Bangladesh Army University of Science and Technology

Department of Civil Engineering

Final Examination, Summer 2021

Course Code: CE 2231 **Level-2 Term-II**

Time: 03 (Three) hours **Full Marks: 180**

Course Title: Engineering Geology and Geomorphology

N.B.
- The questions are of equal value.
- Figures in the margin indicate full marks allotted to each question.
- Symbols and abbreviations bear their standard meaning.
- Use separate answer script for each PART.
- The corresponding course outcomes (COs) are given in the right most column.

PART- A (Marks: 90)

(Answer any three questions including Q. No. 1)

			Marks	COs
1.	a)	Explain the following branches of geology: i. Crystallography ii. Mineralogy iii. Petrology iv. Structural geology v. Hydrology	(15)	1
	b)	An earthquake was generated somewhere underneath the ground surface. The P-wave took 1 minute 30 seconds and the S-wave took 2 minutes 30 seconds to arrive at a station where the seismogram was recorded. It was found from the graph that the highest amplitude of S-wave was 40 mm measured from the base line. Using the chart and graph provided, determine the depth of focus from the epicenter and the magnitude of the earthquake in Richter scale.	(15)	2
2.	a)	State the effect of temperature and pressure on the formation of metamorphic rock.	(10)	1
	b)	Mention a detailed classification of rocks in a flow chart.	(10)	1
	c)	Illustrate the processes of rock cycle and all its terms in a neat sketch.	(10)	1
3.	a)	Mention the types of earthquake based on its magnitude in Richter scale.	(10)	2
	b)	Define fold. Describe the causes of folding.	(10)	1
	c)	Explain the following physical properties of minerals: i. Phosphorescence ii. Fluorescence	(10)	1
4.	a)	Define plate tectonic and its principle. Also explain the convergent and divergent type of plate boundaries with neat sketches.	(10)	2
	b)	Describe the classification of fault with neat sketches.	(10)	1
	c)	Explain the following terms: i. Seismograph and Seismogram ii. Magnitude and intensity of an earthquake	(10)	2

PART- B (Marks: 90)

(Answer any three questions including Q. No. 5)

			Marks	COs
5.	a)	State the name of different geomorphic processes.	(5)	3
	b)	A stream network is shown in Fig. 1. Calculate: i) Bifurcation Ratio ii) Length Ratio iii) Length of the channel iv) Drainage Density v) Length of Overland Flow vi) Stream Frequency	(25)	4

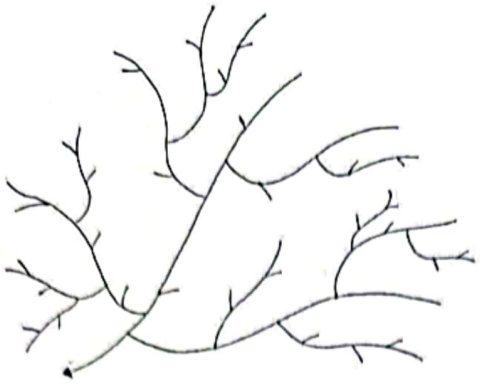


Fig. 1

Given that area of the drainage basin is 2100 sq. mile and length of the streams are $5n^2$ where n = order of stream.

6. Calculate the form factor, compactness coefficient and peak discharge using Rational formula for the given drainage basin in Fig. 2. Following data are given: (30) 4

Rainfall intensity 150 mm/hr.; $C_1 = 0.65$, $C_2 = 0.70$, $C_3 = 0.75$ and $C_4 = 0.85$

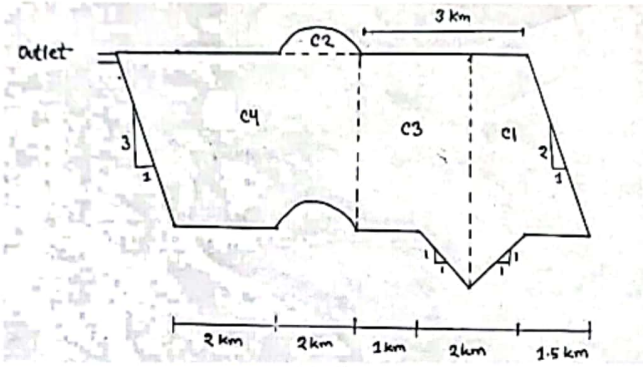


Fig. 2

7. Derive an expression for longitudinal profile of a stream. (30) 4

In the longitudinal profile of a stream, the distance between of two points of elevation of 5 ft and 150 ft from source are 600 miles and 100 miles respectively. Calculate:

i) Integral constant
ii) Proportionality constant
iii) Height of the source
iv) Distance of the point of elevation of 100 ft

Distance between the points of elevation of 50 ft and 75 ft

8. a) Differentiate between infiltration and percolation. (5) 3

b) A 500ha watershed has the land use/cover and corresponding runoff coefficient as given below: (25) 4

Land use/cover	Area (ha)	Runoff coefficient
Forest	250	0.10
Pasture	50	0.11
Cultivated land	200	0.30

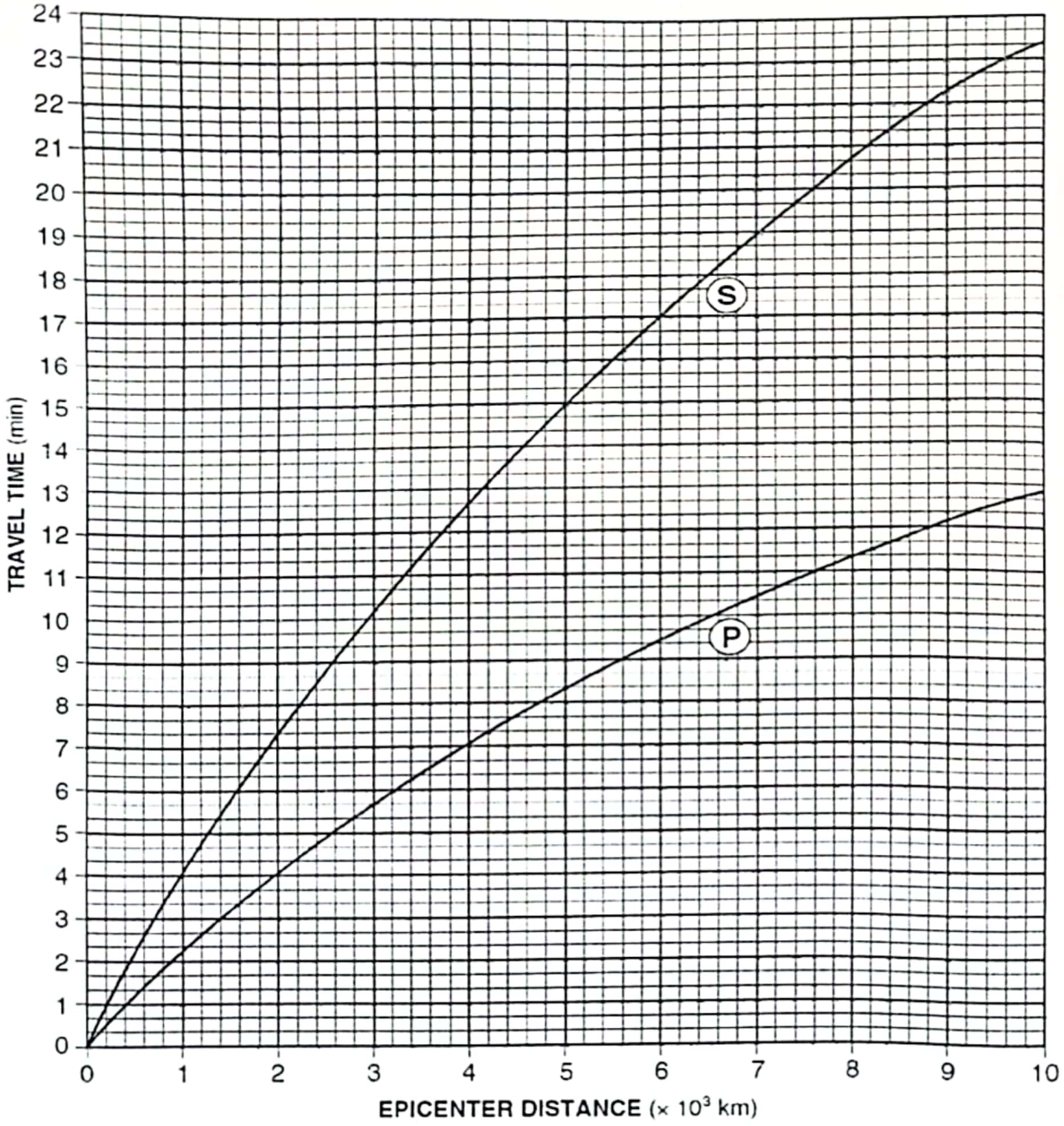
The maximum length of travel of water in the watershed is about 3000 m and the elevation difference between the highest and outlet points of the watershed is 25 m. The maximum intensity duration-frequency relationship of the watershed is given by:

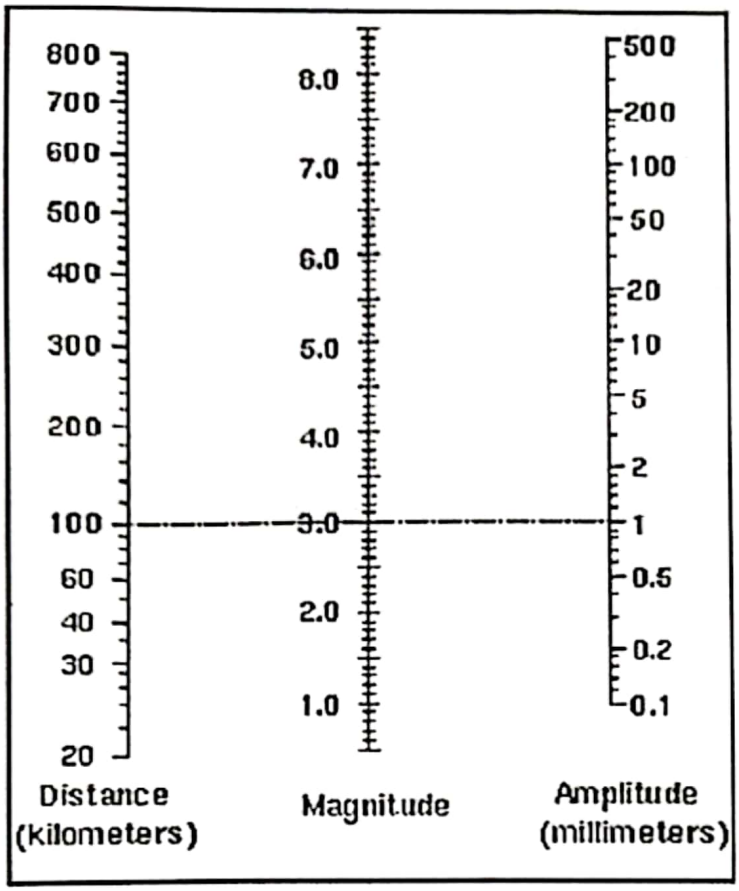
$$i = \frac{6.11T^{0.1523}}{(D + 0.50)^{0.945}}$$

where, i = intensity in cm/h, T = Return period in years and D = duration of the rainfall in hours.

Estimate the (i) 25-year peak runoff from the watershed and (ii) the 25-year peak runoff if the forest cover has decreased to 50 ha and the cultivated land has encroached upon the pasture and forest lands to have a total coverage of 450 ha.

Earthquake P-Wave and S-Wave Travel Time





The Richter Magnitude for this earthquake is _____

Bangladesh Army University of Science and Technology

Department of Civil Engineering

Final Examination, Summer 2021

Course Code: CE 2207 **Level-2 Term-II**

Time: 03 (Three) hours **Full Marks: 180**

Course Title: Applied Mathematics for Engineers

N.B.
- The questions are of equal value.
- Figures in the margin indicate full marks allotted to each question.
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- Use separate answer script for each PART.
- The corresponding course outcomes (COs) are given in the right most column.

PART- A (Marks: 90)

(Answer any three questions including Q. No. 1)

			Marks	COs
1.	a)	An aeroplane is missing. Assume that it is equally likely to have gone down in any of three possible regions. Let α denote the probability that the plane will not be found upon a search in the region i, when the plane is in fact in that region. Determine the conditional probability that the plane is in the region i, given the condition that the search for plane in region 1 was unsuccessful.	(20)	2
	b)	Suppose that the average number of accidents occurring weekly on a particular stretch of a highway equals 3. Calculate the probability that there is at least one accident that may occur this week (assume Poisson's distribution).	(10)	3
2.	a)	Write a short note on Standard Normal Distribution.	(10)	2
	b)	The probability of a specimen to be defective in a Cylinder test is 0.05. Find the probability that a batch of 25 sample will contain two or more defective sample. i) Apply Poisson's distribution ii) Apply Binomial distribution	(20)	3
3.	a)	The continuous random variable X has probability density function given by: $f(x) = k(2-x)(x-5)$ for $2 \le x \le 5$ $= 0$ otherwise Determine: i) K ii) Mean value of X iii) Variance of X Note: $var(X) = E(X2) - \{E(X)\}2$	(20)	2
	b)	Daily probability that a major earthquake occurs $P[E] = 10^{-5}$. Probability that premonitory event A or B occurs given that major earthquake occurs is $P[A\|E] = P[B\|E] = 0.1$. Probability that premonitory event A or B occurs given that major earthquake does not occur is $P[A\|E^C] = P[B\|E^C] = 0.001$. Determine the probability of a major earthquake, given that premonitory event A is observed.	(10)	2
4.	a)	Buses arrive at a specified stop at 15 min. intervals starting from 7 am. That is, they arrive at 7:00, 7:15, 7:30, 7:45 am etc. If a passenger arrives at a stop at a time uniformly distributed between 7:00 & 7:30 am, find the probability that he waits (i) less than 5 min. (ii) at least 12 min.	(20)	3
	b)	IEB Committee of 5 persons to be randomly selected from 6 men and 9 women engineers. Determine the probability that the committee consists of 3 men and 2 women engineers.	(10)	2

PART- B (Marks: 90)

(Answer any three questions including Q. No. 5)

			Marks	COs
5.	a)	Show that Fourier series is a periodic function itself.	(10)	1
	b)	A spring-mass-damper system as shown in Fig. 1. Using Laplace transform the show that the response x of this mass with time i.e., $x(t)$ is an exponentially decaying function.	(20)	1

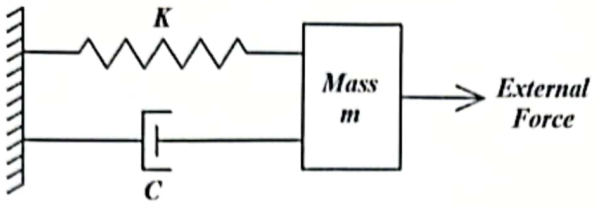

Fig. 1

6.	a)	State the Dirichele conditions for the existence of Fourier transform.	(10)	1
	b)	A square wave is shown in Fig. 2 given below as a function of t. Define the function and find its Fourier series expansion and make a comment based on it.	(20)	1

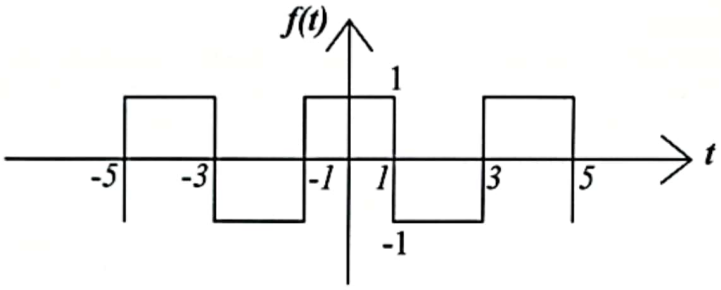

Fig. 2

7.	a)	Show that the Laplace transform is a special form of Integral transform.	(10)	1
	b)	A simply supported beam of length L is subjected to a uniformly distributed load (UDL) as shown in Fig. 3. Using Laplace transform express its deflection y as a function of x.	(20)	1

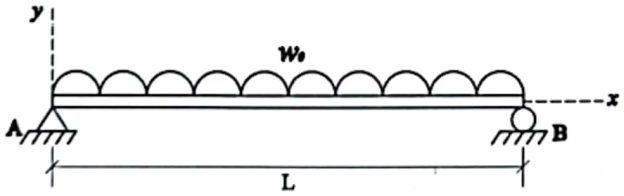

Fig. 3

8.	a)	Define orthogonality of functions. Check the orthogonality of the functions given below: i. 1 and $\cos px$ ii. $\cos px$ and $\cos qx$	(10)	1
	b)	Find out the Fourier transform of an exponential function e^x and e^{-x}.	(20)	1

Bangladesh Army University of Science and Technology

Department of Civil Engineering

Final Examination, Summer 2021

Course Code: CE 2211 **Level-2 Term-II**

Time: 03 (Three) hours **Full Marks: 180**

Course Title: Mechanics of Solids II

N.B.
- The questions are of equal value.
- Figures in the margin indicate full marks allotted to each question.
- Symbols and abbreviations bear their standard meaning.
- Use separate answer script for each PART.
- The corresponding course outcomes (COs) are given in the right most column.

PART- A (Marks: 90)

(Answer any three questions including Q. No. 1)

			Marks	COs
1.	a)	Explain the term 'Kern of a section'.	(05)	2
	b)	A steel tube with the cross section shown in Fig. 1 carries a torque T. The tube is 3 m long and has a constant wall thickness of 10 mm. (1) Compute the torsional stiffness k of the tube. (2) If the tube is twisted through 0.5°, determine the shear stress in the wall of the tube. Use G = 85 GPa and neglect stress concentrations at the corners.	(25)	1

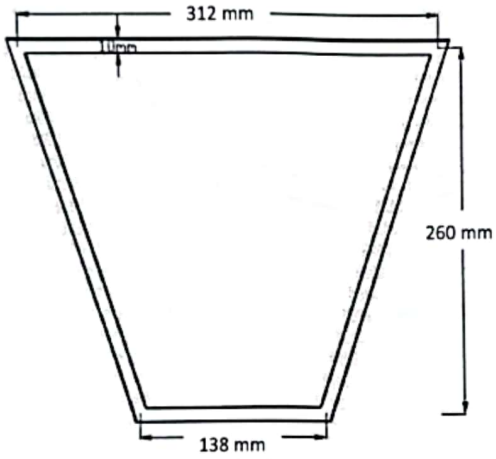

Fig. 1

2.		Find the stress distribution at section ABCD for the block shown in mm in Fig. 2, if P = 100 kN. At the same section locate the line of zero stress. Neglect the weight of the block.	(30)	2

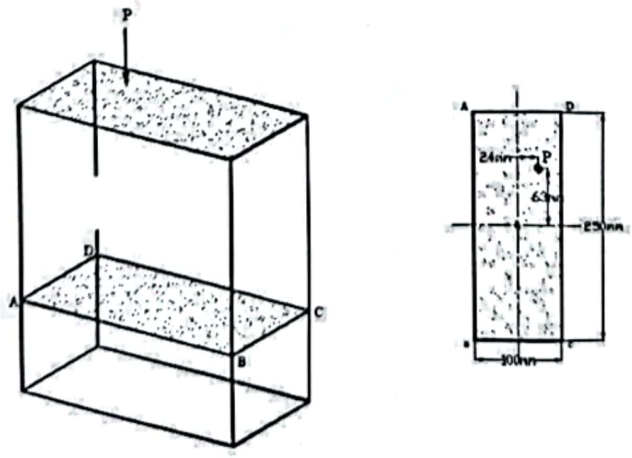

Fig. 2

3.		The state of plane stress at a point with respect to xy axes is shown in Fig. 3. Using Mohr's Circle determine (a) Principal stresses and principal planes; (b) the maximum in plane shear stress; and (c) equivalent state of stress with respect to inclined plane.	(30)	2

Show all results on sketches of properly oriented elements.

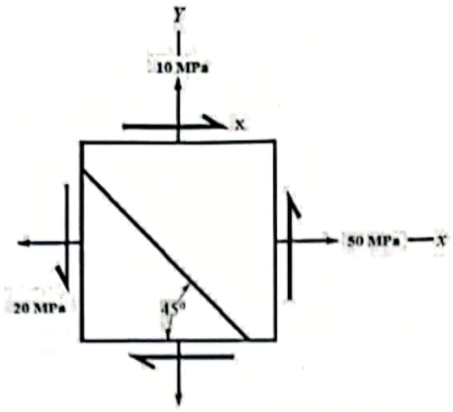

Fig. 3

4. a) State the General Cable Theorem. (05) 4

b) A cable is under point loads on different location as show in Fig. 4. Max sag at point C is 500 mm. Find the cable length and maximum tension on cable. (25) 4

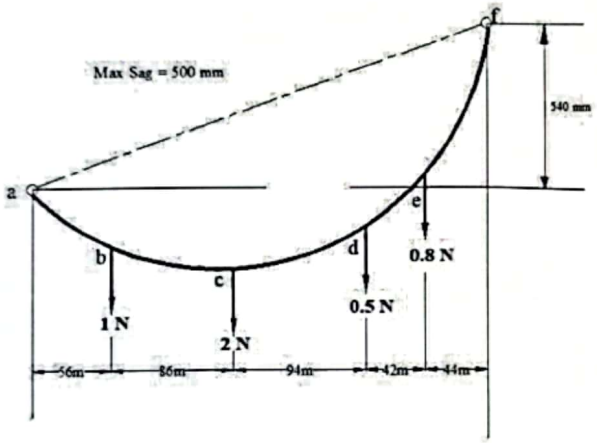

Fig. 4

PART- B (Marks: 90)

(Answer any three questions including Q. No. 5)

			Marks	COs
5.	a)	Define critical load for column. Explain the slenderness of column in terms of its length and radius of gyration.	(10)	3
	b)	An overhanging beam is shown in the Fig. 5 below. Find the value of EIy at point B, C and E by double integration method. Also locate the point of maximum deflection.	(20)	4

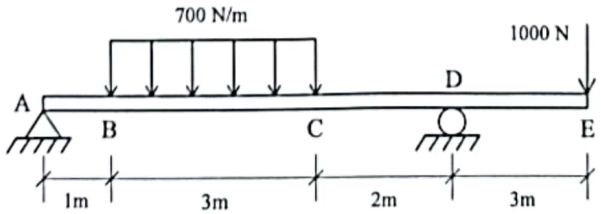

Fig. 5

6. a) A circular column of diameter 300 mm and length 7 m is subjected to a concentric load P = 500 kN. Determine the critical load on that column assuming it to be a simply supported one and comment on whether the applied load is safe or not. Assume FS = 3.0 and E = 30 GPa. (10) 3

b) By area-moment method, determine the value of deflection at point B for the simply (20) 4

supported beam shown in Fig. 6. The cross-sectional dimension is 300 mm x 600 mm and the value of modulus of elasticity is 25 GPa.

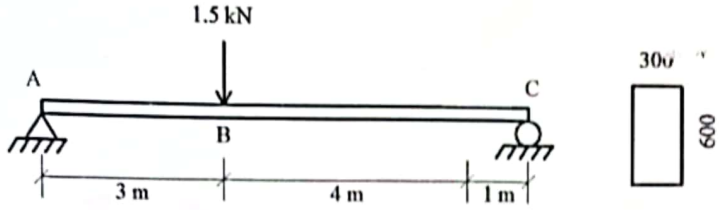

Fig. 6

7. a) Define the following terms with neat sketches: (10) 4

   i. Elastic curve
   ii. Flexural rigidity
   iii. Deflection
   iv. Deformation

   b) For a column subjected to a vertical load P find out the expression for critical load. (20) 3

8. a) Mention the methods for the determination of deflection in a beam. (04) 4

   b) Draw the respective conjugate beams of the beams shown in the Fig. 7 below. (06) 4

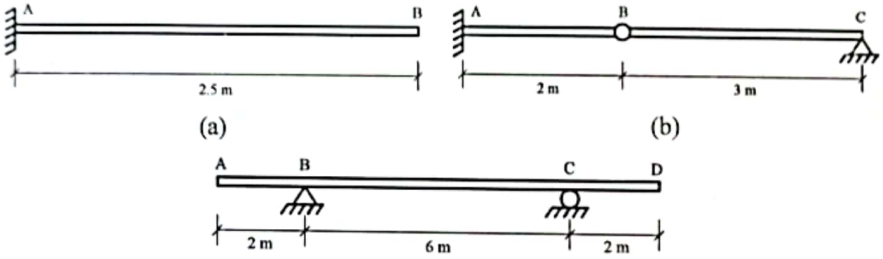

Fig. 7

   c) For a beam subjected to external loading, apply the principle of double-integration method and show that- (20) 4

$$EIy = \int\int M\,dx\,dx + C_1x + C_2$$

Bangladesh Army University of Science and Technology

Department of Civil Engineering

Final Examination, Summer 2021

Course Code: HUM 2209 **Level- 2 Term-II**

Time: 03 (Three) hours **Full Marks: 120**

Course Title: Financial and Managerial Accounting

N.B.
- The questions are of equal value.
- Figures in the margin indicate full marks allotted to each question.
- Symbols and abbreviations bear their standard meaning.
- Use separate answer script for each PART.
- The corresponding course outcomes (COs) are given in the right most column.

PART- A (Marks: 60)

(Answer any three questions including Q. No. 1)

			Marks	COs
1.	a)	Book-keeping is a part of accounting." _ justify this statement with your opinion.	10	1,2
	b)	Explain the general assumptions of operating guidelines provided by Generally Accepted Accounting Principles (GAAP).	10	1,2
2.		Mr. A has started a new business. The following events and transactions occurred there in April. Identify the transactions from the following events: i. Purchase of furniture and equipment for Tk. 50,000 cash. ii. Purchase of supplies of Tk. 5000 on credit. iii. Services provided for Tk. 10,000 cash. iv. Incurred advertising expense on account. v. Mr. A hired a sales person for the salary of Tk. 12000 per month. vi. Purchase computer of Tk. 45,000 on credit. vii. Discussed product design with the potential customer. viii. Rent of the office building and premises of Tk. 20,000 paid. ix. Salary of the sales person paid in cash. x. Mr. A has completed all formalities of opening a bank account with Sonali Bank Ltd. for the business by depositing Tk. 1000.	20	2
3.	a)	What do you know about double entry system? Why is it called the scientific method of recording transactions?	10	1,2
	b)	Show the accounting cycle followed by different organizations in recording accounting data.	10	1,2
4.	a)	Rima opened the campus laundry on July 1, 2019. During the first month of operations, the following transactions were occurred. April 1. Rima invested TK.40,000 cash in the business. 2. The company paid TK.1,500 cash for store rent for April. 3. Purchased washers and dryers for TK. 25,000 paying TK.10,000 in cash. 20. Rima withdrew TK.1,000 for personal use. 25. Cash receipts for laundry services TK.7,000 30. Paid to the creditors for purchasing washers and dryers. Required: Prepare appropriate journals of the transactions occurred in July.	20	2

PART- B (Marks: 60)

(Answer any three questions including Q. No. 6)

			Marks	COs
5.	a)	Define managerial accounting. What are the differences between financial accounting and managerial accounting?	15	3,4
	b)	Explain margin of safety with an example.	05	3,4
6.		On January 1, 2019 Mr. X started a business. Following are the information of his company at December 31st 2020:	20	2,3

Particulars	Amount (Tk.)	Particulars	Amount (Tk.)
Supplies	2,000	Service Revenue	6,700
Accounts Receivable	3,000	Advertising Expense	800
Cash	10,150	Rent expense	1,600
Equipment	10,000	Salaries expense	200
Notes payable	9,000	Capital	12,000
Accounts payable	1,200	Utilities expense	150
Unearned Service Revenue	1,000	Insurance expense	1,000
Owner's drawing	500	Salary and Wages payable	500
Transportation cost	1,000		

Prepare a Trial Balance on 31st December, 2020.

7. Wheel Corporation's most recent income statement is shown below: 20 4

Particulars	TK.
Sales (10,000 units)	3,50,000
Variable expenses	2,00,000
Contribution Margin	1,50,000
Fixed expenses	1,35,000
Net Operating Income	15,000

Requirements:
Prepare a new contribution format income statement under each of the following conditions (consider each case independently):

i. The sales volume increases by 100 units.
ii. The sales volume decreases by 100 units.
iii. The sales volume is 9,000 units.

8. Carbex corporation manufactures basketballs. In July 2020, the company sells 3000 balls at Tk. 75,000. Variable expense 45000 and fixed expense is 21000. 20 3,4

Required:

i. Prepare a CVP graph from 0 levels up to 4000 balls showing break-even point.
ii. The sales manager thinks that an advertising project costing Tk. 10,000 will help to increase sales by 20%. Will you recommend Carbex Corporation to make this change?

Bangladesh Army University of Science and Technology

Department of Civil Engineering

Final Examination, Summer 2021

Course Code: CE 2261 **Level-2 Term-II**

Time: 03 (Three) hours **Full Marks: 240**

Course Title: Mechanics of Fluids

N.B.
- The questions are of equal value.
- Figures in the margin indicate full marks allotted to each question.
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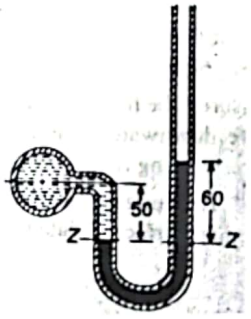
PART- A (Marks: 120)

(Answer any three questions including Q. No. 1)

			Marks	COs
1.	a)	State and prove Pascal's law.	(20)	1
	b)	Distinguish between i) Specific weight and Specific gravity ii) Compressibility and Capillarity	(10)	1
	c)	Explain Newton's Law of viscosity with neat sketch.	(10)	2
2.	a)	With a neat sketch show the relation among Absolute pressure, Gauge pressure, Vacuum pressure and Atmospheric pressure.	(20)	1
	b)	A simple manometer as shown in Fig. below containing mercury is used to measure the pressure of water flowing in a pipe. The mercury level in the open tube is 60 mm higher than that on the left tube. If the height of water in the left tube is 50 mm, determine the pressure in the pipe in terms of head of water.	(20)	1



3.	a)	State the Bernoulli's equation. Derive Bernoulli's equation following any method.	(30)	2
	b)	State the practical applications and assumptions of Bernoulli's equation.	(10)	2
4.	a)	Obtain a relation for the point where the resultant pressure cuts the base of a dam retaining water on one of its sides.	(20)	2
	b)	Explain the term 'stability of a dam'. State the important factors for checking the stability of a trapezoidal dam.	(20)	2

PART- B (Marks: 120)

(Answer any three questions including Q. No. 5)

			Marks	COs
5.	a)	When a fluid is flowing in a pipe some head loss may occur due to friction. Derive Darcy's equation for the determination of loss of head due to friction in pipeline.	(20)	3
	b)	Explain the term "velocity of approach" during the discharge of water over a weir.	(10)	3
	c)	A weir of 10 m long is to be built across a rectangular channel to discharge a flow of 9	(10)	3

m^3/s. If the maximum depth of water on the upstream side of the weir is to be 2 m, calculate the height of the weir. Assume coefficient of discharge 0.65.

6. a) Explain with neat sketch: (20) 1

   i) Compound pipe
   ii) Equivalent pipe
   iii) Branched pipe
   iv) Syphon pipe

   b) Water flows through a pipe of 200 mm in diameter and 60 m long with a velocity of 2.5 m/s. Find the head loss due to friction. Assume C = 55. (20) 3

7. a) Derive the expression of time taken to empty a tank fully through an orifice fitted at the bottom of the tank. (20) 2

   b) A 60 mm diameter orifice is discharging water under a head of 9 m. Calculate the actual discharge through the orifice in liters per second and actual velocity of the jet at vena contracta. Assume, co-efficient of discharge = 0.62 and co-efficient of velocity = 0.98. (20) 3

8. a) Sketch the different types of (20) 1

   i) Mouthpieces
   ii) Notches

   b) A pipe of section 0.1 m^2 suddenly changes to 0.4 m^2 area. The quantity of water flowing in the pipe in 0.3 m^3/s and the pressure at the smaller part of the pipe is 85 kPa. Find (20) 3

   i) Head loss due to sudden enlargement
   ii) Pressure at the larger part of the pipe