University of Asia Pacific
Department of Civil Engineering
Final Examination Spring 2018
Program: B. Sc. Engineering (Civil)

Course # : CE-203 Course Title: Engineering Geology & Geomorphology
Full Marks: 120 (6 X 20 = 120) Time: 3 hours

Answer to all questions

1. (a) Discuss Igneous rock. Giving examples distinguish between sediments and sedimentary rocks. **10**

(b) Distinguish among different geomorphic processes. **6**

(c) Distinguish between physical and chemical weathering processes. **4**

2. (a) What is diastraphism? Draw neat sketch of a typical fold geometry showing its major features. **5**

(b) Write short notes on folds, faults and joints. **6**

(c) Draw neat sketches of Graben and oblique fault. **5**

(d) Draw a schematic diagram of rock cycle. **4**

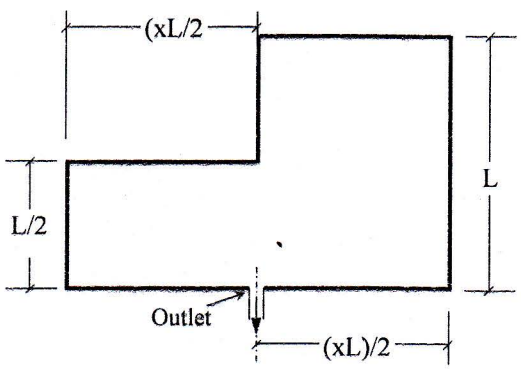
3. (a) Classify (mention names only) folds and discuss any two types showing neat sketches. **6**

(b) Classify and discuss briefly (with neat sketches) various types of faults according to the direction of movement and net slip. **9**

(c) Mention (names only) the principal zones of earth. With the aid of a schematic diagram show the thicknesses of different parts of lithosphere/geosphere. **5**

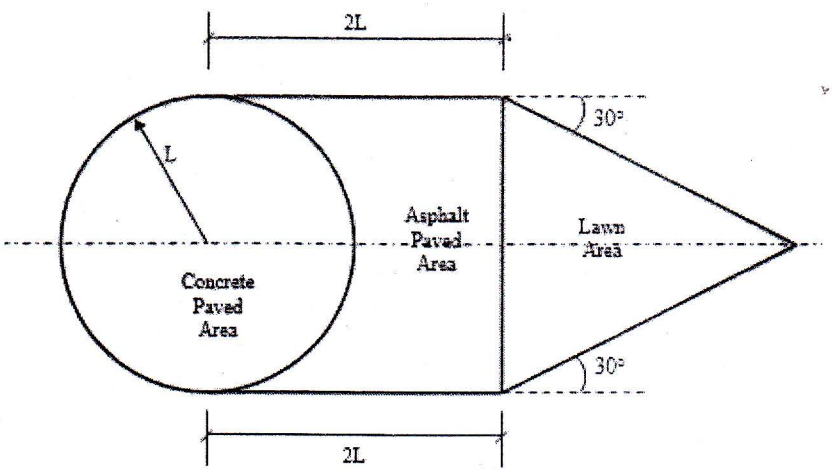
4. (a) Distinguish between infiltration and percolation. **3**

(b) For the following basin, x is a constant factor. For what value of x, the flow rate (Q) will be the maximum for the basin? Find the FF and CC of the basin for maximum runoff. **9**



(c) Calculate Peak runoff (Q_p) in m^3/sec for the following facility under the following conditions: **8**

- Rainfall Intensity for the whole area = 2.25 in/hr
- Co-efficient of runoff for-----
  Concrete paved area = 0.85
  Asphalt paved area = 0.75
  Lawn area = 0.25
- Assume L = 50 yards

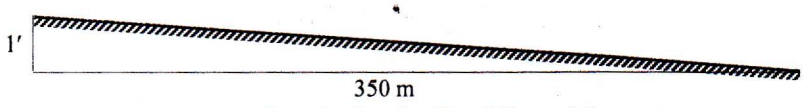


5. (a) What are the major causes of river erosion? Mention three hydraulic actions responsible for river erosion 3

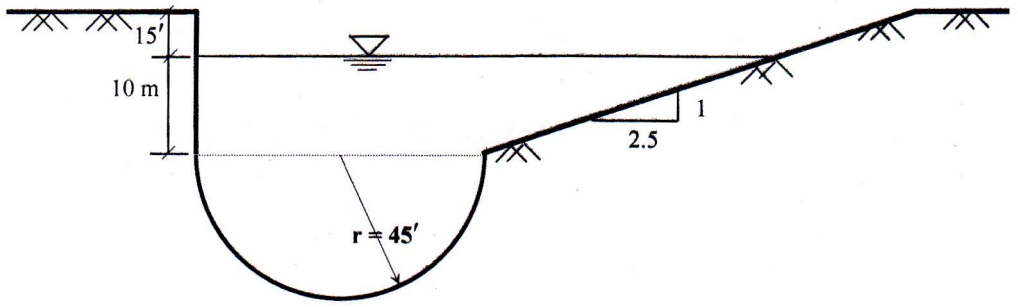
(b) Prove that $d \alpha v^2$; where symbols carry their usual meanings. 7

(c) Velocity of flow of one river (R-1) is four times the velocity of flow of another river (R-2). Derive a correlation between the two rivers in terms of their ability of transporting maximum size of sediments. 3

(d) The longitudinal and cross-sectional profiles of a channel are shown below. Calculate the tractive pressure in kPa along the channel. 7



(Longitudinal Profile of Channel Course)



(X-Sectional Profile of Channel Course)

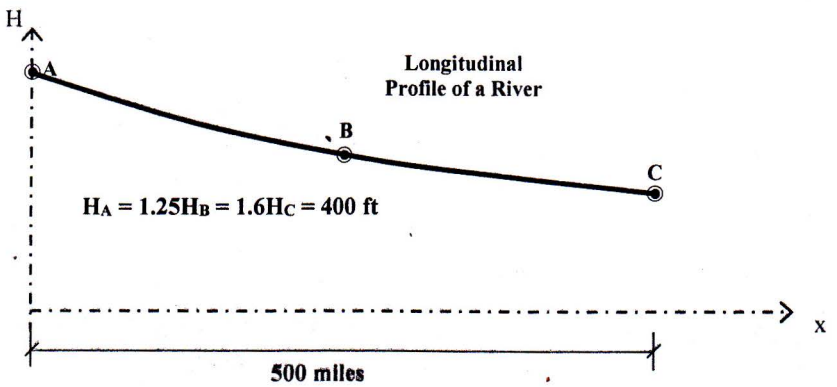
6. (a) For a stream having triangular X-section and D <<<<< T, prove that $\tau \propto D$ 4

where

τ = tractive pressure along the stream T = Top width of stream

D = depth of stream

(b) From the figure shown below, calculate the horizontal distance between the locations B and C. 5



(c) Mention the factors affecting drainage pattern. Classify and discuss, in brief with sketch, any one type of drainage pattern. 6

(d) Discuss, in brief, the ways valleys are deepened. 5

University of Asia Pacific
Department of Civil Engineering
Final Examination Spring 2018
Program: B.Sc. Engineering (Civil)

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

Time- 3 hours — Full marks: 100

(Answer any TEN from the following ELEVEN questions)

1. (a) What are the main motivations of learning numerical method? **(03)**

(b) Evaluate numerically the following integral using the Gauss Quadrature with 4 points or n= 4. **(07)**

$$I = \int_0^5 \frac{e^x(x^2+1)}{\sqrt{x^2+1}}\,dx$$

Table: Gauss points and weight factors for integration

x_i	w_i
$x_1 = +0.861136$	0.347854
$x_2 = +0.339981$	0.652145
$x_3 = -0.339981$	0.652145
$x_4 = -0.861136$	0.347854

2. Fit a second degree parabola to the following data by least squares method. Also estimate the population in 1945. **(10)**

X (Year)	1929	1930	1931	1932	1933	1934	1935	1936	1937
Y (Population in million)	352	356	357	358	360	361	361	360	359

3. (a) Solve the following system of linear equations using the Gauss-Seidel method. Assume the initial values are x = 0, y = 0 and z = 0. Perform 5 iterations. **(06)**

$$5x + 2y + z = 8$$
$$2x + 5y + 2z = 1$$
$$x + 3y - 5z = 25$$

(b) Solve the equations by Gauss Elimination method. **(04)**

$$3x - y = -4$$
$$2x + 5y = 2$$

4. The following table shows the sales value of a company for the five years. Estimate the sales value for the year 2017. Which finite difference method will you prefer for this problem? Explain. **(10)**

Years	2006	2009	2012	2015	2018
Sales Value (In Thousand)	40	43	48	52	57

5. (a) From a dam 120 m long, two ends of which are on the banks, depth of water of a river is measured at intervals of 10 m from one end to the other. The successive readings in meters are as follows: **(05)**
2.4, 6.1, 8.2, 10.7, 12.8, 15, 13.2, 11.5, 10.1, 8.4, 5.9
Applying Simpson's rule, find the approximate superficial area of the dam on the side of measurement in contact with water.

(b) For the data given in the following table, determine the value of y, when x = 53 using Lagrange interpolating polynomial formula. **(05)**

X	10	20	30	40	50	60
Y	1200	900	600	200	110	50

6. (a) Find a root of the equation $x^3 - 3x - 5 = 0$ by Regula Falsi method. Correct up to three decimal places. Use two initial approximations 2 and 3. **(05)**

(b) Determine the real root of the equation $xe^x = 1$ using Secant method. Correct up to three decimal places. Use two initial approximations 0.5 and 0.6. **(05)**

7. Write a program to input three integer values and find the largest number among those using if statement. **(10)**

Or,

Write a program to find the sum of natural numbers using loop function.

8. Write a program to check if the input is a prime number. **(10)**

Or,

Write a program to find the real root of a quadratic equation.

9. Solve the following boundary value problem by the Finite Difference method with step length 0.5 **(10)**

$$5\frac{d^2y}{dx^2} - 8y + 11 = 0$$

Given that,

$y(0) = 1$
$y(2) = 4$

10. The differential equation $\frac{dy}{dx} = x^2 + y^2 - 2$ satisfies the following data: **(10)**

x	y
-0.1	1.0900
0	1.0000
0.1	0.8900
0.2	0.7605

Use Milne's method to obtain the value of $y(0.3)$

11. (a) What are the types of error that you may encounter in numerical analysis? Give short description of each with appropriate examples. **(04)**

(b) What is Transcendental equation? How do you decide initial guess values for solving a polynomial equation? **(03)**

(c) How does the method of false position differ from bisection method? **(03)**

University of Asia Pacific
Department of Civil Engineering
Final Examination Spring 2018 (Set 2)
Program: B. Sc. Engineering (Civil)

Course Title: Mechanics of Solids II | Credit Hours: 3.0 | Course Code: CE 213
Time: 3 hours | Full Marks: 100 (= 10 × 10)

[Answer **any 10 (ten)** of the following 14 questions]

1. Fig. 1 represents a flexible pavement *abcdefg* carrying loads from vehicles at *c*, *d* and *e*. The pavement's support (soil underneath) is eroded (between *b* and *f*), and remains only in *ab* and *fg*.

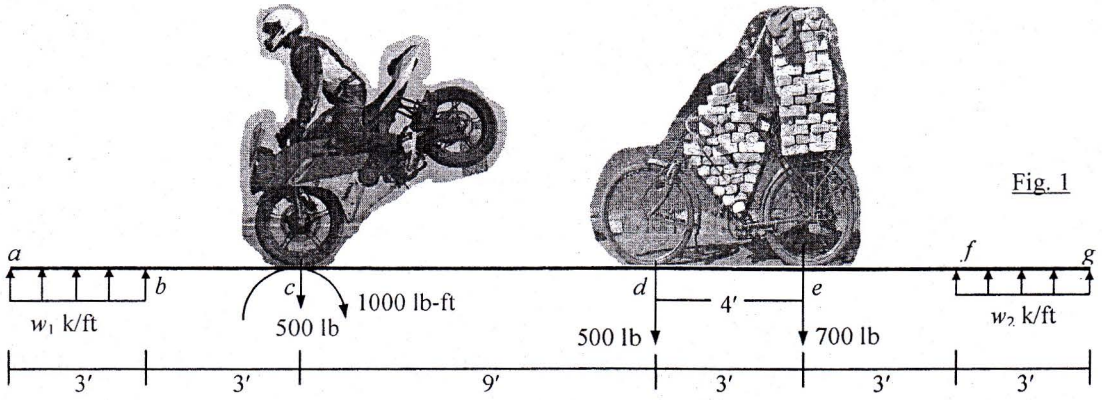


Fig. 1

Determine the distributed loads w_1 (k/ft) and w_2 (k/ft) to maintain structural equilibrium.
If there is no deflection at free ends *a* and *g* (in Fig. 1), use *Singularity Functions* to calculate
(i) The value of *EI* to make *d* deflect 1-inch vertically
(ii) Rotation at *a*, for the value of *EI* calculated in (i).

2. Answer Question 1 using the *Moment-Area Theorems*.

3. Answer Question 1 using the *Conjugate Beam Method*.

4. Fig. 2(a) shows passengers climbing to the roof of a train, while Fig. 2(b) shows the dimensions and loads acting on the simply-supported ladder (inclined at an angle θ = 60° with horizontal) being used for this purpose.

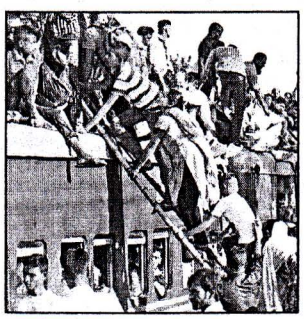


Fig. 2(a)

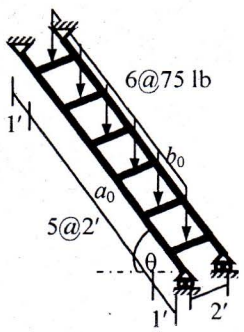


Fig. 2(b)

If $EI = 400$ lb-ft^2, calculate the vertical deflection of the
(i) Joints a_0 (and b_0) of the simply supported ladder
(ii) Midpoint of the 2′-long beam a_0b_0, assuming the rotations at a_0 and b_0 to be zero.

5. (i) For the foot-bridge AB loaded as shown in Fig. 3
- Write equation for load *w(x)* using singularity functions
- Write down the boundary conditions
- Draw the qualitative deflected shape
- Determine if it is statically determinate or indeterminate.

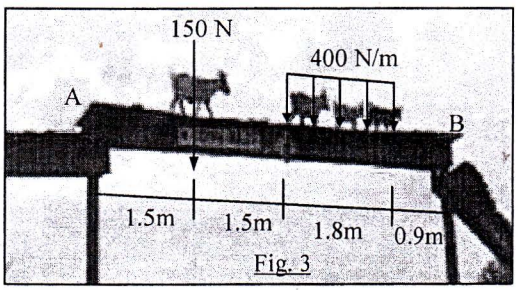


Fig. 3

(ii) Explain
(a) The effect of boundary conditions on effective length of slender columns.
(b) Why column buckling loads in laboratory tests are usually smaller than loads from Euler's formula.

6.

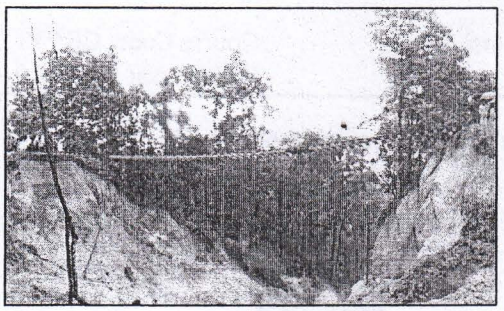


Fig. 4(a)

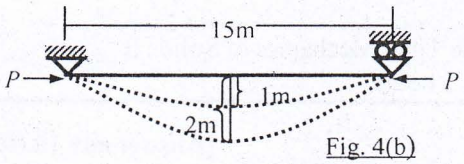
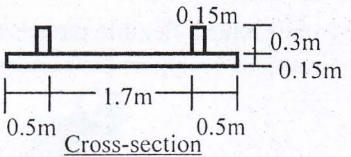


Fig. 4(b)



Cross-section

Fig. 4(c)

Fig. 4(a) shows a 15m-long railway line permanently deformed 1-m at midspan as the soil underneath got eroded. Given the support condition [Fig. 4(b)] and cross-section [Fig. 4(c)] of the railway line

(i) Calculate its buckling load P_{cr} [Given: $E = 200 \times 10^3$ MPa]

(ii) Also calculate the compressive force P required to increase the midspan deflection to 2m [Fig. 4(b)]

(iii) Comment on the role of 'temperature change' as a possible source of the force P.

7. Fig. 5(a) shows a 'stunt' performed by two motorcyclist friends in a street. They are approximately represented by 'equivalent' frames o_1ab and o_2cd in Fig. 5(b), while column ef represents their friend.

(i) Show that the frames o_1ab and o_2cd in Fig. 5(b) are statically unstable and would fall on ef.

(ii) Fig. 5(c) shows o_1 and o_2 are 'joined' by an internal hinge at the head e of friend ef.
Calculate the value of EI required to prevent buckling of Column ab, if it is braced.
Also calculate the buckling load for the braced Column ef, for this vale of EI.

Fig. 5(a)

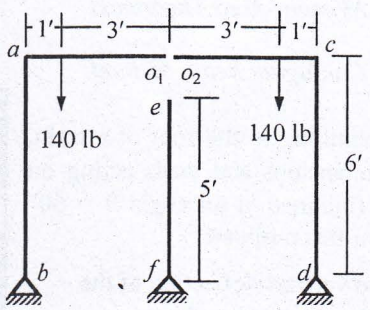


Fig. 5b)

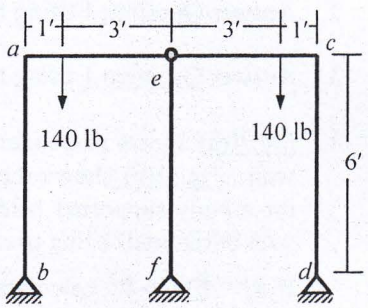


Fig. 5(c)

8. Fig. 6(a) shows a man (weighing 0.9 kN) jumping over a 1m high road divider.
In the process, he applies an axial force on the divider at eccentricity $e = 0.2$m.

Fig. 6(b) shows the load applied on the divider while Fig. 6(c) shows its cross-section.

Calculate the maximum deflection of the divider due to the applied loads

[Given: Modulus of elasticity $E = 20 \times 10^3$ MPa].

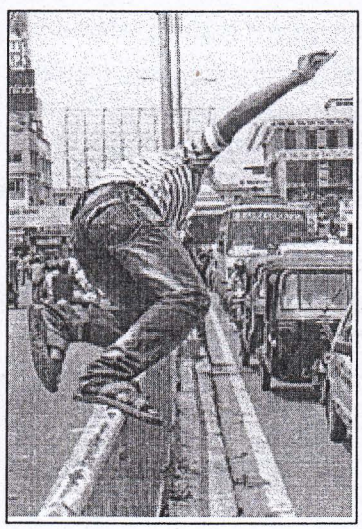


Fig. 6(a)

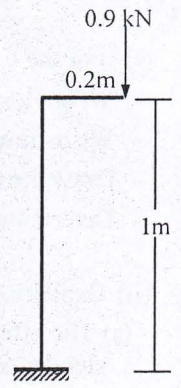


Fig. 6(b)

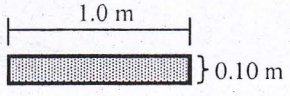


Fig. 6(c)

9. For the road divider described in Question 8 [and shown in Figs. 6(a)~(c)], calculate the critical buckling load (considering material nonlinearity) if its Plastic Moment capacity is $M_p = 20$ kN-m.

10. Fig. 7(a) shows a truck running on footpath and hitting a 12′-high electric pole with horizontal force H [Fig. 7(b)] inclined at 30° [Fig. 7(c)], which also shows cross-section of the pole that weighs 500 lb.

If tensile as well as compressive strength of the pole material is 800 psi, calculate the
(iii) Force H required to cause tensile failure of the pole (at point a)
(iv) Corresponding maximum compressive stress (at point a_0).

Fig. 7(a)

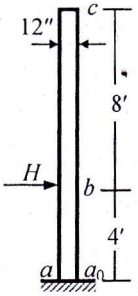


Fig. 7(b)

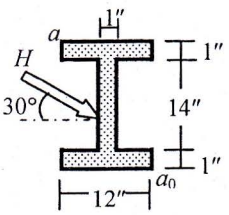


Fig. 7(c)

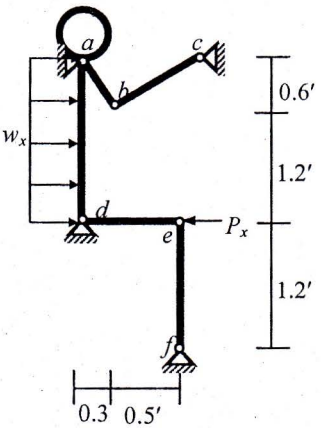
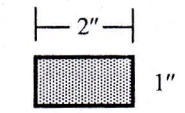


Fig. 8(a)



Spinal Cord (*ad*)

Cross-Section
Fig. 8(b)

11. Fig. 8(a) shows a bus passenger *abcdef* subjected to impact forces from an accident, while Fig. 8(b) shows the approximate cross-section of his spinal cord *ad*.

Calculate the required yield strength Y of the bone if the passenger is to survive a load w_x = 1.5 k/ft on the spinal cord *ad* (a simply supported beam), according to the yield criterion of
(i) Von Mises, (ii) Tresca.

12. Fig. 9 shows wheels of a car traveling through a potholed road.
The wheels are supported on helical springs (only two are shown in Fig. 9) of shear modulus = 12000 ksi, coil diameter = 1″, spring mean diameter = 5″, number of coils = 8.
Original length of the springs is 10″ (shown for Spring A), and is compressed to 7″ (shown for Spring B).
(i) Calculate the (a) Force in Spring B, (b) Energy absorbed by Spring B.
(ii) Draw the Mohr's circle of stresses for the coil of Spring B.

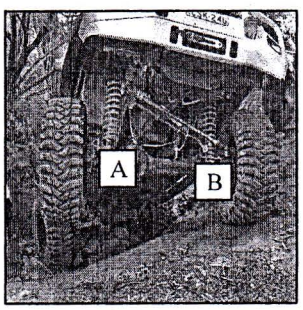


Fig. 9

13.

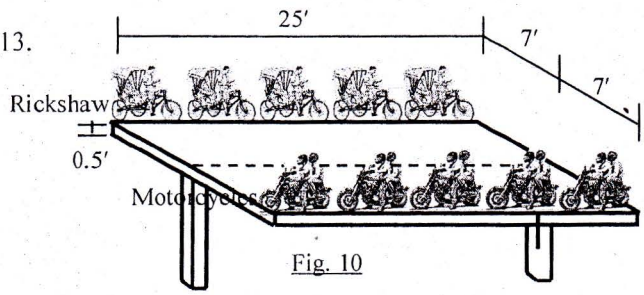


Fig. 10

Fig. 10 shows the traffic organized over a 25′-long, 14′ wide, 0.5′ thick bridge.

The bridge weighs 1000 lb/ft, rickshaws weigh 150 lb/ft and motorcycles weigh 300 lb/ft. Assume the bridge is fixed at two columns and calculate the
(i) Torsional shear stress, (ii) Torsional rotation
for the bridge section.

14. Calculate equivalent polar moments of inertia (J_{eq}) for the cross-sections shown in Figs. 11(a)~(c) by centerline dimensions

[Given:
Wall thickness = 0.10′].

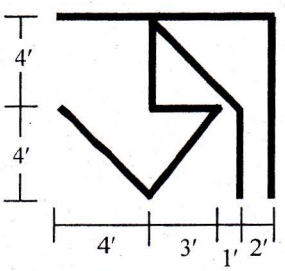


Fig. 11(a)

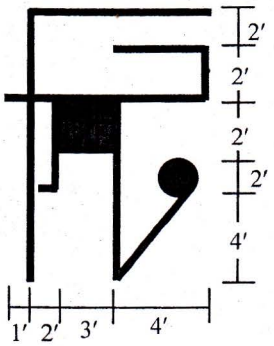


Fig. 11(b)

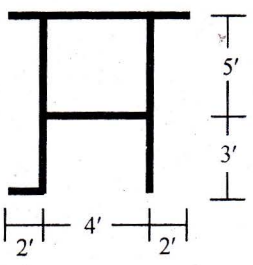


Fig. 11(c)

University of Asia Pacific
Department of Civil Engineering
Final Examination Spring 2018 (Set 1)
Program: B. Sc. Engineering (Civil)

Course Title: Mechanics of Solids II | Credit Hours: 3.0 | Course Code: CE 213
Time: 3 hours | Full Marks: 100 (= 10 × 10)

[Answer **any 10 (ten)** of the following 14 questions]

1. Fig. 1 represents a flexible pavement *abcdefg* carrying loads from vehicles at *c*, *d* and *e*. The pavement's support (soil underneath) is eroded (between *b* and *f*), and remains only in *ab* and *fg*.

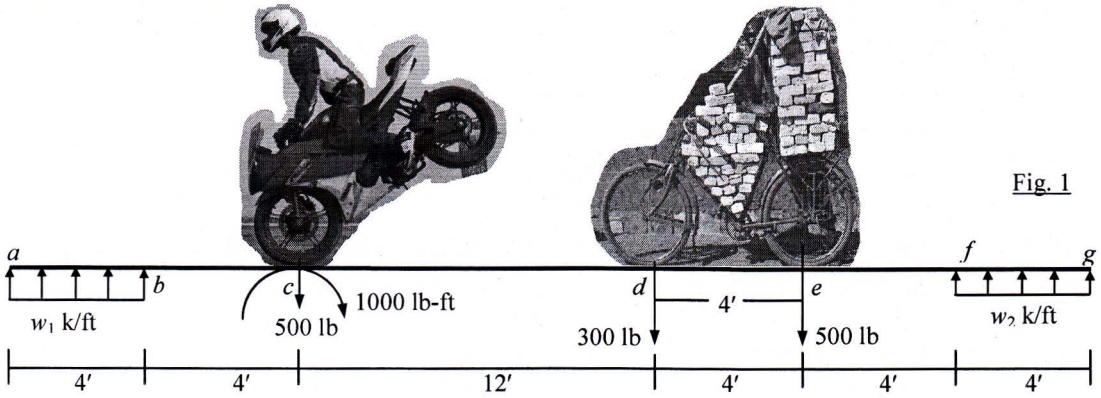


Fig. 1

Determine the distributed loads w_1 (k/ft) and w_2 (k/ft) to maintain structural equilibrium.
If there is no deflection at free ends *a* and *g* (in Fig. 1), use *Singularity Functions* to calculate
(i) The value of *EI* to make *d* deflect 2-inches vertically
(ii) Rotation at *a*, for the value of *EI* calculated in (i).

2. Answer Question 1 using the *Moment-Area Theorems*.

3. Answer Question 1 using the *Conjugate Beam Method.*

4. Fig. 2(a) shows passengers climbing to the roof of a train, while Fig. 2(b) shows the dimensions and loads acting on the simply-supported ladder (inclined at an angle θ = 60° with horizontal) being used for this purpose.

If $EI = 500$ lb-ft^2, calculate the vertical deflection of the
(i) Joints a_0 (and b_0) of the simply supported ladder
(ii) Midpoint of the 2′-long beam a_0b_0, assuming the rotations at a_0 and b_0 to be zero.

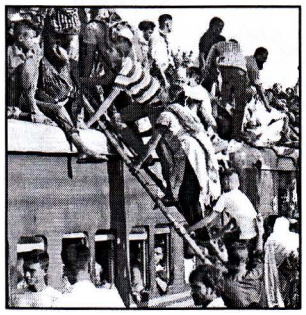


Fig. 2(a)

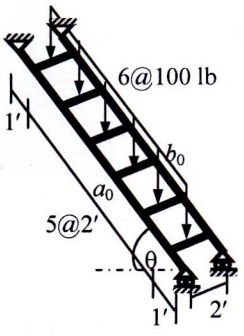


Fig. 2(b)

5. (i) For the foot-bridge AB loaded as shown in Fig. 3
- Write equation for load *w(x)* using singularity functions
- Write down the boundary conditions
- Draw the qualitative deflected shape
- Determine if it is statically determinate or indeterminate.

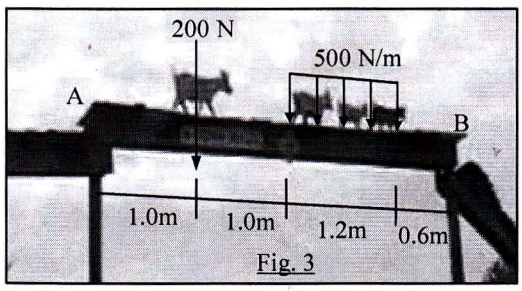


Fig. 3

(ii) Explain
(a) The effect of material nonlinearity on buckling behavior of slender columns.
(b) How do you determine the column buckling loads in laboratory tests.

6.

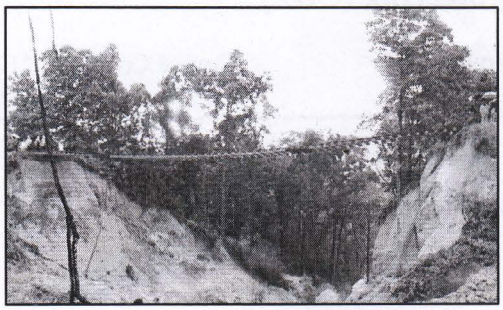


Fig. 4(a)

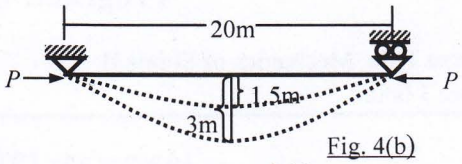
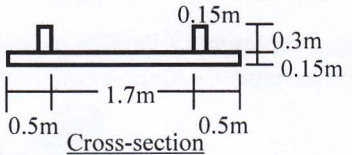


Fig. 4(b)



Cross-section

Fig. 4(c)

Fig. 4(a) shows a 20m-long railway line permanently deformed 1.5-m at midspan as the soil underneath got eroded. Given the support condition [Fig. 4(b)] and cross-section [Fig. 4(c)] of the railway line

(i) Calculate its buckling load P_{cr} [Given: $E = 200 \times 10^3$ MPa]

(ii) Also calculate the compressive force P required to increase the midspan deflection to 3m [Fig. 4(b)]

(iii) Comment on the role of 'temperature change' as a possible source of the force P.

7. Fig. 5(a) shows a 'stunt' performed by two motorcyclist friends in a street. They are approximately represented by 'equivalent' frames o_1ab and o_2cd in Fig. 5(b), while column ef represents their friend.

(i) Show that the frames o_1ab and o_2cd in Fig. 5(b) are statically unstable and would fall on ef.

(ii) Fig. 5(c) shows o_1 and o_2 are 'joined' by an internal hinge at the head e of friend ef.
Calculate the value of EI required to prevent buckling of Column ab, if it is braced.
Also calculate the buckling load for the braced Column ef, for this vale of EI.

Fig. 5(a)

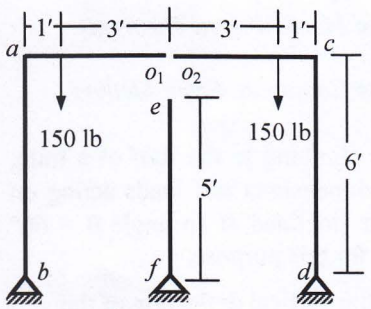


Fig. 5b)

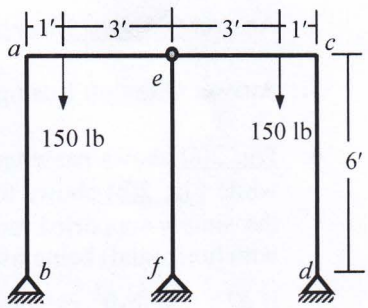


Fig. 5(c)

8. Fig. 6(a) shows a man (weighing 0.8 kN) jumping over a 1m high road divider.
In the process, he applies an axial force on the divider at eccentricity $e = 0.3$m.

Fig. 6(b) shows the load applied on the divider while Fig. 6(c) shows its cross-section.

Calculate the maximum deflection of the divider due to the applied loads

[Given: Modulus of elasticity $E = 20 \times 10^3$ MPa].

9. For the road divider described in Question 8 [and shown in Figs. 6(a)~(c)], calculate the critical buckling load (considering material nonlinearity) if its Plastic Moment capacity is $M_p = 15$ kN-m.

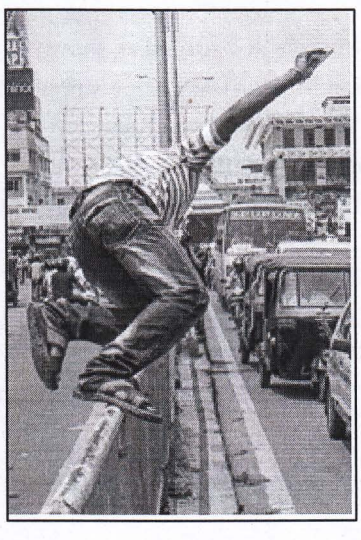


Fig. 6(a)

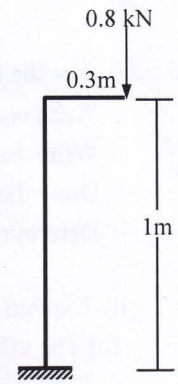


Fig. 6(b)

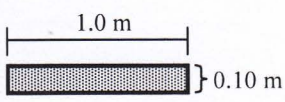


Fig. 6(c)

10. Fig. 7(a) shows a truck running on footpath and hitting a 15′-high electric pole with horizontal force H [Fig. 7(b)] inclined at 30° [Fig. 7(c)], which also shows cross-section of the pole that weighs 600 lb.

If tensile as well as compressive strength of the pole material is 1000 psi, calculate the
(i) Force H required to cause tensile failure of the pole (at point a)
(ii) Corresponding maximum compressive stress (at point a_0).

Fig. 7(a)

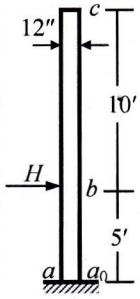


Fig. 7(b)

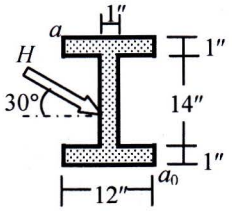


Fig. 7(c)

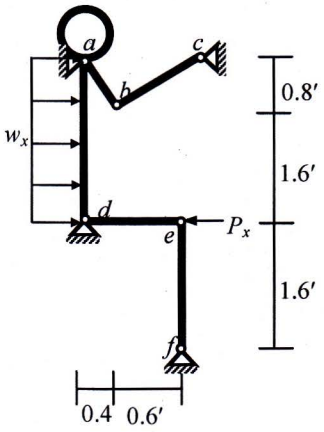
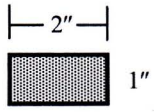


Fig. 8(a)



Spinal Cord (*ad*)

Cross-Section
Fig. 8(b)

11. Fig. 8(a) shows a bus passenger *abcdef* subjected to impact forces from an accident, while Fig. 8(b) shows the approximate cross-section of his spinal cord *ad*.

Calculate the required yield strength Y of the bone if the passenger is to survive a load w_x = 2 k/ft on the spinal cord *ad* (a simply supported beam), according to the yield criterion of
(i) Von Mises, (ii) Tresca.

12. Fig. 9 shows wheels of a car traveling through a potholed road.
The wheels are supported on helical springs (only two are shown in Fig. 9) of shear modulus = 12000 ksi, coil diameter = 1″, spring mean diameter = 6″, number of coils = 8.
Original length of the springs is 12″ (shown for Spring A), and is compressed to 9″ (shown for Spring B).
(i) Calculate the (a) Force in Spring B, (b) Energy absorbed by Spring B.
(ii) Draw the Mohr's circle of stresses for the coil of Spring B.

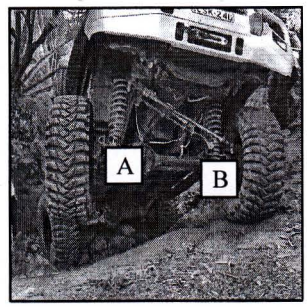


Fig. 9

13.

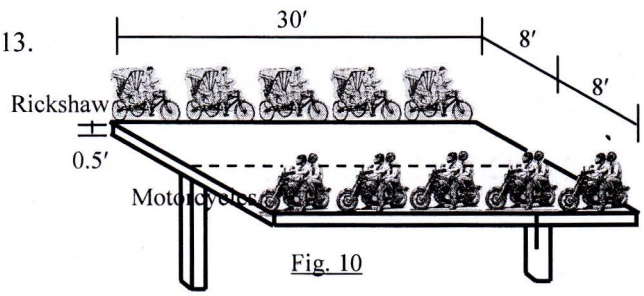


Fig. 10

Fig. 10 shows the traffic organized over a 30′-long, 16′ wide, 0.5′ thick bridge.

The bridge weighs 1000 lb/ft, rickshaws weigh 100 lb/ft and motorcycles weigh 200 lb/ft. Assume the bridge is fixed at two columns and calculate the
(i) Torsional shear stress, (ii) Torsional rotation
for the bridge section.

14. Calculate equivalent polar moments of inertia (J_{eq}) for the cross-sections shown in Figs. 11(a)~(c) by centerline dimensions

[Given:
Wall thickness = 0.10′].

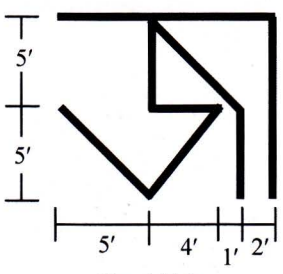


Fig. 11(a)

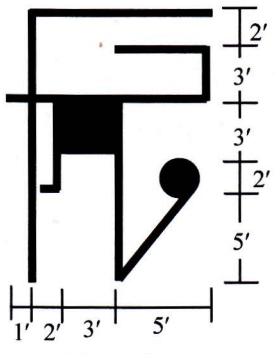


Fig. 11(b)

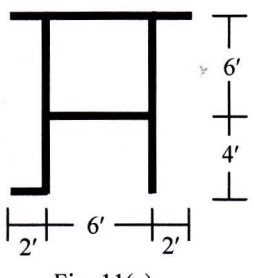


Fig. 11(c)

University of Asia Pacific
Department of Civil Engineering
Final Examination Spring 2018
Program: B.Sc. in Civil Engineering

Course Title: Fluid Mechanics | Course Code: CE 221
Time- 3 hours | Full marks:100

Answer any five among the eight questions
Marks Distribution [5*20=100]
Assume reasonable number for the missing values

1. (a) Discuss the relationship between viscosity and temperature in case of fluid. **[5]**
   (b) Differentiate between hydrodynamics and hydraulics. **[4]**
   (c) Write down the name of those great scientists along with their field of contribution who has immense contribution in historical development of fluid mechanics. **[6]**
   (d) Sketch the shear stress verses strain diagram for different types of fluid, ideal plastic, elastic solid in a single diagram. **[5]**

2. (a) In a flow the velocity vector is given by $V = 3.5\,xi + 6\,yj$. Determine the equation of the streamline passing through a point $M(1,4)$. **[6]**
   (b) Define the i) Path line; ii) Stream line; iii) Streak line **[6]**
   (c) "In case of steady uniform flow there is no acceleration". Prove the statement mathematically. **[8]**

3. (a) Derive the Darcy-Weisbach formula for pipe friction. [Equation for shear stress is given in the list of necessary equation list. You do not need to prove that part] **[6]**
   (b) Establish the equivalent length equation in case of pipes in parallel connection. **[7]**
   (c) The following information's are given for the parallel pipe connection with three pipes shown in Fig:01 **[7]**
   L_1 = 1.1 km, d_1 = 200 mm, f_1 = 0.021; L_2 = 1.4km, d_2 = 100 mm, f_2 = 0.018;
   L_3 = 1.9 km m, d_3 = 400 mm, f_3 = 0.019.
   The head loss between A and B is 12 m. Determine the rate of the flow in Liters/sec.

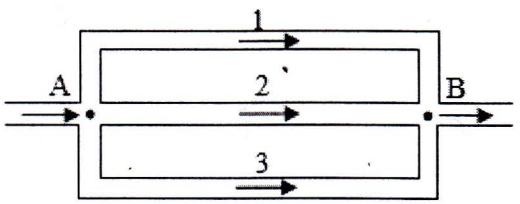


Figure: 01

4. (a) Define absolute and gauge pressure. What is the relation between these? **[1+1+2]**
   (b) What are the practical application of hydrostatic pressure force? **[3]**
   (c) Which device is used for measuring the atmospheric pressure? Which liquid is employed usually in the device and why? **[1+1+2]**
   (d) Find the pressure difference between point A and B using the manometer readings shown in the Figure: 02. Find the absolute pressure at A if the gauge pressure at B is 100kN/m^2. **[6+3]**

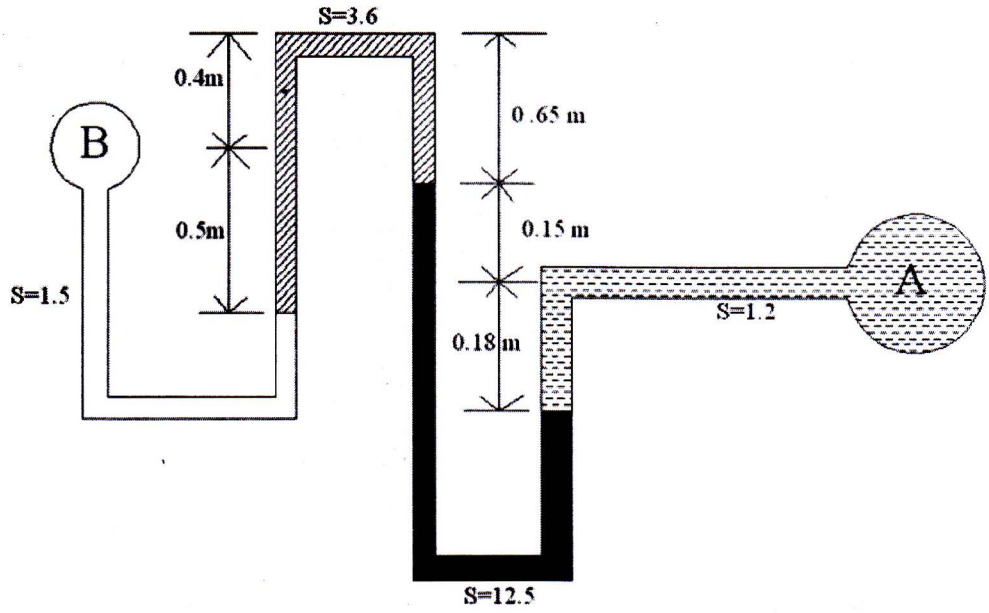


Figure: 02

5. (a) State and prove Bernoulli's Theorem. **[1+7]**

(b) A turbine T draws water from a reservoir A through a 2 m diameter pipe and discharges through another pipe of same diameter into tail race B. The head loss for first pipe is 10 times of its velocity head and for second pipe it is only 0.5 times. If the discharge is 1 m^3/s calculate, i) Power given up by the water to the turbine in Horse Power (HP) ; ii) The pressure head at inlet of turbine. Also draw the HGL and EL for the entire connection. **[6+3+3]**

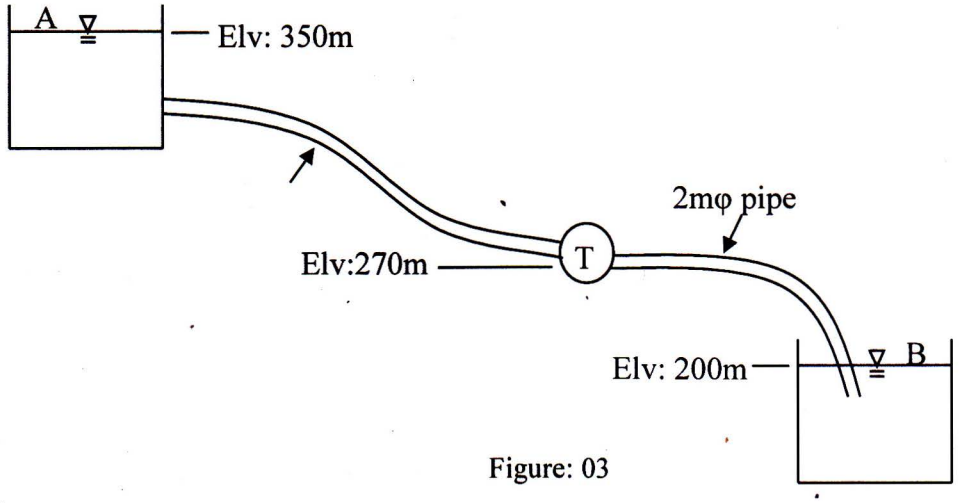


Figure: 03

6 (a) What is cavitation?Write down the cavitation equations.What are the necessary steps that should be taken to avoid cavitation? **[2+3+2]**

(b) A pump is 13 m above the water level and has a pressure of -4 m of water at suction side. The suction pipe is 20 cm diameter and the delivery pipe is 25 cm diameter pipe ending in a nozzle of 10 cm diameter. The nozzle is directed vertically upward at an elevation of 15 m from water level. Determine: i) Discharge ii) Power of pump iii) Elevation at end point of jet. **[7+3+3]**

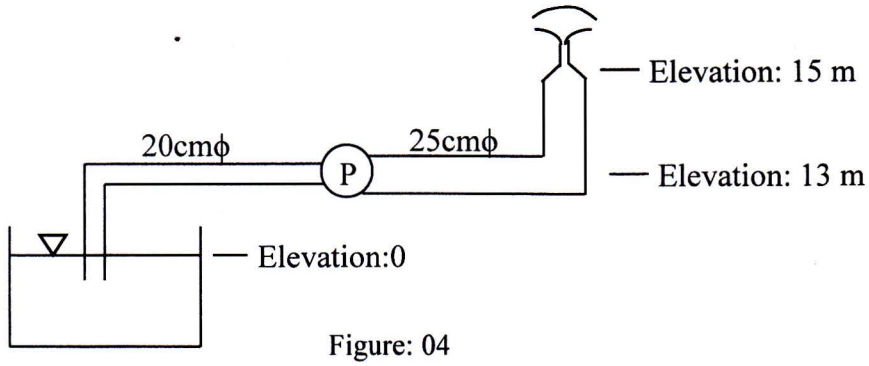


Figure: 04

7. (a) Write short note on Critical Reynolds Number. Explain demarcation point and show it with sketch. **[3+1+1]**
   (b) Explain the concept behind hydraulic radius. **[3]**
   (c) A fluid is flowing through a series of pipes which is shown in the following figure. Determine the rate of flow from A to B when total frictional head loss is 10 m and the kinematic viscosity of the fluid is 1.14×10^{-6}. Use Moody diagram to determine fiction factor. Neglect minor losses. **[12]**

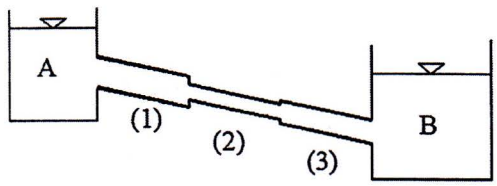


Figure: 05

Pipe properties are given in the following table: (next page)

Pipe No.	Diameter (mm)	Length (m)	Equivalent Roughness, e (mm)
1	600	400	0.25
2	300	400	0.3
3	450	400	0.275

8. (a) Write short notes on different minor head losses in case of pipe flow. **[4]**
   (b) Sketch the HGL and EGL for the figure given below and mention the name of each losses. **[8]**

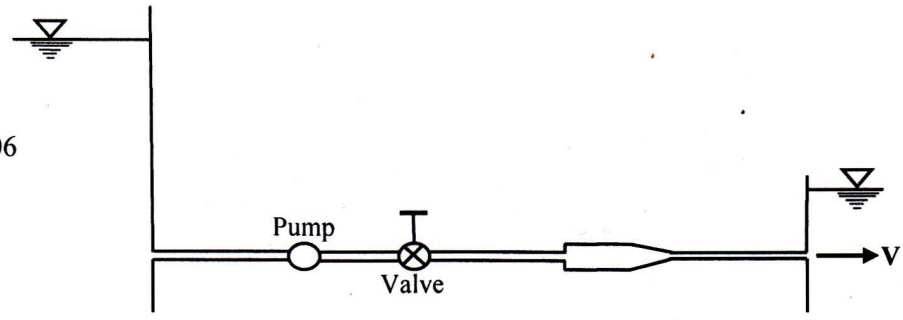


Figure: 06

(c) Establish the equivalent length equation in case of pipes in series connection. [8]

List of Necessary equations

$$Shear\ stress = c_f\left(\frac{\rho V^2}{2}\right)$$

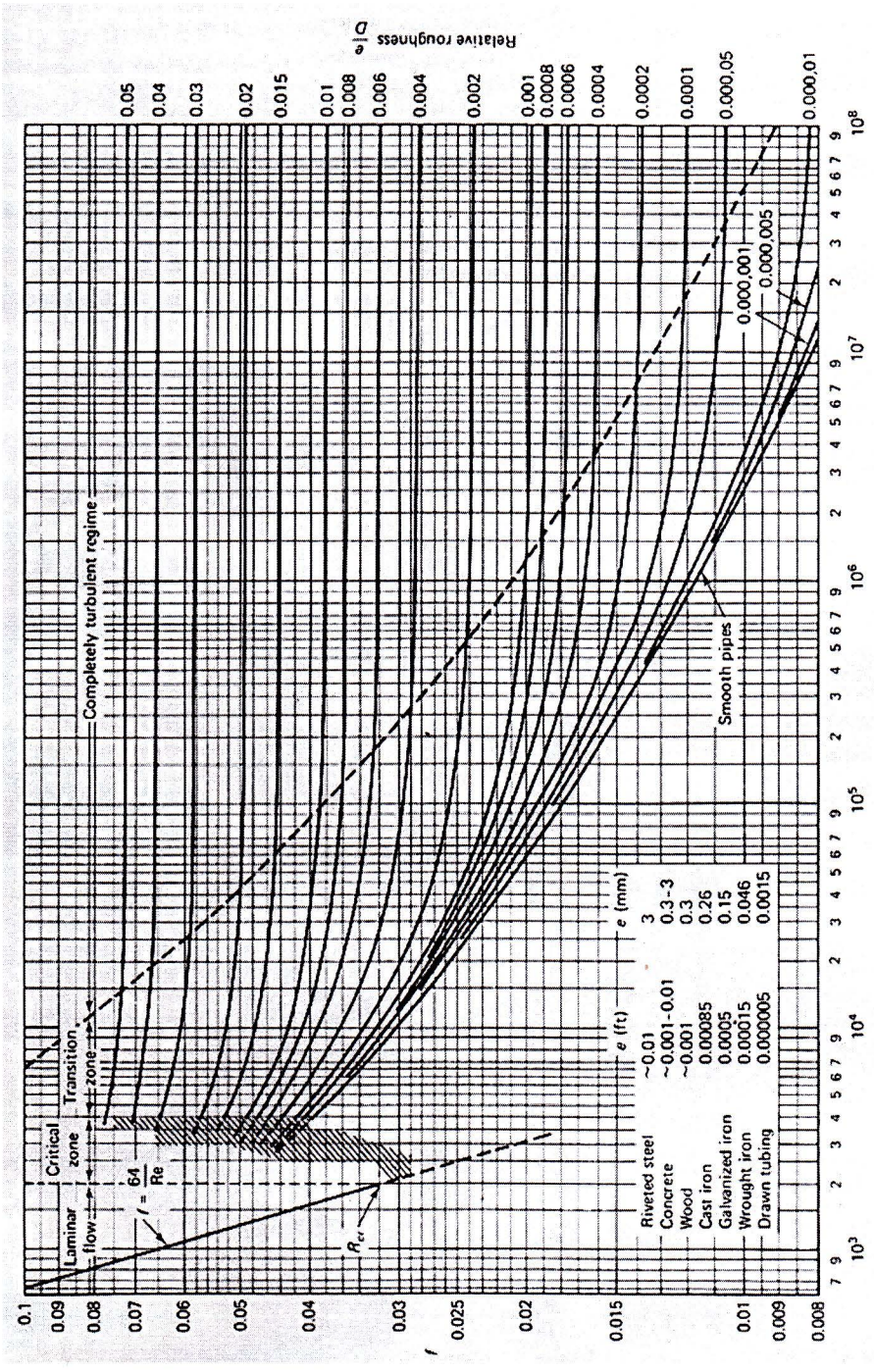


Figure 7.13 Moody diagram. (From L. F. Moody, *Trans. ASME*, Vol. 66, 1944.)

University of Asia Pacific
Department of Civil Engineering
Final Examination Spring - 2018
Program: B.Sc in Civil Engineering

Course Title: Principles of Economics | Course Code: ECN 201
Time: 2 hours | Full Marks: 50

(Answer all of the following questions.)

1. Market demand and supply schedule for mangoes:

Price (Tk. Per Kg)	Quantity Demanded (Millions of Kg.)	Quantity Supplied (Millions of Kg.)
250	3	11
200	5	9
150	7	7
100	9	5
50	11	3

a) Draw the demand and supply curve for mangoes. (1)
b) Is there any equilibrium point? If yes then identify the equilibrium level with explanation. (1)
c) What will be the effect of changes in demand and supply on equilibrium? (4)

2. Briefly discuss the functions of money. (4)

3. Explain different types of price elasticity of demand with examples and proper illustrations. (5)

4. What is the formula of calculating NDP, NI, PI, and DI? (5)

5. Specify whether the following statements are true or false:
a) Environmental degradation is not considered in calculating GDP using expenditure approach. (1)
b) If e_d is greater than 1, then quantity demanded is inelastic. (1)
c) If e_d is greater than 1, then quantity demanded is elastic. (1)
d) 20 percent increase in price causes 80 percent changes in quantity demanded. This is inelastic demand. (1)
e) 20 percent increase in price causes 30 percent changes in quantity demanded. This is inelastic demand. (1)

6. How will you explain the calculation of GDP using expenditure approach? What are the problems not considered in GDP while using expenditure approach? (5)

7. Calculate DI from the following table: (10)

GDP	Tk. 5000000000
Net exports	Tk. 500000
Government purchases	Tk. 400000
Net foreign factor income	Tk. 300000
Consumption of fixed capital	Tk. 400000

Sales taxes	Tk. 10000
Corporate income taxes	Tk. 40000
Customs duties	Tk. 50000
Social security contribution	Tk. 70000
Pension allowances	Tk. 10000
Undistributed corporate profits	Tk. 40000
Freedom fighter allowances	Tk. 70000
Investment	Tk. 75000
Net exports	Tk. 8000000
GDP deflator	Tk. 470000
Purchase of power plant	Tk. 450000
Personal consumption expenditure	Tk. 6500000
Personal taxes	Tk. 85000
Debt	Tk. 730000
Capital	Tk. 88000

8. Calculate elasticity for the following problems:

a) Monthly purchases of cell phones decrease from 15000 to 10000 when the average price of cell phones increases from $100 to $200. (1)

b) Newspapers purchases of consumers decreases from 4 to 2 when the price increases from $ 5 to $10. (1)

c) An increase in average consumer incomes from $20000 to $30000 decreases monthly purchases of second hand furniture from 5 to 3. (1)

d) Weekly purchases of packs of chewing gum fall from 5000 to 2000 packs when their price increases from $2 to $3. (1)

e) A fall in the average price of air conditioner from $250 to$200 increases purchases of air conditioner from 10000 to 20000 per month. (1)

9. Suppose, a person bought a T-shirt at Tk. 2500. He also bought some grocery items worth Tk. 10000. He also bought a diamond necklace for her wife worth Tk. 100000. Government bought a power plant by spending Tk. 200000000. The amount of undistributed corporate profits of a company is Tk. 500000. That company also paid Tk. 200000 as corporate income tax. A company constructed a building by spending Tk. 500000000. By exporting RMG the country earned Tk. 700000000 and the country spent Tk. 400000000. A company paid Tk. 100000 as corporate income tax. (5)

All of those events happened in Bangladesh within one fiscal year 2017-2018. Then, calculate the GDP of this particular country using expenditure approach for the mentioned fiscal year.

University of Asia Pacific
Department of Basic Sciences and Humanities
Final Examination, Spring-2018
Program: B. Sc. in Civil Engineering

Course Title: Mathematics-IV | Course Code: MTH 203
Time: 3.00 Hours. | Full Marks: 150

There are **Eight** questions. Answer any **Six**. All questions are of equal value. Figures in the right margin indicate marks.

1. (a) Define Fourier sine and cosine transforms. Find the **10**

(i) finite Fourier sine transform,

(ii) finite Fourier cosine transform of the function

$$F(x) = kx^2 \ , \quad 0 < x < 4$$

(b) Obtain the Fourier Series of the function **10**

$$f(x) = \begin{cases} 0 \ , & -\pi < x < 0 \\ x \ , & 0 < x < \pi \end{cases}$$

(c) Find the Fourier transform of $f(x) = e^{-|x|}$,where x belongs to $(-\infty, \infty)$. **5**

2. (a) Use Finite Fourier sine transform to solve **18**

$$\frac{\partial U}{\partial t} = \frac{\partial^2 U}{\partial x^2} \ , 0 < x < 6 \quad and \ t > 0$$

with conditions $U(0,t) = 0, \ U(6,t) = 0, \ U(x,0) = \begin{cases} 1, & 0 < x < 3 \\ 0, & 3 < x < 6 \end{cases}$.

(b) Find the Fourier integral of the function $f(x) = e^{-kx}$ when $x > 0$ and $f(-x) = -f(x)$, **7**

for $k > 0$ and hence prove that $\int_0^\infty \frac{usinux}{k^2+u^2} du = \frac{\pi}{2} e^{-kx} \ , k > 0$

3. (a) Evaluate $\mathcal{L}^{-1}\left\{\frac{1}{(s+2)^2(s-2)}\right\}$ by using Convolution theorem. Verify the result by evaluating it **15**
by partial fraction method.

(b) Use Heaviside's expansion formula to find $\mathcal{L}^{-1}\left\{\frac{3s+1}{(s-1)(s^2+1)}\right\}$ **10**

4. (a) Find Laplace transformation of the following functions: **15**

(i) $F(t) = (1 + te^{-t})^3$

(ii) $F(t) = e^{5t}(3cos6t - 5sin6t)$

(iii) $F(t) = \frac{e^{-at} - e^{-bt}}{t}$, where a, b are constants.

(b) Prove that (i) $\int_0^\infty te^{-st}\, cosat\, dt = \frac{s^2-a^2}{(s^2+a^2)^2}$ (ii) $\int_0^\infty te^{-st}\, sinat\, dt = \frac{2as}{(s^2+a^2)^2}$, $a > 0$, using derivatives of Laplace transformation. **10**

5. (a) Solve using Laplace transformation: $Y''(t) - 3Y'(t) + 2Y(t) = 4e^{2t}$, $Y(0) = -3, Y'(0) = 5$ **12**

(b) Define inverse Laplace transformation. Evaluate $\mathcal{L}^{-1}\left\{\frac{8s+20}{s^2-12s+32}\right\}$ as a function of t. **8**

(c) Evaluate $\mathcal{L}^{-1}\left\{\frac{5s-6}{s^2+9} - \frac{s-15}{s^2-25}\right\}$ **5**

6. (a) A culture initially has P_0 number of bacteria. At $t = 2\ hour$, the number of bacteria is measured to be $\frac{5}{2}P_0$. If the rate of growth is proportional to the number of bacteria $P(t)$ present at time t, determine time necessary for the number of bacteria to triple. **15**

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

7. Solve the following differential equations using appropriate methods: **25**

(i) $\left\{y\left(1 + \frac{1}{x}\right) + cosy\right\}dx + (x + lnx - xsiny)dy = 0$

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

(iii) $x(x + y)dy = y(x - y)dx$

(iv) $\sqrt{a + x}\ \frac{dy}{dx} + x = 0$

8. (a) Find the differential equation of $y^2 = 4a(x + a)$, where a is a constant and also write down the order and degree of this differential equation. **5**

(b) Solve the following differential equations: **20**

(i) $(D^4 - 2D^3 + 5D^2)y = 0$

(ii) $(D^2 - 4)y = sin^2x$

(iii) $(D^2 - 9)y = e^{3x}cosx.$

(iv) $(D^2 - 3D + 2)y = e^{5x}.$