1. (a) Given below is the Cost Data of ZZZ company for the year 2012.

(All the figures are in Taka.)

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount (Tk)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material Purchase</td>
<td>1,80,000</td>
</tr>
<tr>
<td>Returns &amp; Allowances of material</td>
<td>2,000</td>
</tr>
<tr>
<td>Carriage in</td>
<td>2,500</td>
</tr>
<tr>
<td>Direct Labour Cost</td>
<td>75,000</td>
</tr>
<tr>
<td>Factory machine insurance</td>
<td>20,200</td>
</tr>
<tr>
<td>Manufacturing Equipment repair cost</td>
<td>30,000</td>
</tr>
<tr>
<td>Factory rent</td>
<td>15,000</td>
</tr>
<tr>
<td>Sales Revenue</td>
<td>3,33,000</td>
</tr>
<tr>
<td>Promotional expense</td>
<td>40,000</td>
</tr>
<tr>
<td>Indirect labour</td>
<td>70,000</td>
</tr>
<tr>
<td>Office telephone expense</td>
<td>3,000</td>
</tr>
<tr>
<td>Manager's salary</td>
<td>1,50,000</td>
</tr>
<tr>
<td>Inventory in units</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Raw Materials</td>
<td>Beginning of the year</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Raw Materials</td>
<td>42,000</td>
</tr>
<tr>
<td>Work in process</td>
<td>12000</td>
</tr>
<tr>
<td>Finished Goods</td>
<td>58000</td>
</tr>
</tbody>
</table>

Requirements:

(i) Prepare a Cost Statement for the year 2012.

(ii) Calculate what is the net income.

(b) Give Journal Entries for the following transactions.

Materials Purchased on Account Tk. 50000.
Direct materials used Tk. 30000 and indirect material Tk. 15000.
Direct and Indirect labor paid Tk. 20000 and 16000 respectively.
Manufacturing Overhead applied for Tk. 45000.
Actual Overhead incurred on account Tk. 40000.
Goods were completed and transferred to Finished Goods Account.
Sales of products on account for Tk. 75000.
Cost of goods sold is 60% of finished goods.
HUM 225(URP)

2. (a) What are the factors that comprise CVP Analysis? How does contribution margin differ from net operating income? (5 pts)

(b) V company sells telephone wire. The company's cost and sales data is given below:

Sales (20000) units at 60 taka per unit
Variable expense 45 taka per unit
Fixed expense 2,40,000 taka

Requirements:

(i) Prepare a Contribution Margin Income Statement. (18)
(ii) Compute the company's Contribution Margin ratio and variable expense ratio.
(iii) Compute the company’s break-even point in sales and in units. Use the contribution margin method to answer. Compute Margin of Safety in taka and in percent.
(iv) Assume that the company's sales increase by 4,00,000 taka next year. If everything remains unchanged, how much will be company's net operating income increase?
(v) Refer to the original data. If the company wants to sack one employee who was being paid 70000 taka salary and also expects to decrease the variable cost per unit by 15% what will be the change in net operating income?

3. (a) The following data are given for calculation of Variances. (18)

Number of Finished Goods 900 units.

Material:
Standard Cost per unit 3 units @ Tk. 4 per unit
Actual units purchased 2820 units @ Tk. 3.9 per unit
Material Used 2750 units.

Labor:
Standard Cost per unit 2 hours @ Tk.5 per hour
Total Direct Wages paid 2000 hours @ Tk. 5.2 per hour
Standard hours allowed 1800 hours

Overhead:
Actual Tk. 4800
Budgeted fixed overhead 2000 hours @ Tk. 0.80
Standard Overhead 1800 hours @ Tk. 2.8

Requirements: Calculate the following variances:

(i) Material Price Variance and Material Quantity Variance
(ii) Labor Rate and Labor Efficiency Variance
(iii) Volume Variance and Controllable Variance.
(b) Write down the classification of Tax on the basis of structure of tax rate. Which tax system is followed in Bangladesh?

(c) Show the effects of Residential Status in assessing income for tax purpose.

4. (a) What is the difference between Income year and Assessment year? Mr. Jalil stayed in Bangladesh from 1st August, 2008 to 31st December, 2008 and then left for London. What will be his residential status in the income year 2008-2009?

(b) Mr. Noman is an executive who generated following income during the year ended 30.06.2012:

- Basic salary Tk. 8000 per month.
- House rent allowance Tk. 5,000 per month.
- Conveyance allowance Tk. 1000 per month.
- Mobile bill allowance Tk. 500 per month.
- Two festival bonus each equal to Tk. 10,000.
- Commission received total Tk. 20,000 for the year.
- Overtime allowance Tk. 30,000 for the year.
- Income from sole proprietorship business Tk. 80,000.
- Dividend from limited company share Tk. 5,400.
- Interest on bank deposit Tk. 2,700.
- Interest from tax free government securities Tk. 8,000.
- Interest from approved commercial securities Tk. 7,000

Mr. Noman incurred the following investments and expense during the year:

- Life Insurance Premium paid Tk. 20,000; Policy value Tk. 200,000.
- Investment in stocks and shares of listed companies Tk. 60,000.
- Investment in Savings Certificate Tk. 30,000.
- Donation to a charitable hospital Tk. 10,000.
- Donation to Zakat Fund Tk. 5,000.

Required: Calculate taxable income and net tax liability for Mr. Noman for the Income Year 2011-2012.
5. (a) What is accounting equation? Write a brief note on different elements of accounting equation.
(b) Mr. Kabir started his own business "Kabir Enterprise" on June 1, 2012. The following transactions were completed during the month:

<table>
<thead>
<tr>
<th>Date</th>
<th>Transaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>June-1</td>
<td>Kabir invested Tk. 15,000 cash to start the enterprise.</td>
</tr>
<tr>
<td>June-2</td>
<td>Paid Tk. 600 cash for June office rent.</td>
</tr>
<tr>
<td>June-11</td>
<td>Purchased office equipment for Tk. 3000 cash.</td>
</tr>
<tr>
<td>June-14</td>
<td>Incurred Tk. 700 advertising cost in the Daily News, on account.</td>
</tr>
<tr>
<td>June-17</td>
<td>Paid Tk. 800 cash for office supplies.</td>
</tr>
<tr>
<td>June-19</td>
<td>Earned Tk. 11,000 for services rendered, Tk. 3000 cash is received from clients and the balance of Tk. 8000 is billed to clients on account.</td>
</tr>
<tr>
<td>June-23</td>
<td>Withdrew Tk. 500 cash for personal use.</td>
</tr>
<tr>
<td>June-29</td>
<td>Paid employees' salaries Tk. 2200.</td>
</tr>
<tr>
<td>June-30</td>
<td>Received Tk. 4000 in cash from clients who previously been billed in the transaction of June 19.</td>
</tr>
</tbody>
</table>

Required:
(i) Prepare a tabular analysis of transaction using the following column headings: Cash, Accounts receivable, Supplies, Office equipment, Accounts payable and Kabir Capital.
(ii) From an analysis of the owner's equity columns compute the net income or net loss for June.

6. (a) "Accounting is an information system" - Explain.
(b) The unadjusted trial balance of Marine Company at January 31, 2012 is shown below:

<table>
<thead>
<tr>
<th>Accounts Title</th>
<th>Debit (Tk.)</th>
<th>Credit (Tk.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>15,200</td>
<td></td>
</tr>
<tr>
<td>Supplies</td>
<td>2,500</td>
<td></td>
</tr>
<tr>
<td>Prepaid insurance</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>Office equipment</td>
<td>5000</td>
<td></td>
</tr>
<tr>
<td>Notes payable</td>
<td></td>
<td>5,000</td>
</tr>
<tr>
<td>Accounts payable</td>
<td></td>
<td>2500</td>
</tr>
</tbody>
</table>

Contd ......... P/5
HUM 225(URP)
Contd ... Q. No. 6(b)

<table>
<thead>
<tr>
<th>Accounts Title</th>
<th>Debit (Tk.)</th>
<th>Credit (Tk.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unearned revenue</td>
<td></td>
<td>1200</td>
</tr>
<tr>
<td>Toma's capital</td>
<td></td>
<td>10,000</td>
</tr>
<tr>
<td>Toma's drawing</td>
<td></td>
<td>500</td>
</tr>
<tr>
<td>Service revenue</td>
<td></td>
<td>10,000</td>
</tr>
<tr>
<td>Salaries expenses</td>
<td></td>
<td>4,000</td>
</tr>
<tr>
<td>Utilities expenses</td>
<td></td>
<td>900</td>
</tr>
</tbody>
</table>

28,700 28,700

Analysis reveals the following data:
- Supplies on hand Tk. 1500 at January 31.
- Insurance policy is for two years.
- Depreciation per month Tk. 200 for office equipment.
- Tk. 500 of unearned revenue is still unearned at month end.
- Services provided but not recorded at January 31 is Tk. 500.
- Unpaid salary is Tk. 700.

Required:
(i) Explain the principles that are related with the adjusting entries.
(ii) Journalise the adjusting entries for the items above at January 31, 2012.

7. The adjusted trial balance for premium Bus service is as follows:

Premium Bus Service
Adjusted Trial Balance
December 31, 2010

<table>
<thead>
<tr>
<th>Accounts Title</th>
<th>Debit (Tk.)</th>
<th>Credit (Tk.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>8100</td>
<td></td>
</tr>
<tr>
<td>Accounts receivable</td>
<td>10,800</td>
<td></td>
</tr>
<tr>
<td>Supplies</td>
<td>1,500</td>
<td></td>
</tr>
<tr>
<td>Prepaid advertisement expense</td>
<td>2,000</td>
<td></td>
</tr>
<tr>
<td>Office equipment</td>
<td>24,000</td>
<td></td>
</tr>
<tr>
<td>Accumulated depreciation on office equipment</td>
<td>5,600</td>
<td></td>
</tr>
<tr>
<td>Notes payable</td>
<td>15,000</td>
<td></td>
</tr>
<tr>
<td>Accounts payable</td>
<td>6100</td>
<td></td>
</tr>
<tr>
<td>Salaries payable</td>
<td>2400</td>
<td></td>
</tr>
<tr>
<td>Interest payable</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>Capital</td>
<td>15,800</td>
<td></td>
</tr>
</tbody>
</table>

Contd .......... P/6
**HUM 225(URP)**

Contd ... Q. No. 7

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount Tk.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drawing</td>
<td>7,000</td>
</tr>
<tr>
<td>Service revenue</td>
<td>56,000</td>
</tr>
<tr>
<td>Insurance</td>
<td>3500</td>
</tr>
<tr>
<td>Supplies expenses</td>
<td>4000</td>
</tr>
<tr>
<td>Depreciation</td>
<td>5600</td>
</tr>
<tr>
<td>Advertising expenses</td>
<td>8400</td>
</tr>
<tr>
<td>Salaries expenses</td>
<td>31000</td>
</tr>
<tr>
<td>Interest expenses</td>
<td>600</td>
</tr>
<tr>
<td>Unearned service revenues</td>
<td>5000</td>
</tr>
<tr>
<td></td>
<td><strong>106,500</strong></td>
</tr>
</tbody>
</table>

**Required:**

(i) Prepare an income statement for the period.

(ii) Prepare a statement of owner's equity for the period. Additional investment made by the owner during the year was Tk. 5800.

(iii) Prepare a classified balance sheet on December 31, Tk. 9000 for the notes payable become due in 2011.

8. (a) Briefly discuss the importance of financial statement analysis.

(b) Following is the balance sheet of AB Ltd. as on 31st December, 2010:

**AB Ltd.**

**Balance sheet**

as at 31st December 2010

<table>
<thead>
<tr>
<th>Assets</th>
<th>Amount Tk.</th>
<th>Liabilities &amp; Owner's equity</th>
<th>Amount Tk.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plants machinery</td>
<td>14,00,000</td>
<td>Accounts payable</td>
<td>60,000</td>
</tr>
<tr>
<td>Office equipment</td>
<td>775,000</td>
<td>VAT payable</td>
<td>35,000</td>
</tr>
<tr>
<td>Cash and bank</td>
<td>105,000</td>
<td>Unpaid salaries</td>
<td>100,000</td>
</tr>
<tr>
<td>Closing inventory</td>
<td>120,000</td>
<td>Mortgage loan</td>
<td>6,00,000</td>
</tr>
<tr>
<td>Prepaid insurance</td>
<td>20,000</td>
<td>Unearned service revenues</td>
<td>150,000</td>
</tr>
<tr>
<td>Accounts receivable</td>
<td>75,000</td>
<td>Capital</td>
<td>15,50,000</td>
</tr>
<tr>
<td></td>
<td>24,95,000</td>
<td></td>
<td>24,95,000</td>
</tr>
</tbody>
</table>

**Other information:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount Tk.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>Tk. 47,50,000</td>
</tr>
<tr>
<td>Gross profit</td>
<td>20,00,000</td>
</tr>
<tr>
<td>Net profit after tax</td>
<td>950,000</td>
</tr>
<tr>
<td>Tax rate</td>
<td>40%</td>
</tr>
</tbody>
</table>
HUM 225(URP)

Contd... Q. No. 8(b)

Required:
Calculate the following:

(i) Current ratio; (ii) Quick ratio; (iii) Gross profit ratio; (iv) return on investment;
(v) Debt-equity ratio; (vi) proprietary ratio; (vii) Inventory turnover; (viii) receivable
turnover.

(c) Maria Helen, a business graduate, has started her own consulting firm 'Helen M.
Consulting' on May 2010, The following transactions occurred during the month of May:

<table>
<thead>
<tr>
<th>May -1:</th>
<th>Maria invested Tk. 200,000 cash to start business.</th>
</tr>
</thead>
<tbody>
<tr>
<td>May -2:</td>
<td>Purchased supplies for Tk. 12,000; paid Tk. 6,000 in cash and the balance on account.</td>
</tr>
<tr>
<td>May -8:</td>
<td>Paid cash Tk. 1000 to the Daily Prothom Alo for advertising expenses.</td>
</tr>
<tr>
<td>May -12:</td>
<td>Service provided to the clients Tk. 5000 on account.</td>
</tr>
<tr>
<td>May -20:</td>
<td>Withdrew Tk. 2000 cash from the business for personal use.</td>
</tr>
</tbody>
</table>

Required:

(i) Journalise each transaction

(ii) Prepare cash ledger.
L-3/T-1/BURP

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA
L-3/T-1 B. URP Examinations 2011-2012
Sub: CE 361/327 (Elements of Solid Mechanics)
Full Marks: 210 Time: 3 Hours
The figures in the margin indicate full marks.
USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION - A

There are FOUR questions in this Section. Answer any THREE.

1. (a) Write down 5 (five) points on which selection of Factor of Safety (F.S) depend. (10)
   (b) Locate the centroid of a hemispherical volume whose radius is 'r'. (10)
   (c) Determine \( I_y \) of the shaded area as shown in Figure-1 (area between the curve \( x^2 = by \) and line \( y = ax \)) using the elementary area dA as shown in the Figure-1. (15)

   \[ \text{Figure - 1} \]

2. (a) Say, 'Moment of Inertia' of an area about two perpendicular axes passing through a particular point is known. Derive an expression to determine 'Moment of Inertia' about any axis passing through that point and hence determine the corresponding axis for which 'radius of gyration' is minimum. (15)
   (b) Find \( I_x \) and \( I_y \) for the channel section shown in Figure-2. (20)

   \[ \text{Figure - 2} \]

   Given:
   \[ a = 1'' \]
   \[ b = 4.5'' \]
   \[ c = 11'' \]

3. (a) The rigid bar BDE (Figure-3) is supported by two links AB and CD. Link AB is made of aluminum (\( E = 75 \text{ GPa} \)) and has a cross sectional area of 450 mm\(^2\); link CD is made of steel (\( E = 200 \text{ GPa} \)) and has a cross sectional area of 550 mm\(^2\). Determine the maximum force 'P' for which neither the stresses in the links exceed 200 MPa nor the deflection of point E exceeds 2.5 mm. (25)

   \[ \text{Figure - 3} \]

Contd ........... P/2
CE 361 /327

**Contd ... Q. No. 3**

(b) A pin is used to attach a clevis to a rope. The maximum force in the rope will be 70 kN. If the maximum shear stress allowed in the pin is 40 MPa, calculate the diameter of the pin.

4. (a) By stating the necessary assumptions, prove that for isotropic material $0 < \phi < \frac{\pi}{2}$.

(b) Write down the mathematical expressions of two theorems of 'Pappus & Guldinus'.

(c) Draw Shear force and Bending Moment Diagram for the loaded beam shown in Figure-4.

![Figure-4](image)

**SECTION – B**

There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) In the system of sheaves shown in Figure-5, what force $F$ will hold a weight of $W = 6000$ lbs in equilibrium? There are no frictional losses at the axes.

![Figure-5](image)

(b) Determine shear forces and bending moments at sections through b and d of the beam shown in Figure-6.

![Figure-6](image)

6. (a) Draw shear force and bending moment diagrams of the beam shown in Figure-7.

![Figure-7](image)

Contd .......... P/3
(b) A 6000 lbs sphere rests on a smooth plane inclined at an angle of $\theta = 30^\circ$ with the horizontal and against a smooth vertical wall (Figure-8). What are the reactions at the contact surface A and B? Assume that the sphere is subjected to a concurrent force system.

Figure- 8

7. (a) In Figure-9, let $W_A = 2500$ lbs, $W_B = 1000$ lbs, $W_C = 4000$ lbs and force $R = 8000$ lbs. Neglecting all friction so that the reactions are normal to the surfaces, find the force $Q$ on top of the wedge. Assume that each body is subjected to a concurrent force system. $\theta = 7.5^\circ$.

Figure- 9

(b) The derrick shown diagrammatically in Figure-10 supports a load of 3000 lbs. Find the tension in the boom cable and the compression in the boom. Neglect the self weight of the boom. $\theta = 30^\circ$.

Figure- 10

8. (a) Find the forces on all members of the truss shown in Figure-11.
CE 361 / 327

Contd ... Q. No. 6

(b) An ore car B which weighs 20 tons is balanced by a weight A as shown in Figure-12. The angle of the inclination, $\theta = 60^\circ$. What should be the weight A if there is no friction at any point?

Figure- 12
SECTION - A

There are FOUR questions in this section. Answer any THREE.

1. (a) Discuss the importance of housing finance. What are the ways to strengthen formal housing finance in developing countries? (04+09=13)
   (b) Name the laws concerned with Real Estate sector and discuss important Real Estate Regulations with special reference to Real Estate Development and Management Act, 2010. (15)
   (c) Draw normal demand and supply curve. Depict the market condition of neither a shortage nor a surplus of apartment housing using the same curve. State the condition of shifting Market demand and supply curve. (07)

2. (a) Use Figure 01 to show the effects of the following changes on the optimum location of the polluting factory. Do the changes cause the optimum location to move closer to or farther from the residential area? (12)
   (i) The unit commuting cost (cost per mile) increases
   (ii) Residents become more sensitive to pollution
   (iii) The polluting factory discovers a new method of pollution abatement that cuts abatement cost in half.
   (b) In Figure 02, large lot zoning increases the price of apartment land and decreases the price of land for single-family homes. Under what circumstances (what values of the relevant elasticities) will the zoning policy increase the total value of land in the city? (08)
   (c) What is Real Estate Economics? Which factors play important role in choosing a dwelling for different income households. Explain with proper graphical representation. (4+8=12)
   (d) What is 'Assurance of Title'? (03)

3. (a) In Figure 03, the equilibrium price of building permits is $30,000. Suppose that the demand curve shifts down and intersects the supply curve at a quantity of 50 dwellings per year. What is the equilibrium price of permits? (10)
   (b) Consider a city where a polluting industry is separated from the residential area by a 7 mile buffer. The closer the firm to the residential district, the lower the wage and the higher the effluent fee. What is the social cost of the segregation zoning policy? In other words, if the city prevents the firm from locating at its optimum location, what is the cost to society? (08)
   (c) Why poor households occupy used housing? (05)
   (d) Explain Real Estate trade cycle with proper illustrations. (12)

Contd ......... P/2
PLAN 321

4. (a) Define Lemon market, Moral hazard and Adverse selection in case of securitization in Real Estate. (09)

(b) What is Agency theory? Distinguish between Pre-investment and Post-investment relationship of principal and agent in a Real Estate Management procedure. (04+10=14)

(c) Suppose that a city has recently proposed the rezoning of a 12 acre parcel of land, from low density use (1 dwelling/acre) to high density use (20 dwellings/acre). (12)

(i) Who will support the zoning change? Who will oppose the rezoning?

(ii) Describe a policy under which all parties will agree to the rezoning if in fact the rezoning is efficient.

SECTION – B

There are FOUR questions in this section. Answer any THREE.

5. What should be the characteristics of good or adequate housing according to the planning guidelines and principles? Explain with examples. (35)

6. Write short notes on the following (any five): (5×7=35)
   (a) Types of houses,
   (b) The benefits of adequate housing, with necessary diagrams,
   (c) Indicators for measuring the quality of housing,
   (d) The twelve (12) signs of a good place to live,
   (e) Micro-finance for house improvement,
   (f) Group leading for financing housing,
   (g) Community vision and principles for better planning of the city.

7. Briefly describe— (5×7=35)
   (a) Who provides loan for housing?
   (b) Who can apply for housing loan and under what conditions?
   (c) What are the sources of housing finance?
   (d) What are the barriers for accumulating capital in the public sector housing finance in Bangladesh?
   (e) What strategies should be adopted in order to increase capital in the House Building Finance Corporation of Bangladesh?

8. (a) Briefly describe the evolution of housing policy in the developing countries. (15)
   (b) Compare the housing policy of Bangladesh with that of Singapore or Hong Kong. (20)
Figure 01

Figure 02
PLAN 321

\[ \begin{align*}
\text{Price of housing (}$ \times 1,000) & \\
\text{New houses / year} & \\
\text{Supply curve} & \\
\text{with 60 building permits} & \\
\text{Initial supply curve} & \\
\text{Demand curve} & \\
\end{align*} \]
SECTION – A

There are FOUR questions in this section. Answer any THREE.

1. (a) What is water resources planning? Briefly discuss the various levels of water resources planning with proper examples.
   
   (2+10)

   (b) Define IWRM. Discuss the rationale for water pricing in the context of IWRM.
   
   (2+6)

   (c) Briefly discuss the processes of EIA and SIA for water resources projects.
   
   (6+5)

   (d) "Public participation is necessary in every stages of water resources planning and management" — why?
   
   (4)

2. (a) Enlist the various stages of a river. Explain how bends are developed in an alluvial river.
   
   (2+8)

   (b) Differentiate between—

   (i) Perennial and non-perennial rivers (ii) Aggrading and degrading rivers

   (4+4)

   (c) Classify river training works. Describe the objectives of constructing groynes as river training structures.
   
   (6+5)

   (d) Sketch the cross sections of the following river training works—

   (i) Marginal embankment (ii) Permeable groyne (iii) Guide bank

   (6)

3. (a) Enlist the various bank protection measures practiced in Bangladesh. Discuss the major components of revetment with proper sketch.

   (6+6)

   (b) What are the general requirements of navigable waterways in alluvial river? Describe the basic steps while planning a navigation project?

   (3+8)

   (c) Write short notes on—

   (i) Bandalling (ii) Artificial cut-off

   (4+4)

   (d) Explain why "underkeel clearance" is needed?

   (4)

4. (a) Briefly describe the status of Inland Waterway Transport in Bangladesh. Discuss the necessity of dredging in this context.

   (5+5)

   (b) Describe the basic dredging process. What are the objectives of such dredging?

   (3+7)
(c) Draw a typical layout of an irrigation project. What are the factors that should be considered while planning an irrigation project?  
(d) Enlist the general methods of irrigation. Write down the advantages and disadvantages of furrow irrigation.

SECTION - B

There are FOUR questions in this section. Answer any THREE.

5. (a) What are the purposes of water resources development and management? Briefly discuss the participatory approach of water resources planning.  
(b) Describe with a neat diagram the hydrologic cycle.  
(c) Briefly describe the types of precipitation based on air lifting.  
(d) The average rainfall over a basin of area of 50 ha during a storm was as follows:

<table>
<thead>
<tr>
<th>Time (h)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rainfall (mm)</td>
<td>0.0</td>
<td>6.0</td>
<td>11.0</td>
<td>34.0</td>
<td>28.0</td>
<td>12.0</td>
<td>6.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

If the volume of runoff of this storm was $25 \times 10^3 \text{ m}^3$. Calculate the $\phi$-index for the storm.

6. (a) Briefly describe different methods of determining average rainfall over a catchment.  
(b) What are the considerations in siting a raingauge? Briefly describe a non-recording Raingauge.  
(c) What do you mean by (i) pan coefficient (ii) $\Phi$-index (iii) Field capacity (iv) Potential Evapotranspiration (v) Effective rainfall?  
(d) At the site of a large reservoir the average climatic data during a week are: water Temperature $= 20^\circ \text{C}$, relative humidity $= 55\%$ and wind speed at 2 m above the ground level $= 4.5 \text{ m/s}$. Estimate the average daily evaporation from the reservoir during that week. The saturation vapour pressure at $20^\circ \text{C}$ is $17.54 \text{ mm of H}_2\text{O}$. 

7. (a) Explain with a schematic diagram the different routes of runoff. Write about the maintenance work of a float gauge recorder.  
(b) An urban catchment has an area of $0.75 \text{ km}^2$. The slope of the catchment is 0.005 and the maximum length of travel is $850 \text{ m}$. The maximum depth of rainfall with a 25 year return period is as below:

<table>
<thead>
<tr>
<th>Duration (min)</th>
<th>5</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth of rainfall (mm)</td>
<td>17</td>
<td>26</td>
<td>40</td>
<td>50</td>
<td>57</td>
<td>62</td>
</tr>
</tbody>
</table>
WRE 309

Contd... Q. No. 7(b)

If a culvert for drainage at the outlet of this area is to be designed for a return period of 25 years, estimate the required peak flow rate, by assuming runoff coefficient as 0.2.

(c) What is vertical axis current meter? Write the disadvantages of vertical axis current meter.

(d) The ordinate of a 6-h unit hydrograph are as given below:

<table>
<thead>
<tr>
<th>Time (h)</th>
<th>0</th>
<th>6</th>
<th>12</th>
<th>18</th>
<th>24</th>
<th>30</th>
<th>36</th>
<th>42</th>
<th>48</th>
<th>54</th>
<th>60</th>
<th>66</th>
</tr>
</thead>
<tbody>
<tr>
<td>UH (m³/s)</td>
<td>0</td>
<td>20</td>
<td>60</td>
<td>150</td>
<td>120</td>
<td>90</td>
<td>66</td>
<td>50</td>
<td>32</td>
<td>20</td>
<td>10</td>
<td>0</td>
</tr>
</tbody>
</table>

If two storms, each of 1-cm rainfall excess and 6-h duration occur in succession, calculate the resulting hydrograph of flow. Assume base flow to be uniform at 10 m³/s.

8. (a) Briefly discuss the design considerations for an urban storm drainage system.

(b) What do you mean by (i) Saturated zone (ii) Aquitard (iii) Cone of depression (iv) Specific yield (v) Invert elevation?

(c) What are the assumptions necessary for the derivation of steady flow in a well in confined aquifer? Derive an equation for steady flow to a well in an unconfined aquifer.

(d) A 40 cm diameter well completely penetrates a confined aquifer of Permeability 45 m/day. The length of the strainer is 20 m. under steady state of pumping the drawdown at the well was found to be 3.0 m and the radius of influence was 300 m. if the discharge is required to increase 5% from the present condition, how much the diameter of the well have to be increased?
SECTION - A

There are FOUR questions in this section. Answer any THREE.

1. (a) What do you understand by the term "Transportation System"? Why transportation is called a Space-Shaping Technology? (5+5=10)
   (b) What are the factors responsible for efficiency of a transport mode?
   (c) Explain how changes in the various factors of land use affect trip length, trip frequency and mode choice of the residents of a city.

2. (a) To what extent the transportation system of Dhaka city can be described as a balanced and integrated system? Explain briefly with relevant examples. (6)
   (b) "Automobile cities, developed in the 20th century, create different social, economic and environmental problems" – State some of these problems and discuss about the solutions to reduce automobile dependence. (12+8=20)
   (c) All urban road system must support three functional categories of travel. Briefly describe each of these categories.

3. (a) Describe the factors on which the minimum stopping distance of a motorized vehicle depends. (8)
   (b) BRTA is deciding on the maximum speed limit for vehicles which would travel on a newly constructed road that ends at a major intersection. Considering the roadway and traffic characteristics, a stop sign is placed 295 feet from the intersection. What should be the maximum speed limit on this road? (If required, assume standard values for roadway factors) (10)
   (c) "Better solution to a transport problem can be found outside the transport sector itself" – Do you agree with this statement? Justify your answer with relevant examples. (5)
   (d) Distinguish among the major categories of urban roads. Give examples for each category of road. (12)

4. (a) Explain how transportation plays an influential role in determining the urban form and land use pattern of a city. (10)
   (b) Right-turning traffic is a major problem which results in the formation of long queues at the major intersection of Dhaka city. Describe, with necessary illustrations, the various method of restricting right-turning traffic at an intersection with their merits and demerits. (15)
   (c) What is "level of service" in relation to an urban road? List the factors which determine the level of service of a road. (5+5=10)

Contd ........... P/2
PLAN 343

SECTION – B

There are FOUR questions in this section. Answer any THREE.

5. (a) A 13 meter wide bituminous road in front of EME building of BUET is facing heavy rainfall. Parabolic camber is to be provided there. What will be the height of the crown (in mm) above edges? (Adopt camber 1 in 60).  
(b) What are the different levels of measurements that can be adopted for volume study? Which one of these measurements is most suitable for intersection design and why?  
(c) Write down the characteristics of O-D zones.  
(d) "On-street parking should be prohibited at certain locations" – Which locations are those? Briefly discuss.

6. (a) Write down the advantages of traffic rotaries.  
(b) What are the factors that influence the PCE at 'intersection' and 'link'? From the following table calculate the PCE value for Bus, Rickshaw and Auto-rickshaw.  

<table>
<thead>
<tr>
<th>Mode</th>
<th>Headway (sec)</th>
<th>Width (m)</th>
<th>Required lateral clearance (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Car</td>
<td>2.2</td>
<td>1.8</td>
<td>1</td>
</tr>
<tr>
<td>Bus</td>
<td>4.4</td>
<td>2.5</td>
<td>1</td>
</tr>
<tr>
<td>Rickshaw</td>
<td>2.4</td>
<td>1.2</td>
<td>0.8</td>
</tr>
<tr>
<td>Auto-rickshaw</td>
<td>1.2</td>
<td>1.2</td>
<td>1</td>
</tr>
</tbody>
</table>

(c) What do you mean by 'traffic delay'? Discuss with examples.  
(d) What is an 'interchange ramp'? Briefly state different forms of interchange ramp with appropriate illustrations.

7. (a) Why shoulders are kept along urban roadway?  
(b) What are the differences between traffic sign and road marking?  
(c) Discuss about the pictorial representation of O-D survey data.
(d) A Parking Patrol Survey has been conducted on last Wednesday from 12:00 PM to 2:00 PM and 6:00 PM to 8:00 PM (total 4 hours period) at the interval of 15 minutes on the on-street parking provision of 'Japan-Bangladesh Friendship Hospital'. At that place the number of marked on-street parking spaces is 14.

Collected data are given in the following tables:

<table>
<thead>
<tr>
<th>Duration (min)</th>
<th>No. of vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>74</td>
</tr>
<tr>
<td>30</td>
<td>34</td>
</tr>
<tr>
<td>45</td>
<td>7</td>
</tr>
<tr>
<td>60</td>
<td>1</td>
</tr>
<tr>
<td>75</td>
<td>2</td>
</tr>
<tr>
<td>90</td>
<td>1</td>
</tr>
<tr>
<td>225</td>
<td>1</td>
</tr>
<tr>
<td>240</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Parking Accumulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>19:00</td>
<td>15</td>
</tr>
<tr>
<td>19:15</td>
<td>13</td>
</tr>
<tr>
<td>19:30</td>
<td>11</td>
</tr>
<tr>
<td>19:45</td>
<td>19</td>
</tr>
<tr>
<td>20:00</td>
<td>16</td>
</tr>
</tbody>
</table>

Calculate –

(i) Average Parking Duration (in hour)
(ii) Parking Volume (veh/hr)
(iii) Parking Demand (veh-hr) (from 7:00 PM to 8:00 PM)
(iv) Parking Turnover (in a period of 4 hours)
(v) Expected number of vehicles (over 4 hours)

8. (a) Sketch the layout and dimension for a 45° angle parking.

(b) Accident Research Institute (ARI) of BUET has reported that a considerable number of accidents involve pedestrians in Dhaka city. What kind of measures would you apply to increase pedestrian safety in Dhaka City?

(c) What kind of data for on-street and off-street spaces are needed to be collected parking space inventory?

(d) The students of URP department at BUET have conducted speed survey on Mirpur Road. They have recorded ten spot speed measurements (in km/hr) from the roadway section of Nilkhet to Kalabagan, which are as follows:

50, 40, 31, 58, 65, 43, 55, 30, 49, 50

From the above data calculate time-mean speed and space-mean speed for the study section.