

Khulna University of Engineering & Technology
Department of Industrial Engineering and Management

B.Sc. Engineering 2nd Year 1st Term Examination, 2017

CSE 2111

Data Structures and Algorithm

Full Marks: 210

Time: 03 hrs

N.B: i) Answer any *THREE* questions from each section in separate scripts.
 ii) Figures in the right margin indicate full marks.
 iii) Assume reasonable data if missing any.

SECTION-A

1. (a) What is data structure? Why do we need to study data structure? 10
 (b) What are the advantages and disadvantages of using array as a data structures? 08
 (c) How can you represent a linear array in terms of memory? Explain. 07
 (d) Write an algorithm to insert an element in an array before a specific element. 10

2. (a) What is meant by the complexity of sorting algorithm? 05
 (b) Write down the quick sort algorithm to sort the elements of an array in ascending order. 15
 (c) Apply binary search algorithm to find out the item= 80 in the following sort data 15
 elements: 10 15 25 40 55 60 65 70 75 80

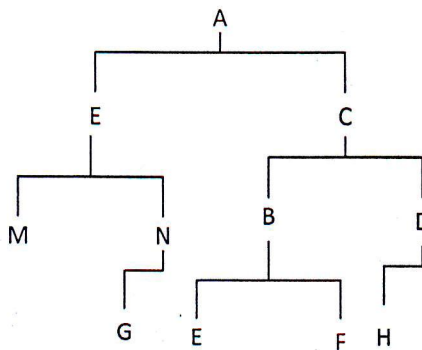
3. (a) Explain overflow and underflow problem with proper example(s). 08
 (b) What is circular queue? Describe the operations performed on circular queue with example. 12
 (c) Translate the following infix expression into its equivalent postfix expression P. 15

$$Q: (A * (B - C) / D \uparrow E) - (F + G / H)$$

4. (a) What is linked list? What are the advantages of using a two way linked list over one way linked list? 07
 (b) Write an algorithm to delete an element from any position of a one way linked list. 15
 (c) Write an algorithm to create a two way linked list? 13

SECTION-B

5. (a) What is tree? When do we use tree? 08
 (b) Define complete binary tree. Represent the following tree in memory: 13

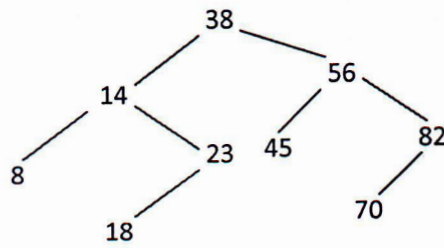


- (c) Inorder: D B FE AGC LJHK 14
 Preorder: D F EB GLJ KHCA
 Draw the tree.

6. (a) Define binary search tree. Mention its benefits. 08
 (b) Describe the deleting methodology in binary search tree with example. 15

6. (c) Insert 13, 39 and 57 in the following BST

12

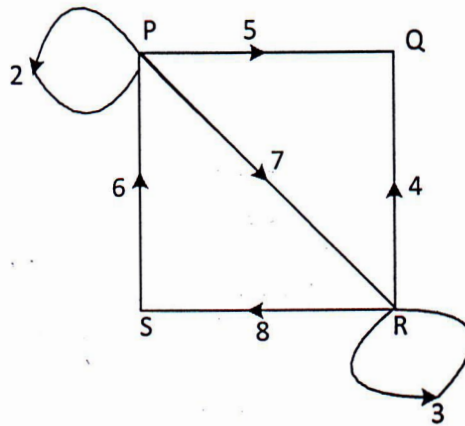


7. (a) Define graph, connected graph, complete graph and simple graph.

10

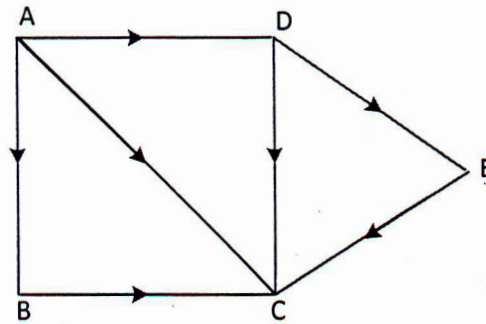
(b) Find the shortest path matrix of the following graph:

13



(c) Describe linked representation of the following graph.

12



8. (a) Define hashing. Describe the requirements of hashing.

10

(b) You have 60 keys of students viz. 1511001, 1511002,....., 1511060. And 100 four-digit addresses viz. 6451, 6452,, 6550. Develop a hash function to store the keys.

13

(c) What is collision? Mention the methods of collision resolution.

12

Khulna University of Engineering & Technology
Department of Industrial Engineering and Management

B.Sc. Engineering 2nd Year 1st Term Examination, 2017

HUM 2111

Financial, Cost and Management Accounting

Full Marks: 210

Time: 03 hrs

- N.B:** i) Answer any *THREE* questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.
iii) Assume reasonable data if missing any.

SECTION-A

1. (a) Mr. Habib started a business on June 2016. The following transactions occurred during the month of June: 28

2016 June 01	Invested TK 40,000 cash as capital.
2016 June 03	Purchase office equipment in cash TK 10,000.
2016 June 05	Paid TK 8000 cash for office rent for the month.
2016 June 06	Purchase office supplies on account TK 5000.
2016 June 08	Performed services TK 16,000 on account.
2016 June 10	Received TK 10,000 cash for service provide.
2016 June 13	Incurred TK 3,000 for advertising cost on account.
2016 June 15	Withdrew TK 2,000 cash for personal use.
2016 June 18	Earned TK 17,000 for service rendered of which TK 10,000 received in cash from customer and the balance is billed to customer on account.
2016 June 20	Paid TK 6,000 for employee salaries for the month.
2016 June 21	Paid the advertising cost due to transaction June-13.
2016 June 25	Received TK 9,000 cash from Dhaka Bank money borrowed on a note payable.
2016 June 28	Paid TK 2,700 for utilities expense.
2016 June 29	Paid the supplies purchased on account June 06.

Required: Show the effects of the transactions on the accounting equation using the following needs: Cash + Accounts + Receivable + Supplies + Office Equipment = Notes Payable + Accounts Payable + Habib's Capital.

- (b) Who are the users of accounting information? What are the purposes of their using accounting information? 07
2. (a) What is transaction? Discuss the characteristics of transaction. 05
(b) Why ledger is called the king of all books? 05
(c) Mr. Enamul is an architect. During April 2014 he completed the following transactions: 25

2014 April 01	He invested TK 10,00,000 in cash.
2014 April 03	Cash paid for office rent TK 4000.
2014 April 08	Paid TK 3000 to advertise in the local newspaper.
2014 April 10	Received cash TK 15,000 for service provided.
2014 April 12	Completed architectural work on account TK 60,000.
2014 April 20	Earned revenue TK 2,20,000 of which 1,20,000 received in cash and balance on account.
2014 April 25	Purchase office computer TK 50,000, paying TK 40,000 in cash and balance on account.
2014 April 28	Paid TK 10,000 for utility expenses.

Required: Prepare necessary ledger accounts.

3. (a) What do you mean by adjusting entries? When to be adjusted? 08
(b) What is trial balance? Discuss the errors not disclosed by trail balance. 07
(c) The following data are collected from the books of Adcom advertising: 20
i) Supplies on hand at December 31, total TK 1,850 (Trail balance shows a debit balance of supplies account TK 4,000.).

- ii) Automobile depreciation for the year TK 2500.
- iii) Service provided but unbilled TK 4,500 at December 31.
- iv) Expired insurance for the year TK 1,800.
- v) Interest of TK 1,400 accrued on notes payable for the year.
- vi) TK 2000 of the unearned fees has been earned.
- vii) Accrued salaries at December 31 are TK 5000.
- viii) Repairs of automobiles of TK 800 have been incurred but bills are unpaid.

Required: Prepare the adjusting entries for the above item.

4. (a) From the book of Nabila company, the following trial balance has been prepared on 31st December, 2015. 35

Nabila Co. Trial balance, 31.12.2015		
Account Titles	Debit(TK)	Credit(TK)
Capital		5,00,000
Plant	8,00,000	
Sales		17,70,000
Purchase	6,00,000	
Sales return and purchase return	20,000	24,500
Opening inventory	3,00,000	
Sales expenses	3,500	
Telephone expenses	750	
Accounts receivable	4,50,000	
Accounts payable		2,50,000
Salaries	1,67,000	
Transportation-in	7,500	
Transportation-out	12,000	
Allowance for doubtful debts		5,250
Bad debts expense	2,000	
Rent and Taxes	1,00,000	
Advertisement	18,000	
Cash in hand	9,000	
Cash at bank	60,000	
Total	<u>25,49,750</u>	<u>25,49,750</u>

The following adjustment are required:

- a) Ending inventory TK 3,50,000.
- b) Depreciation of plant @ 6% p.a.
- c) Make allowance for doubtful debts to TK 5,000.

Required:

- i) Prepare a statement of comprehensive income.
- ii) Owner's equity statement and
- iii) Statement of financial position as on 31st December, 2015.

SECTION-B

5. (a) What is cost sheet? Why and how is it prepared? 10
- (b) From the following information of Progati manufacturing company, you are required to prepare a cost sheet for half year end on June 30, 2016. Showing: 25
- i) Cost of raw materials consumed;
 - ii) Prime cost;
 - iii) Production cost;
 - iv) Cost of goods sold;
 - v) Cost of sales and profit:

Elements of cost	01-01-2016(TK)	30-06-2016(TK)
Inventory of raw materials	66,000	30,000
Inventory of work-in-progress	20,000	16,000
Inventory of finish goods	36,000	24,000
Purchase of raw materials		2,10,000
Return of raw materials purchase		6,000
Direct labor cost		80,000

Direct expenses	10,000
Factory rent	14,000
Depreciation on machinery	8,000
Administrative overhead (10% of production cost)	
Sales manager's salary	20,000
Advertising expense	12,000
Profit: 25% on sales.	

6. (a) What do you mean by raw materials? 05
(b) Differentiate between direct materials and indirect materials. 08
(c) From the following particulars of Jamuna Mills Ltd. For the month of February, 2017: 22

February 01	Opening inventory 1,500 units @ TK 10.00 each;
February 04	Purchased 1,200 units @ TK 9.00 each;
February 08	Purchased 1,800 units @ TK 11.00 each;
February 12	Issued 2,200 units
February 16	Purchased 2,700 units @ TK 8.00 each;
February 21	Issued 3,000 units
February 24	Return from production 500 units issued on February 12;
February 26	Purchased 2,100 units @ TK 12.00 each;
February 28	Issued 1,700 units.

Required: Prepare store ledger account under LIFO method.

7. (a) What is salaries and wages sheet? State the deductible items from salaries and wages? 10
(b) Following information for three office assistants of Provati Enterprise: 25

Particulars	Name of employees		
	Kamal	Bahar	Habib
Basic salaries(TK)	15,000	12,000	10,000
House rent (% of basic salary)	45%	45%	45%
Medical allowance(TK)	1,500	1,500	1,500
Dearness allowance (% of basic salary)	20%	20%	20%
Conveyance allowance (TK)	600	600	600
Subscription to joint life policy	2%	2%	2%
Subscription to welfare fund	1%	1%	1%
Employees contribution to provident fund (% of basic salary)	10%	10%	10%
Overtime (hours)	20	25	30
Deduction of advance against provident fund (TK)	700	-----	500

During the month, normal working hours were 200 hours. Overtime allowance was double of the basic salary per hour. Bahar enjoy 2 days leave without salary.

Instruction: Prepare payroll register for the month of September, 2016.

8. (a) What is budget? 04
(b) Show the classification of budget? 08
(c) From the following information of Surma company Ltd. Prepare a cash budget for the month of January to March, 2017. Expected purchase and sales are given below: 23

Months	Purchases(TK)	Sales(TK)
December, 2016	1,44,000	1,80,000
January, 2017	2,10,000	1,20,000
February, 2017	2,25,000	1,35,000
March, 2017	2,55,000	1,50,000

40% of the sales are on credit, cash on 50% of the credit sales will be collected in the month of sales and other 50% will be collected in the next month. Purchases are all for cash. Wages to be paid are TK 15,000 per month. Balance at bank on January 01, TK 24,000. It has been decided by the management that in case of deficit of fund in any month with in a limit of TK 90,000, the deficiency can be met by making arrangement of overdrawing the account in the bank. But the deficiency exceeds TK 90,000, long term loans will be arranged.

Khulna University of Engineering & Technology
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B.Sc. Engineering 2nd Year 1st Term Examination, 2017

IPE 2111
Mathematics-III

Full Marks: 210

Time: 03 hrs

- N.B:** i) Answer any *THREE* questions from each section in separate scripts.
 ii) Figures in the right margin indicate full marks.
 iii) Assume reasonable data if missing any.

SECTION-A

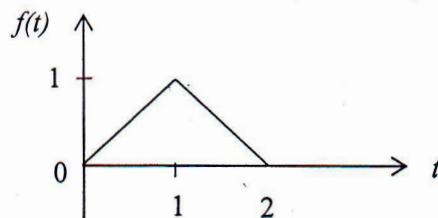
1. (a) Define function of a complex variable and limit of a function. A function is defined as follows: $f(x) = \begin{cases} \frac{z^2+4}{z-2i} & \text{when } Z \neq 2i \\ 3 + 4i & \text{when } Z = 2i \end{cases}$ Find $\lim_{z \rightarrow 2i} f(Z)$, if exists. Is the function continuous at $Z = 2i$? Explain. 12
- (b) Separate real and imaginary parts of the function $f(Z) = \frac{z}{|z|}$ and verify whether they satisfy the Cauchy-Riemann equations or not? 10
- (c) Determine the set of points and sketch them in a finite Z -plane represented by the inequality $\text{Im}\left(\frac{1}{z}\right) \geq \frac{1}{2}$. 07
- (d) Define limit point and branch point with examples. 06
2. (a) What do we understand by simply-and multiply-connected regions? Using appropriate theorem(s) evaluate the integral $\oint_C \frac{dz}{z(2z-3)(z-3)}$; where C is a positively oriented circle $|Z| = 2$. 16
- (b) Define isolate and non-isolate singular points with examples. Find all the singular points and classify them of the followings: 13
 - i) $\frac{\ln(Z-3)}{(Z^2+Z+1)^4}$
 - ii) $\frac{e^{\frac{1}{z-3}}}{(Z+1)^2}$
 - iii) $\frac{1}{Z(e^Z-1)}$
- (c) Define analytic function and harmonic function. 06
3. (a) State Taylor's theorem. Expand $f(Z) = \frac{1}{(Z+1)^2}$ in a Taylor series about $Z = i$. 10
- (b) Expand $f(Z) = \frac{z-1}{z^2+5z+6}$ in a Laurent series valid for the region $0 < |Z+2| < 1$. 09
- (c) Evaluate $\int_C (Z - Z^2)dZ$, where C is in the upper half of the circle $|Z| = 1$. 07
- (d) Using Cauchy's residue theorem evaluate $\oint_C \frac{dz}{z^3(z+4)}$; $c = \{Z: |Z| = 2\}$ 09
4. (a) Evaluate any two of the following integrals by the method of contour integrations: 30
 - i) $\int_0^{\infty} \frac{dx}{x^4+1}$
 - ii) $\int_{-\infty}^{\infty} \frac{x \sin x}{x^2+a^2} dx; a > 0$
 - iii) $\int_0^{2\pi} \frac{d\theta}{3+2 \cos \theta}$
- (b) Find all the values of $\left(\frac{1+i}{1-i}\right)^{\frac{1}{5}}$ 05

SECTION-B

5. (a) Show that the form of differential equation by the family of curves $y = Ae^x + Be^{-x} + c \cos x$, where A, B, C are arbitrary constants, in written as 10

$$\frac{d^3y}{dx^3} + \tan x \frac{d^2y}{dx^2} - \frac{dy}{dx} - (\tan x)y = 0$$

5. (b) Find the particular solution of $(D^3 - D^2 + 4D - 4)y = 0$ with $y(0) = 1, Dy(0) = 4$ and $Dy\left(\frac{\pi}{2}\right) = 0$ 10
- (c) Solve $\frac{\partial u}{\partial t} = 2 \frac{\partial^2 u}{\partial x^2}$ subject to the conditions $u(0, t) = u(3, t) = 0, u(x, 0) = f(x)$ and $u(x, t)$ is bounded by the method of separation of variables. 15
6. (a) Solve $\frac{d^2 y}{dx^2} + y = \sec x$ by the method of variation of parameters. 12
- (b) Solve $\frac{dy}{dx} = \frac{6x-4y+3}{3x-2y+1}$ 12
- (c) Solve $\frac{dy}{dx} = \frac{a^2}{(x-y)^2}$ 11
7. (a) Solve $(D^3 - 2D^2 + 5D)y = 10 + 5 \sin 2x$ 12
- (b) Solve $(D^2 - 4D + 4)y = x^2 e^{2x}$ 11
- (c) Solve $(D^2 - 9D + 18)y = e^{-3x}$ 12
8. (a) Find the Laplace transform of the function $f(t)$ which is represented by the graph: 11



- (b) Evaluate $L^{-1}\left\{\frac{1}{s^2(s^2+4)}\right\}$ by using the convolution theorem. 10
- (c) Using the Laplace transform, find the solution of the initial value problem: 14
- $$y'' + 25y = 10 \cos 5t$$
- $$y(0) = 2, y'(0) = 0$$

Khulna University of Engineering & Technology
Department of Industrial Engineering and Management

B.Sc. Engineering 2nd Year 1st Term Examination, 2017

ME 2111

Engineering Mechanics and Theory of Machines

Full Marks: 210

Time: 3 hrs

- N.B:** i) Answer any **THREE** questions from each section in separate scripts.
 ii) Figures in the right margin indicate full marks.
 iii) Assume reasonable data if missing any.

SECTION-A

1. (a) A container of weight $W=1165\text{ N}$ is supported by three cable as shown in figure 1(a). 20
 Determine the tension in each cable.

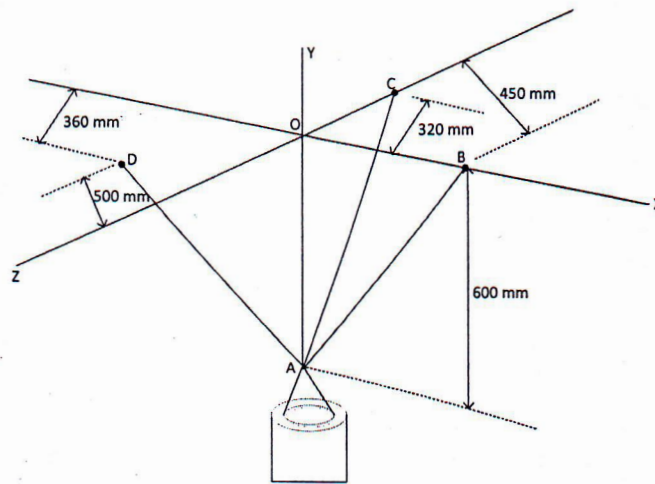


Figure 1(a)

- (b) A light bar AB supports a 15-Kg block at its midpoint C. Rollers at A and B rest against frictionless surfaces, and a horizontal cable AD is attached at A as shown in figure 1(b). Determine the tension in cable AD and the reactions at A and B. 15

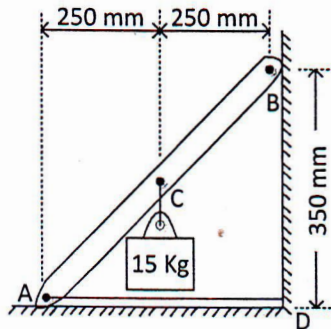


Figure 1(b)

2. (a) Locate the centroid of the plane area shown in figure 2(a). 17

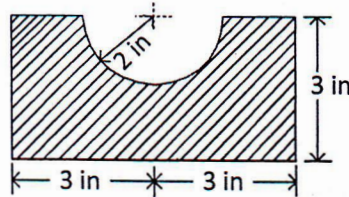


Figure 2(a)

- (b) Determine the moment of inertia and radius of gyration of the shaded area shown in figure 2(b) with respect to x axis. 18

for which sliding is impending and compute the corresponding value of the normal force exerted on the block by the vertical wall.

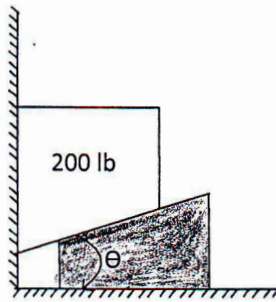


Figure 4(b)

SECTION-B

5. (a) The two blocks shown in figure 5(a) are originally at rest. Assuming that the coefficient of friction between block A and incline are $\mu_s = 0.25$ and $\mu_k = 0.20$. Neglecting the masses of the pulleys. Determine-

- i) The acceleration of each block.
- ii) The tension in the cable.

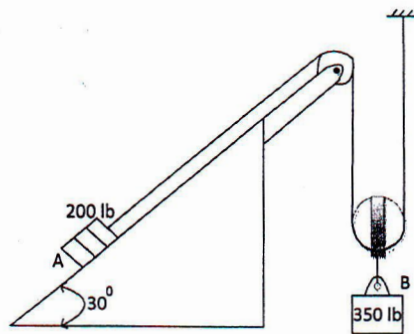


Figure 5(a)

- (b) A 2000-lb car starts from rest at port 1 and moves without friction down the track shown in figure 5(b).

- i) Determine the force exerted by the track on the car at point 2, where the radius of curvature of the track is 20 ft.
- ii) Determine the minimum safe value of the radius of curvature at point 3.

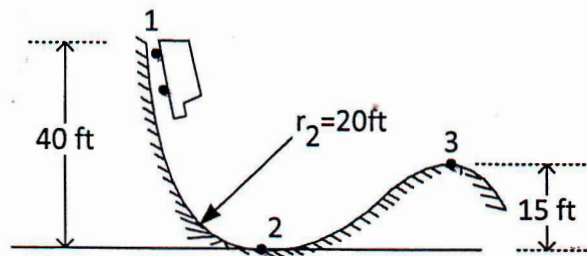


Figure 5(b)

6. (a) The magnitude and direction of the velocities of two identical frictionless balls before they strike each other are shown in figure 6(a). Assuming $e=0.90$, determine the magnitude and direction of the velocity of each ball after the impact.

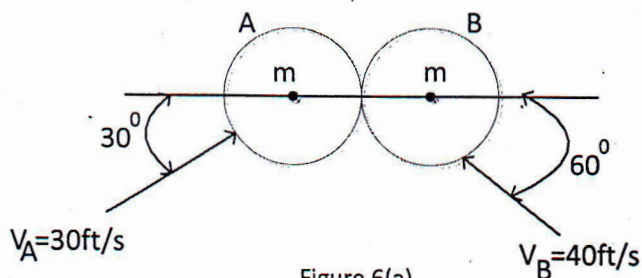


Figure 6(a)

6. (b) A 10-lb slender rod AB is welded to the 6 lb uniform disk which rotates about a pivot at A. A spring of constant 0.625 lb/in is attached to the disk and is un-stretched when rod AB is horizontal. Knowing that the assembly is released from rest in the position shown in figure 6(b). Determine its angular velocity after it has rotated through 90° . 17

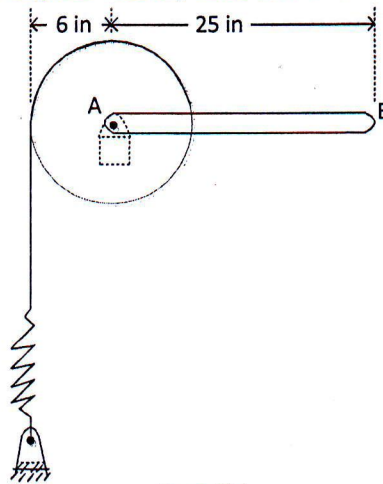


Figure 6(b)

7. (a) A slender rod of length L and mass m is supported as shown in figure 7(a). After the cable is cut the rod swings freely. 18
- Determine the angular velocity of the rod as it first passes through a vertical position and the corresponding reaction at the pin support.
 - Solve part (i) for $m = 3 \text{ Kg}$ and $L = 720 \text{ mm}$.

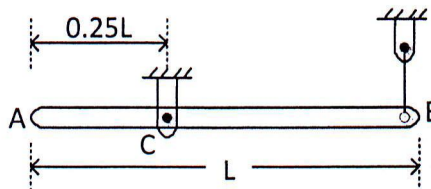


Figure 7(a)

- (b) Four masses A, B, C and D are attached to a shaft and revolve at equal Radii and are equally spaced along a shaft. The mass B is 7 Kg and the radii of C and D make angles of 90° and 240° respectively with the radius of B. Find the magnitude of the masses A, C and D and the angular position of A so that the system may be completely balanced. 17

8. (a) Define: 08
- Damping factor
 - Logarithmic decrement
 - Critical damping
 - Transmissibility
- (b) Deduce the expressions for the natural frequency of free longitudinal method using Rayleigh's method. 12
- (c) A flywheel is mounted on a vertical shaft as shown in figure 8(c). The both ends are free 15 and its diameter is 50 mm. the flywheel has a mass of 500 Kg. Find the natural frequencies of longitudinal and transverse vibrations. Take $E = 200 \text{ GN/m}^2$.

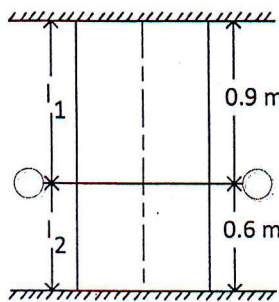


Figure 8(c)