5. Determine the constants a and b by least square method such that $y=ae^{bx}$ fits the following data (5)

x	1	1.2	1.4	1.6
y	41	75	136	247