1. Select the correct answer and provide concise reason(s) for your choice. If you do not provide explanation you will only get 40% marks. (10×5=50)

(i) At what level of an organization does a corporate manager operate?
   (a) Functional
   (b) Operational
   (c) Middle level
   (d) Top level

(ii) In what order do managers typically perform the managerial functions?
   (a) organizing, planning, controlling, leading
   (b) organizing, leading, planning, controlling
   (c) planning, organizing, leading, controlling
   (d) planning, organizing, controlling, leading

(iii) Process of management aims at
   (a) Cooperating with a number of persons pursuing a goal
   (b) Coordinating work of number of persons to achieve objectives
   (c) Supervising a number of persons pursuing an objective
   (d) None of the above

(iv) Guidelines for setting effective objectives
   (a) Linkage to overall objective
   (b) Attainable objectives
   (c) Review of objectives
   (d) All of the above

(v) Departmentation aiming at span of management, span of control or span of supervision is based on
   (a) Numbers
   (b) Region or Area
   (c) Functions
   (d) None of the above
(vi) The superior cannot assign duties to his subordinates unless he delegates ..........
to them.
   (a) Responsibility
   (b) Authority
   (c) Liability
   (d) None of the above

(vii) Canon sells its fax machine to consumer, business, and government markets. In this
case, where customers fall into different user groups, a ........... organization is
desirable.
   (a) matrix management
   (b) geographic
   (c) product (or brand) management
   (d) market-management
   (e) functional

(viii) The manager gives incentive for one employee on their extra effort on new project,
the power which used in this situation is –
   (a) Coercive
   (b) Reward
   (c) Legitimate
   (d) Expert

(ix) When we classify managers according to their level in the organization they are
described as ............
   (a) Functional, staff and line managers
   (b) Top managers, middle managers and supervisors
   (c) High level and low level managers
   (d) General managers and administrative managers

(x) As a manager moves to higher positions in an organization the ability to make
......... becomes .......... important.
   (a) Non-programmed; more
   (b) Programmed; more
   (c) Non-programmed; less
   (d) Programmed; much more

2. (a) What are the main features of a GOOD plan? Write an explanatory note on the
Types of Plans.
   (b) In Planning there are – Objectives, Goals and Indicators. Using a suitable example,
EXPLAIN these three terms.
   (c) What do you understand by Technology Transfer? Why is it difficult to have
effective Technology Transfer?
3. (a) Why information systems are so essential in business today?
(b) Discuss and compare the following types of communications: mass communication, inverses mass communication, and conference type communication.
(c) Draw an organization chart showing at least 5 levels for a Bangladeshi health and consumer products manufacturing company having the following features:
   (i) Operates in three regions of the country
   (ii) Produces three different types of products
   (iii) Develops new products through research and development
   (iv) There are staff supports at the higher level
   (v) Company regularly looks to reinvest profits in new ventures

4. (a) The following table shows the activities that needs to be undertaken to complete an engineering project. Draw the Activity Diagram for the project. Calculate the early time, late time and total float for each event, and identify the Critical Path of the given project with the help of arrow network.

<table>
<thead>
<tr>
<th>Activity Symbol</th>
<th>Estimated Time (week)</th>
<th>Post Requisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>7</td>
<td>E</td>
</tr>
<tr>
<td>B</td>
<td>2</td>
<td>E</td>
</tr>
<tr>
<td>C</td>
<td>15</td>
<td>I</td>
</tr>
<tr>
<td>D</td>
<td>8</td>
<td>F</td>
</tr>
<tr>
<td>E</td>
<td>10</td>
<td>G, D</td>
</tr>
<tr>
<td>F</td>
<td>2</td>
<td>I</td>
</tr>
<tr>
<td>G</td>
<td>5</td>
<td>H, F</td>
</tr>
<tr>
<td>H</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>2</td>
<td>J</td>
</tr>
<tr>
<td>J</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

(b) Explain 'Theory X' and 'Theory Y' of organizing.

SECTION-B
There are FOUR questions in this section. Answer any THREE.

5. (a) Derive the followings:
   (i) For continuous compounding of a principal amount \( F = Pe^{rN} \)

   (ii) Future worth of annuity is \( F = A \left[ \frac{(1+i)^n-1}{i} \right] \)

(b) Suppose you are now 20 years old. You have decided to save Tk. A per year starting on your twenty-first birthday and continuing through your sixtieth birthday. At age 60 you will have saved an accumulated (compounded) amount of Tk. F.
CHE 411
Contd... Q. No. 5(b)

A friend of yours waits five years to start his savings plan. Starting on his twenty-sixth birthday, it takes annual payment of Tk. 2 A for him to accumulate Tk. F when he becomes 60 years old. Calculate the annual interest rate.

6. (a) What are the difficulties of the IRR method and advantages of the IRR method and advantages of ERR method over IRR method in project feasibility study.

(b) A small company purchased now for 25,000 will lose 1,200 each year for the first four years. An additional $ 10,000 invested in the company at the end of fourth year will result in a profit of $ 6,000 each year from the fifth year through the twelveth year. At the end of twelve years the company can be sold for $ 30,000. MARR is 10%. Check the acceptability of the company with ERR method.

7. (a) Discuss the major sources of uncertainty that arises when we undertake economic analysis of engineering projects.

(b) Name the non-probabilistic methodologies for dealing with uncertainty in engineering economy studies. Describe few of them.

(c) Two 100-horsepower motors are being considered for use

<table>
<thead>
<tr>
<th></th>
<th>ABC Brand</th>
<th>XYZ Brand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase price</td>
<td>$1,900</td>
<td>$6,200</td>
</tr>
<tr>
<td>Useful life in years</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Salvage value</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Annual maintenance cost</td>
<td>$170</td>
<td>$310</td>
</tr>
<tr>
<td>Efficiency</td>
<td>80%</td>
<td>90%</td>
</tr>
</tbody>
</table>

Power cost is $ 0.10 per kWhr and the interest rate is 12%. How many hours of operation per year are required to justify the purchase of XYZ brand motor? (1 hp = 0.746 kW).

8. (a) What are the advantages and disadvantages of using risk adjusted MARR and Truncated useful life in sensitivity analysis of a project?

(b) A new steam flow monitoring device must be purchased immediately by a local municipality. The following most likely (best) estimates have been developed by a group of engineers:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital investment</td>
<td>$140,000</td>
</tr>
<tr>
<td>Annual savings</td>
<td>$25,000</td>
</tr>
<tr>
<td>Useful life</td>
<td>12 years</td>
</tr>
<tr>
<td>Salvage value (end of year 12)</td>
<td>$40,000</td>
</tr>
<tr>
<td>MARR</td>
<td>10%/year</td>
</tr>
</tbody>
</table>

Because considerable uncertainty surrounds these estimates, it is desired to evaluate the sensitivity of PW to ± 50% changes in the most-likely estimates of (a) annual savings, (b) useful life, and (c) interest rate (MARR). Plot the results and determine to which factor the decision is most sensitive.
SECTION - A

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

1. (a) What are the phases of Thermal Maturation of organic matter in a sedimentary environment? Elaborate on these phases. (6)
   (b) Write short note on Kerogen and its relation with Oil Window. (5)
   (c) Classify and describe each type of Fault with sketch. (9)
   (d) Draw and describe the “Rock Cycle”. (15)

2. (a) What are the different types of reservoir rocks? Write short note on Shale and Carbonate rock. (10)
   (b) Differentiate between Primary and Effective Porosity. What is the significance of Porosity to a Reservoir Engineer? (8)
   (c) Assuming a sandstone grain density of 2.65 gm/cm$^3$, calculate the porosity of a 3 in. long sandstone core sample of 1.5 in width and breadth, respectively, if the grain weigh 250 gm. (10)
   (d) Given the following data:
      \[ c_f = 10 \times 10^{-6} \text{ psi}^{-1} \]
      Original pore pressure = 5000 psi
      Original porosity = 18%
      Current pore pressure = 4500 psi
      Calculate the porosity at 4,500 psi (7)

3. (a) A reservoir (Figure 1) consisting of three parallel beds has equal height, breadth and width. If the beds have local permeability values of 3, 7 and 10 mD, respectively, then what is the average permeability of the total reservoir? (10)
   (b) Explain Klinkenberg effect and its application for permeability measurement. (10)
   (c) What is relative permeability? Write down the Darcy equation in Relative Permeability terms. Draw a typical relative permeability curve showing Critical oil and water saturations. (5+10)
CHE 493

4. (a) Explain the factors affecting fluid distribution in reservoir rocks (Use diagrams). (10)
   (b) With a diagram describe Capillary Hysteresis. (5)
   (c) What are the causes of Abnormal pressure? What is the difference between FE and DLE? (5+5)
   (d) Define and explain the following terms:
      (i) Formation Volume Factor of Oil and (ii) Solution Gas-Oil ratio (5+5)

SECTION - B

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

5. (a) Briefly discuss the types of boundary conditions of oil and gas reservoirs, and how they affect ultimate recovery. (10)
   (b) Provide a comparative discussion between the volumetric method and the Material Balance method. (10)
   (c) The Iosppach map of an oil reservoir 'X' is shown below. The contours are of semi-circle shape, whose radii are given in the table below. It is known that the average porosity is 12% the initial water saturation is 27%, and the reservoir is at bubble point initially. The oil formation volume factor at initial reservoir condition is 1.4 RB/STB, and at abandonment condition it is 1.1 RB/STB. It is also know that there is a gas saturation of 23% at abandonment condition. Estimate: (5+5+5=15)
      (i) Bulk volume of the reservoir; (ii) Gas initially in place (GIIP)
      (iii) The expected recovery factor

![Diagram of Iosppach map]

<table>
<thead>
<tr>
<th>Contour</th>
<th>Radius (ft)</th>
<th>Thickness (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A0</td>
<td>800</td>
<td>0</td>
</tr>
<tr>
<td>A1</td>
<td>1,000</td>
<td>10</td>
</tr>
<tr>
<td>A2</td>
<td>1,200</td>
<td>10</td>
</tr>
</tbody>
</table>

6. (a) The general material balance equation is given in the attached sheet-1. Identify each term of this equation. (7)
   (b) Reduce the general material balance equation into the Havlena-Odeh form. (7)
   (c) Reduce the Havlena-Odeh form for an under saturated oil reservoir with no water influx. (7)
   (d) Explain how the above equation is used. (7)
   (e) What is drive index? Show how drive indices can be deduced from the general material balance equation. (7)

Contd ........... P/3
7. (a) The simplified material balance equation for dry gas reservoir is given by
\[ G(Bg - Bgi) + We = Gp Bg + WpBw \]

Explain each term of this equation.

(b) Stating the necessary assumptions, show how this equation can be further reduced to an equation of a straight line of the form \( p/z \) versus \( Gp \).

(c) Explain how this equation can be used to determine gas initially in place (G), and the recovery factor at any given abandonment pressure.

(d) Production history of gas field ‘A’ is shown below:

<table>
<thead>
<tr>
<th>Pressure (psia)</th>
<th>Cumulative Production Gp (MMSCF)</th>
<th>Z factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>3250</td>
<td>0</td>
<td>0.910</td>
</tr>
<tr>
<td>2864</td>
<td>1,000</td>
<td>0.888</td>
</tr>
<tr>
<td>500</td>
<td>??</td>
<td>0.951</td>
</tr>
</tbody>
</table>

Reservoir Temperature 213 F
Base pressure and Temperature: 15.025 psia and 60 F
Assume negligible water production and volumetric reservoir.

Estimate
(i) Gas initially in place (GHP)
(ii) Initial gas reserve based on abandonment pressure of 500 psia
(iii) Recovery factor based on abandonment pressure of 500 psia

8. (a) Derive the integral form of Darcy equation for slightly compressible fluid in radial flow geometry.

(b) Comment on the equation with regards to pressure distribution along space and time.

(c) Explain how we can determine whether the production rate-versus-time data follows an ‘exponential’ decline.

(d) Following data is from gas field ‘B’. Assuming volumetric reservoir; estimate the gas initially in place (G) for each pressure. Form the results, discuss whether the volumetric assumption is valid.

<table>
<thead>
<tr>
<th>Pressure (psia)</th>
<th>Cumulative gas production Gp (MMSCF)</th>
<th>Gas volume factor Bg (ft³/SCF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3200</td>
<td>0</td>
<td>0.00526</td>
</tr>
<tr>
<td>2925</td>
<td>79</td>
<td>0.0057</td>
</tr>
<tr>
<td>2525</td>
<td>221</td>
<td>0.00653</td>
</tr>
<tr>
<td>2125</td>
<td>452</td>
<td>0.0077</td>
</tr>
</tbody>
</table>
Appendix Sheet 1

The General Material Balance Equation

\[ N(B_r - B_d) + \frac{NmB_d}{B_g}(B_g - B_d) + (1 + m) N B_d \left[ \frac{c_w S_{wi} + c_f}{1 - S_{wi}} \right] \Delta p + W_e = N_p [B_r + (R_p - R_{sol})B_g] + B_w W_p \]

Two phase or total formation volume factor

\[ B_{oi} = B_{ti} \text{ and } [B_o + (R_{sol} - R_{so})B_g] = B \]
1. (a) Briefly explain the key principles and illustrates the generalized process of Environmental Impact Assessment (EIA)? (15)
   (b) Explain how the trends of Environmental Impact Assessment (EIA) have changed over time. (10)
   (c) Briefly discuss the objectives of ZDHC (Zero Discharge of Hazardous Chemicals) Programme. Outline and describe different groups of ZDHC Manufacturers Restricted Substances List (MRSL). (10)

2. (a) A textile dyeing industry operates an effluent treatment plant which contains two clarifiers to separate suspended solids from chemical and biological units. The solid contents of the clarifiers go to a digester to digest sludge. The solid contents, volatile matter, specific gravity of fixed solids and specific gravity of volatile solids of the sludge are 5%, 60%, 2.5 and 1.0, respectively. After digestion, the solid contents, volatile matter, specific gravity of fixed solids and specific gravity of volatile solids of the digested sludge are 15%, 37.5%, 2.5 and 1.0 respectively. Determine the liquid volume before and after digestion for 550 kg (dry basis) of the sludge generated. (13)
   (b) Briefly describe the category, mechanisms and regeneration process(es) of different media filtration systems. (12)
   (c) Compare mechanism and applications of Activated Sludge process and Moving Bed Bioreactor process for industrial effluent treatment. (10)

3. (a) Briefly discuss the objectives and mechanisms of Cleaner Production Options for Textile Industries. (10)
   (b) A composite knit dyeing plant of daily capacity 15 ton, produces mostly dark and medium shade fabric. The pre-dyeing, dyeing and post-dyeing stages include the following steps (see the table below). For a regular dyeing step, the dyeing machines use liquor ratio 1:8 (i.e., 8 litre liquor required for 1 kg fabric). For rinsing, the dyeing machine uses three times more water than a regular dyeing step. Key pollution indicating parameters of different industry does not run any ETP and discharges the effluent generated to the nearby wetland. What are the composite characteristics (in mg/L) of the effluent produced by the above-mentioned industry? What would be the yearly (330 working days per year) liquid volume, TDS, TSS and BOD₃ load (in tones) discharged in the environment by the dyeing plant? (10)

Contd ............ P/2
4. (a) Recommend and justify techniques for the assessment of a running Effluent Treatment Plant (ETP).

(b) Categorize and discuss different sludge disposal options. Considering resources, rain and soil patterns, justify the suitable sludge disposal technique(s) for Bangladesh.

(c) For a pharmaceutical company producing vitamins, penicillin, penem, and oncological drugs, please suggest an effective and economic Effluent Treatment Process with appropriate flow diagram, and brief description of the treatment mechanism.

5. (a) What are primary and secondary pollutants? Explain the formation mechanism of secondary pollutants with examples. Between NO₂ and NO₃, which one is important to measure at source? (5+6+2=13)

(b) Draw a schematic of source monitoring device and explain how air pollution is measured for a pollutant. If the concentration of a gaseous pollutant (with molecular weight, M_w) is 3µg/m³ in ambient air (at 30°C), what will be its concentration in ppm? (8+4=12)

(c) What are the difficulties of air pollution measurement? Describe the methods to improve the air sampling and measurement accuracy. (5+5=10)
6. (a) How many types of plume behavior can result based on the boundary layer stability? Explain using schematic diagrams. (2+12=14)

(b) A factory emits 20 g/s of SO₂ at a height of H (including plume rise). The wind speed is 3 m/s. At a distance of 1 km downstream, σₓ and σᵧ are 30 m and 20 m. The plume follows the Gaussian Plume model expressed as:

\[ C(x,y,z) = \frac{Q}{2\pi u \sigma_x \sigma_y} \exp \left( -\frac{1}{2} \left( \frac{y^2}{\sigma_y^2} + \frac{(z-H)^2}{\sigma_z^2} \right) \right) \]  

What are the SO₂ concentrations at the centerline of the plume and at a point 60 m to the side and 20 m below the centerline?

(c) Describe the working principle of a venturi scrubber. (8)

7. (a) Consider a bituminous coal that contains 77.2% C, 5.2% H, 1.2% N, 2.6% S, 5.9% O and 7.9% ash by weight. This ultimate analysis is reported on an “as received” basis, including the moisture in the chemical analysis. The combustion of the pulverized coal is carried out in a wall fired, wet bottom type furnace without any control equipment at a rate of 200 ton/h. Stoichiometric amount of oxygen is supplied during the process and a complete combustion is achieved. What will be the flue gas composition? Also determine the emission from ash and sulphur present in the coal (emission factor are provided in Table 7(a) at the end of this question paper) (15+8=23)

(b) Draw a schematic of high volume air sample for measuring PM₁₀ concentration and explain its working principle. (7+5=12)

8. (a) What are the main sources of air pollutions in a pulp and paper industry? What measures can you take to reduce the pollution? (5+5=10)

(b) Discuss the advantages and disadvantages of thermal incineration, catalytic incineration and absorption process to remove VOCs from industrial emission systems. (5+5+5=15)

(c) Write short notes on-

(i) atmospheric stability

(ii) air quality modeling. (5+5=10)
## Table 7a

### Emission factors for bituminous and subbituminous coal combustion without control equipment

<table>
<thead>
<tr>
<th>Furnace type(^b)</th>
<th>Emission factor, lb/ton of coal burned(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All particles(^c)</td>
</tr>
<tr>
<td>PC, wall-fired, dry bottom</td>
<td>10A</td>
</tr>
<tr>
<td>PC, wall-fired, wet bottom</td>
<td>7A</td>
</tr>
<tr>
<td>PC, tangential fired, dry bottom</td>
<td>10A</td>
</tr>
<tr>
<td>Cyclone</td>
<td>2A</td>
</tr>
<tr>
<td>Spreader stoker</td>
<td>66</td>
</tr>
<tr>
<td>Hand-fired</td>
<td>15</td>
</tr>
</tbody>
</table>

\(^a\)To obtain emission factors in kg/MT, divide table values by 2.

\(^b\)The various furnace types are described in [7] and in combustion books. PC means pulverized coal.

\(^c\)The letter A on some particulate and PM\(_{10}\) values indicates that the weight percentage of ash in the coal should be multiplied by the value given. Example: If the factor is 10A and the ash content is 8%, the particulate emissions before the control equipment would be 10\(\times\) 8 or 80 lb of particulate per ton of coal.

\(^d\)S = the sulfur content, which plays the same role as A in the preceding footnote.

\(^e\)SO\(_x\) is expressed as SO\(_2\). It includes SO\(_2\), SO\(_3\), and gaseous sulfates.

\(^f\)NO\(_x\) is expressed as NO\(_2\). It includes NO and NO\(_2\).
1. (a) One study, in the USA, showed galvanized sheet steels rusting in only 2.4 years in an “industrial area, while the same material began to rust after 14.6 years in rural atmosphere. Explain why?  
(b) List the remedial measures that can be taken for preventing stray current corrosion. Briefly discuss them with schematic.  
(c) How can you detect the source of stray corrosion current? 

2. (a) “The most of common types of failure in low-carbon structural steels were those occurring in riveted steam boilers and in welded vats used to contain caustics at high temperature.” – List the sequence of events that may lead such failures. Explain the failure mechanism. What control measures can be taken to eliminate this type of failure?  
(b) “Medium alloy steels have only slightly higher corrosion fatigue strength than ordinary carbon steels”. – What are the implications of this finding?  
(c) Use of “Killed steel” can prevent hydrogen cracking in corrosion environments causing H₂ evolution. – Explain. 

3. (a) List five broad groups of methods used for corrosion prevention of metallic materials.  
(b) “Coating and cathodic protection are complementary to one another and neither, on its own, can provide the complete answer.” – do you agree with the statement? Give reasons for your answer.  
(c) A super phosphoric acid containing tank can be protected using cathodic or anodic protection. Which one would you select? Why?  
(d) One study found that the zinc-coated sheet steels exposed to an industrial area began to rust after 2.4 years from the day of exposure. Why did it take 2.4 years to start rusting? Why did it eventually begin to rust?
(e) The saturation index (SI) of water from a municipal water supply company is +0.75. How would you treat this water for corrosion prevention? What if the SI is −0.75? Would you change your treatment method?

4. (a) Write short notes on (i) carburization, (ii) sulfidation, (iii) fuel-ash corrosion.
(b) Briefly explain the use of corrosion coupons for corrosion monitoring. Would you use this method where the chemical composition (and corrosiveness) of a system varies from day to day? Justify your answer.
(c) What are the sources of CO₂ in boiler water? How would you treat your boiler water to reduce carbonic acid?

SECTION – B
Q. No. 5 which is COMPULSORY, any TWO from the rest

5. Answer all the questions. Choose the correct answer and give brief reasons for your answer. Give tick (✓) mark to the correct answer. (5×9=45)
(a) Uniform corrosion does not take place due to electrochemical contrast. TRUE/FALSE
(b) Intergranular corrosion is a localized type of corrosion attack. TRUE/FALSE
(c) Oxygen electrode is the common reference electrode used in corrosion studies. TRUE/FALSE.
(d) Pourbaix Diagrams can be used to analyze corrosion behavior of all metals and alloys. TRUE/FALSE
(e) There can be only one Galvanic series with sea water as environment. TRUE/FALSE
(f) Velocity of acidic liquid does not increase corrosion of iron and steel if it is continuously supplied with oxygen. TRUE/FALSE
(g) Breakdown of passivity by chloride ions takes place only in acidic environment. TRUE/FALSE
(h) In case of corrosion taking place due to concentration polarization all other forms of polarization are absent. TRUE/FALSE
(i) Boiler feed water with negative Saturation Index is corrosion only when acid is present. TRUE/FALSE

6. (a) Why one has to be very careful when using passivators?
(b) According to metallurgical history of a Metal, you have concluded that it will undergo corrosion. What measures can you suggest to make it resist corrosion?
(c) Can corrosion rate be altered by changing the size and structure of metal grains? Give reasons for your answer.
7. (a) Discuss the effect of high activation energy requirement for hydrogen evolution reaction during corrosion of iron in acid environment. What happens when O₂ is continuously supplied in this situation? (15)

(b) Design an experiment to determine the effect of pH on corrosion of iron in aqueous environment. (15)

8. Write short Notes on: (7 1/2 x 4 = 30)
(a) Ultra pure metals
(b) Corrosion due to differential temperature
(c) Cost of corrosion due to overdesign
(d) Formation of deep corrosion pits due to area effect.
SECTION – A

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

1. (a) Contractors and Consultants engaged so far in a process plant project in Bangladesh in the public sector are expatriates- What is the main reason for such practice? (7½)

(b) Eastern Refinery Limited (ERL) is going to set up its second unit with a capacity of refining around 3.5 \times 10^6 Ton of crude oil annually. Write down definition of this project. (8)

(c) In the public sector there is often considerable delay in project execution- how can this delay be minimized? (8)

2. (a) Distinguish between Project definition and Technical definition. (8)

(b) Which party prepares technical specifications in public sector projects? ‘In the private sector many design project fail due to improper technical specifications’- Discuss. (8)

(c) “Establishing design basis is critical for successful completion of a process plant project”- Justify this statement with examples. (7½)

3. (a) Describe different types of process licensing arrangements available. Write down the role of different parties involved in licensing arrangements in Bangladesh for ZFCL and CUFL. (12)

(b) Distinguish between Basic Engineering Design and Detailed Engineering Design. What is FEED? When is FEED carried out? (11½)

4. (a) Write short notes on-

   (i) Plant layout
   (ii) Beneficial occupancy
   (iii) Auxiliaries and offsites
   (iv) Utilities of a process plant. (12)

(b) List US codes and standards for the following application area. (11½)

   (i) Pressure vessel
   (ii) Welding materials
   (iii) Shell and tube heat exchanger
   (iv) Fire protection and safety.

Contd .......... P/2
section-b
there are four questions in this section. q. no. 5 is compulsory.
answer any two from the rest.

5. (a) “procurement operation are complicated when multiple funding agencies and donors are involved in case of large projects in bangladesh”- discuss. (10)
(b) design a questionnaire to obtain specific information from potential epc bidder. (15)
(c) do you prefer the “two envelope” system for evaluation of epc bidders? give reasons for your answer. (5)

6. (a) in the context of bangladesh which aspects of performance test are very important? (10)
(b) why is it important to “overdesign” some equipments and package units? how does weather in bangladesh affect the extent of “overdesign” of some package units? (10)

7. (a) in your opinion did the “bhopal tragedy” occur due to “inspection failure” or negligence of top management? give reasons for your answer. (15)
(b) discuss a case of wrong vendor selection in a bangladeshi process plant. (5)

8. write short notes on: (5x4=20)
(a) “liquidated damage”.
(b) items for discussion at the negotiating table in bangladesh (for a process plant contract).
(c) third party inspection.
(d) performance test of equipment.

-----------------------------------------------