UNIVERSITY OF PUNE

[4364]-201

B. E. (Chemical)

Process Dynamics and Control

(2003 Course)

Total No. of Questions : 12 **[Total No. of Printed Pages :2]**

[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

*(1) Answers to the **two sections** should be written in **separate books**.*

(2) Neat diagram must be drawn wherever necessary.

(3)Black figures to the right indicate full marks.

(4)Use of logarithmic tables,slide rule,Mollier charts, electronic pocket calculator and steam tables is allowed.

(5)Assume suitable data, if necessary.

SECTION-I

Q1.

a) What are the incentives for chemical process control? [8]

b) Write the state equations for stirred Tank Heater Model. [8]

OR

Q2.

a) Discuss the history of Process Control. [8]

b) Develop the Input-Output model for CSTR. [8]

Q3. Develop the transfer function for first order system. Assume suitable example and state the assumptions. [16]

OR

Q4. Derive the transfer function model for Damped oscillator. Draw suitable sketch. [16]

Q5. Define P.I & D control. Derive their transfer functions and discuss the open-loop response. [18]

OR

Q6.

a) A first order process is controlled by Integral controller. Neglecting the dynamics of measuring instrument and final control element i.e. Gm=Gf=1, determine the following [18]
   1) Closed loop equation.
   2) Order of response.
   3) Closed loop time constant
   4) Closed loop gain. &
   5) Offset

SECTION-II

Q7. Sketch the root Locus diagram for given open loop process with following transfer function:

$$Gp = \frac{kp}{s(s+1)(s+2)}$$

OR

Q8.

a) Sketch the Bode plot for PI controller [8]
b) Sketch the Nyquist plot for Pd controller [8]

Q9. Discuss the following in detail; [18]

a) Cascade control
b) Auctionering control.

OR

Q10.

a) Differentiate between feedback and feed forward control. [9]
b) Draw a neat sketch of ratio control and discuss in detail. [9]

Q11. Write short notes on; [16]

a) Digital control.
b) DCS

OR

Q12. Write short notes on; [16]

a) PLC and SCADA b)Controller Tuning

[Total No. of Questions: *12*] **[Total No. of Printed Pages: 2]**

UNIVERSITY OF PUNE

[4364]-219

B. E. (Chemical Engineering) Examination – 2013

PIPING DESIGN AND ENGINEERING

(2003 Course) (Elective-II)

[Time: *3* **Hours]** **[Max. Marks: 100]**

Instructions:

1 *Answer 3 questions from each Section.*
2 *Answers to the two sections should be written in separate answer-books.*
3 *Neat diagrams must be drawn wherever necessary.*
4 *Figures to the right indicate full marks.*
5 *Use of electronic pocket calculator is allowed.*

SECTION -I

Q.1	A	Explain the following terms i) Pipe Sizing ii) Economic velocity	8
	B	Explain in brief the meeting of non-compressible and compressible fluids. Give the equation for estimation of pressure drop for non-compressible and compressible fluids?	10
		OR	
Q.2	A	Two pipes each 300 mm long are available for connecting to a reservoir from which a flow of 0.085 m^3/s required. If the diameter of the two pipes are 0.30 and 0.15 m respectively. Determine the ratio of the head loss when the pipes are connected in series to the head loss when they are connected in parallel. Neglect minor losses.	8
	B	Discuss principles of pipe line network and give the comparison between head balancing and quantity balancing methods.	10
Q. 3	A	Explain in detail the following types of flanges i) Threaded Flange ii) Orifice Flange	6
	B	Discuss the different sections of American Society for testing and Materials (ASTM)?	10
		OR	
Q. 4	A	State and explain the difference material standards for metallic piping components?	8
	B	Discuss the various types of gasket according to ASME b16.5 and b16.47 for flanges?	8
Q. 5	A	How to size control valves for liquid and gas service?	10
	B	Write down the different application considerations for butterfly valves?	6

OR

Q. 6	A	Explain the guidelines used for selecting the proper type of Rapture Disk?	8
	B	Discuss the working principle of safety valve with the following points: i) Lifting ii) Reseating	8

SECTION II

Q. 7	A	Discuss the significance of Churchill and Swamee-Jain equation for calculation friction factor in compresses-Air Piping Systems?	10
	B	Explain the types of two phase flow and their characteristics linear velocity?	8

OR

Q. 8	A	Discuss steam pipe sizing based on flowrate and maximum velocity of the steam or pressure drop?	10
	B	Discuss the general selection criteria and general characteristics of steam trap?	8
Q. 9	A	Which are the considerations involved in the pipe rack design?	8
	B	What are the plant lay out specifications considered by the design engineer?	8

OR

Q. 10	A	Explain the types of plot plan and their advantages?	8
	B	Develop the typical layout considerations for distillation systems and reactors?	8
Q. 11	A	Write down the different insulation material classifications mostly used in the industrial and commercial piping industry?	8
	B	Discuss the design criteria used in insulation system design for piping applications?	8

OR

Q. 12		Write short notes	16
	1)	High alloy steel & its usage in piping	
	2)	List of documents for preparation of layout for a process plant	
	3)	Pipeline Economics	

University Of Pune
(4364)-205
B.E.(Chemical), Examination - 2013
Environmental Engineering
(2003 Pattern)

[Total No. of Questions : 12] **[Total No. of Printed Pages :2]**
[Time: 3 Hours] **[Max. Marks: 100]**

Instructions:

(1) Answers 03 question from section I Answers 03 question from section II
(2) Answers to the two Sections should be written in separate answer- book .
(3)Neat diagrams must be drawn whenever necessary.
(4) Assume suitable data, if necessary.
(5) Use of logarithmic tables slide rule, Mollier charts, Electronic packet calculator and steam tables is allowed.

SECTION I

Q1. A) Population always has impact on environment. Comment.
B) Discuss the impact of thermal power on environment. [16]

OR

Q2. A) Classify the air pollutants according to source type.
B) Discuss the sources and harmful effects of particulate matter on human health. [16]

Q3. A) What is CDM? How to implement it?
B) Discuss about Kyoto protocol. [16]

OR

Q4. A) Discuss economic effect of air pollution.
B) Discuss air pollution control standard. [16]

Q.5. Explain basic design and operating principle of settling chamber with neat figure. [18]

OR

Q6. Explain design and operation principles of cyclone separator with neat figure. [18]

SECTION II

Q7. Explain the physical & Chemical characteristics of wastewater, what are the techniques available for their treatment. [16]

OR

Q8. A) Explain- DO
BOD
COD
TOC
TSS

B) What is oxygen deficit. [16]

Q9. Explain the microbial growth kinetics with respect to batch culture system and the various reactions occurring in the system. What do you understand by observed yield and specific growth rate? [18]

OR

Q10. A) What are photo catalytic reactors? Explain.

B) Write briefly about wet air oxidation. [18]

Q11. Explain in detail the classification of solid waste and how they pose hazard to environment. What are the techniques to deal with solid waste generated in process plant? [16]

OR

Q12. A) What are the various methods of sludge disposal? Explain anaerobic sludge disposal? Explain anaerobic sludge digestion processing detail. [16]

UNIVERSITY OF PUNE
[4364]-209
B.E. chemical
Examination – 2013
Catalysis
(2008 Pattern)

Total No. of Questions : 12 **[Total No. of Printed Pages :3]**
[Time: 3 Hours] **[Max. Marks : 100]**

Instructions:

(1) Answer three questions from section I and three question from section II.
(2) Answers to the two sections should be written in separate answer-books.
(4) Neat diagrams must be drawn wherever necessary.
(5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
(6) Assume suitable data, if necessary.

Section I

Q1. a) Explain how homogeneous and heterogeneous catalysis is industrially useful? [8]
b) Discuss the role of supports in heterogeneous catalysis. [8]

OR

Q2. a) With the help of neat sketch explain how catalyst changes reaction pathways. [8]
b) Define the following terms:
i) Active site,
ii) Functionality,
iii) Turnover frequency. [8]

Q3. a) Write a short note on multiphase catalysis for processing of hydrocarbons. In this context highlight the reaction engineering aspects as well. Name various types of reactors often employed. [10]
b) Explain tri-phase catalysis. [6]

OR

Q4. a) Explain concept of Thiele Modulus and its application in catalysis. [8]

b) Discuss various engineering problems associated with heterogeneous catalysis. [8]

Q5. a) Explain diffusion effect in pores of a catalyst particle. [9]

b) Discuss the step wise procedure of catalytic reaction. Highlight the importance of rate limiting step in this context. [9]

OR

Q6. a) State various adsorption isotherms and explain their significance. [9]

b) Differentiate between Riedel Model and Langmuir Hinshelwood model for catalytic reaction. [9]

Section II

Q7. a) Name four different methods of catalyst synthesis and explain any one method in detail. [10]

b) What are catalyst support? Discuss their important characteristics with the help of neat diagram. Explain the monolith support. [8]

OR

Q8. a) Derive mathematical equation for determination of catalyst surface area by BET method. [10]

b) Explain major steps involved in catalyst preparation and formation. [8]

Q9. a) 15.7 gm of imported hydrogenation catalyst when studied with N_2adsorption reveals

pressure (mmHg)	6	70	110	240	380	452
volume adsorbed (cm^3)	68	147	172	215	267	318

The volume measured at 0°C and lateen pressure. Estimate the surface area of the catalyst.

Data- Density of liquid N_2 at -195.8°C is 0.808gm/cm^3. [12]

b) What are Zeolites? Explain? [4]

OR

Q10. a) Highlight important characteristics of Zeolites. Discuss the shape selectivity of Zeolites and their industrial applications in details. [10]

b)Write a short note on modification of Zeolites. [6]

Q11. a) Write a note on Michaclis Mentos Kinetics [8]

b)Explain Catalyst inhibitors with suitable examples [8]

OR

Q12. a) Explain the role of enzymes, lipases and microbes as catalysts. [8]

b) Explain any two industrial reactions where biocatalysts are used. [8]

UNIVERSITY OF PUNE

[4364]-204
B. E. (Process Equipment Design II)
Examination – May 2013
(2003 Pattern)

Total No. of Questions : 12 **[Total No. of Printed Pages :3]**

[Time : 3 Hours] **[Max. Marks : 100]**

Instruction to the candidates:

i. Answer three questions from section I and three questions from section II.
ii. Answers to the two sections should be written in separate answer books.
iii. Draw neat diagrams wherever necessary.
iv. Figures to the right indicate full marks.
v. Make necessary assumption wherever required.

SECTION - I

Q. 1. a) Comments on heat transfer in agitated vessels. [08]

b) In an sugar industry for agitation the torque acting over the shaft is 110000 Kg-cm, while bending moment acting over the shaft = 34600 kg-cm^2.Ultimate tensile strength of shaft material = 6900 Kg/cm^2.Ultimate shear stress is 70% of ultimate tensile stress. Factor of safety is 6.0.Calculate the diameter of shaft used in agitation system. [08]

OR

Q. 2. a) Explain classification of agitators. [08]

b) Discuss various flow patterns in agitated vessels. [04]

c) Draw neat sketches of Jackets and Coil for reaction vessel. [04]

Q. 3. 6250 Kg/hr dry potassium chloride is to be produced in a fluidized bed dryer. Initial moisture contents are 10%. While final moisture contents are 0.5%.The feed enters the dryer at 20^{0}C. [18]

Density of potassium chloride = 2000 Kg/m^3

Specific heat of potassium chloride = 712 J/Kg.K

Minimum Size of particle = 0.1 mm

Maximum Size of particle = 0.5 mm

Mean Size of particle = 0.25 mm

Flue gases available at 800 ^{0}C for drying. The temperature of exhaust flue gases from fluidized bed dryer = 125^{0}C. Heat loss can be assumed as 15 %.

Temperature of dry salt at discharge = 125 ^{0}C

Specific heat of flue gases = 1050 J/Kg.K

Latent heat of vaporization = 2470 J/Kg.K

Sp. Heat of water vapour = 1970 J/kg.K

Density of flue gas at std. condition = 1.29 Kg/m^3

Viscosity of flue gas at exit temp is 0.22 x 10^{-3} N-S/m^2

Porosity of fluidized bed = 0.70

Porosity of fixed bed = 0.4

Fluidized bed height = 360 mm (appox.)

OR

Q.4. Write short note on: [18]

i) Solvent drying

ii) Atomisers in spray dryer

iii) Fluidized bed drying

Q. 5. a) Explain design variables in distillation [06]

b) Write short note on: [10]

i) Smoker equation ii) Plate pressure drop

OR

Q.6. a) Give comparison of plate contactor used in plate distillation column. [06]

b) Explain the following method of calculating plate and column efficiencies.

i) AIChE method ii) Van winkles method [10]

SECTION II

Q. 7. a) Explain cornell's method for prediction of height of transfer units in details. [09]

b) Discuss on choice of plate or packings in distillation column for separation. [09]

OR

Q. 8. a) Explain packing support, liquid distributors, liquid redistributors in the column internals with neat sketch [09]

b) Explain design procedure with equations for packed column in details. [09]

Q. 9. a) Explain detail design of decanter with essential equations and neat sketch. [08]

b) Explain constructional feature of Knockout drum with neat sketch. [08]

OR

Q. 10 a) Explain reflux drum with neat sketch [08]

b) Comments on safety devices used in process industries. [08]

Q. 11. a) Discuss on fluid dynamics parameter in pipeline design. [08]

b) Discuss design of steam piping. [08]

OR

Q. 12 a) Describe design of pipeline for natural gas. [06]

b) Write short note on:

i) Pipe thickness and diameter ii) Pipe support [10]

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[Total No. of Questions: *12*] **[Total No. of Printed Pages: *2*]**

UNIVERSITY OF PUNE

[4364]-207

B. E. (*Chemical*) Examination - 2013

Energy Conservation (2003 Course) Elective-I

[Time: *3* Hours] **[Max. Marks: 100]**

Instructions to the candidates:

1. Answer three questions from each section.
2. Neat diagrams must be drawn wherever necessary
3. Figures to the right indicate full marks.
4. Assume suitable data, if necessary

SECTION-I

Q.1.a) Describe the method of solar drying? Discuss the factors considered for the design of solar dryer? [10]

Q.1.b) Explain the concept of Renewable and Nonrenewable Energy? [08]

OR

Q.2.a) Explain principle and working of solar ponds with neat diagram? [10]

Q.2.b) Discuss the tidal and geothermal energy in detail? [08]

Q.3.a) Explain the role, types, design and material of absorption plate in solar flat plate collector? [08]

Q.3.b) Explain the various zones of gasification along with temperature. Explain its significance? [08]

OR

Q.4.a) Explain the working of bio-gas plant and factors considered in optimization of bio-gas plant? [10]

Q.4.b) Explain hydrogen as an alternative source of energy? [06]

Q.5.) What are the types of recuperators for waste heat recovery? Explain any two in detail?

[16]

OR

Q.6.a) Discuss the Heat transformers used to boost temperature of industrial waste heat?

[08]

Q.6.b) Explain in detail the efficient use of steam condensate in chemical plant??

[08]

SECTION-II

Q.7.a) Explain the energy performance assessment of heat exchanger and discuss the steps involved in pinch analysis? [10]

Q.7.b) Justify that fluidized bed combustion of coal is efficient method of combustion? [08]

OR

Q.8. Draw neat sketch & explain working of following: [18]

a) Thermal wheel

b) Heat pump

c) Lighting systems

Q.9. Enlist the energy consumption units in Fertilizer plant. Explain how energy can be conserved? [16]

OR

Q.10.a) Explain the energy conservation Act of Govt. of India? [08]

Q.10.b) Explain the consumption and conservation of energy in sugar industry? [08]

Q.11.a) What do you mean by energy audits and energy monitoring? Explain in brief.

[08]

Q.11.b) Explain benchmarking of energy consumption and plant energy performance (PEP)?

[08]

OR

Q.12.) Write short notes on (Any two) [16]

a) Role of energy manager in the process industries

b) Fluidized bed combustion

c) Optimizing the energy input requirement

UNIVERSITY OF PUNE

[4364]-202

B. E. (Chemical Engineering)

CHEMICAL REACTION ENGINEERING-II

(2003 Pattern)

[Total No. of Questions :] **[Total No. of Printed Pages :5]**

[Time : 3 Hours] **[Max. Marks : 100]**

Instructions

*(1) Answer **any three** question from each section.*

*(2) Answers to the **two sections** should be written in **separate answer-books**.*

(3) Neat diagram must be drawn wherever necessary.

(4) Figures to the right indicate full marks.

(5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(6) Assume suitable data, if necessary.

SECTION-I

Q1. a) Derive the expression for Diffusion through gas film control in case of spherical particle of unchanging size with unreacted core model. [10]

b) Explain the limitations of shrinking core model in detail. [8]

OR

Q2. a) Explain the procedure for determination of the rate controlling steps. [8]

b) Derive the expression for mixed flow of size mixture of particles of unchanging size, uniform gas composition for Film diffusion control, chemical reaction control and ash diffusion control. [10]

Q3. a) What are the various kinetic regimes for mass transfer and reaction? Explain each in detail with Interface behavior for the liquid phase reaction: $A(g)+bB(L)\rightarrow Product(L)$ [8]

b) The concentration of an undesirable impurity A in air is to be reduced [8]

from 0.1% to 0.02% by absorption in pure water. Find the height of the tower required for counter-current operation.

Data given: for the packing used

$k_{Ag}a$=32000 mol/hr.m^3.atm k_{Al}=0.1/hr

The solubility of A in pure water is given by $H_A=125\times10^{-6}$ atm.m^3/mol

Flow rates of liquid and gas are $L\approx L'=7\times10^5$ mol/hr.m^2

$G\approx G'1\times10^5$ mol/hr.m^2 at π =1 atm

Molar dnsity of liquid under all conditions is C^T=56000 mol/m^3

OR

Q4. a) Derive the rate equation for instantaneous reaction of fluid –fluid system. [8]

b) Write a note on towers for slow reaction. [8]

Q5. a) Explain in detail the Langmuir treatment of adsorption for solid catalyst. [8]

b) The following data were obtained at 70ºC for the equilibrium adsorption of n-hexane on silica gel particles. Determine how well the Langmuir isotherm fits these data and find the values of constant C ^{m} and K_C by mean square analysis. [8]

Partial Pressure of C_6H_{14} in gas, atm	0.0020	0.0040	0.0080	0.0113	0.0156	0.0206
C6H14 adsorbed, gmol/(g gel)	$10.5_5\times10^-$	16.0×10^{-5}	27.2×10^{-5}	34.6×10^{-5}	43.0×10^{-5}	47.3×10^{-5}

OR

Q6. a) Explain the BET method for determination of surface area of catalyst. [8]

b) What do you mean by catalyst deactivation? Explain the various types of catalyst poisons in detail. [8]

SECTION-II

Q7. a) Derive the equation for calculating the molal flux for gaseous diffusion in single cylindrical pores? [8]

b) Write a short note on mass transfer with reaction. [8]

OR

Q8. a) Derive equation for the effectiveness factor for a first order reversible reaction A $\leftrightarrow$ B at isothermal conditions for spherical catalyst pellet. [8]

b) What is the significance of intrapellet diffusion? Explain in detail with the help of effectiveness factor [8]

Q9. a) When the variation in reaction rate within a reactor is so large, what will be the method of analysis and which reactor will be selected for this case? Explain the procedure of analysis with its rate equation. [8]

b) What are the various experimental methods for finding rates? Explain one in detail with its procedure. [8]

OR

Q10. The catalytic reaction A$\rightarrow$4R, is run at 3.2 atm and 117ºC in a plug flow reactor which contains 0.01 kg of catalyst and uses a feed consisting of partially converted product of 20 lit/hr of pure unreacted A. The results are as follows: [16]

Run	1	2	3	4
$C_{A,in}$(mol/lit)	0.100	0.080	0.060	0.040
$C_{a,out}$(mol/lit)	0.084	0.070	0.055	0.038

Find the rate equation to represent the above reaction with given data.

Q11. a) What are the various design considerations while designing fixed bed reactors? Explain with the help of construction and working and schematic diagram. [8]

b) The effect of by passing in a bubbling fluidized bed is determined by the fraction (l - ε_d) of the reactor volume that consists of bubbles and by the relative values of the reaction rate and mass transfer rate. The quantities k_m ε_d u_b and a_v all depends upon the bubble diameter. In a particular case suppose that these parameters have the following values for a first-order reaction operating isothermal in the bubbling regime:

P_d=0.01 g/cm^3

($k_m a_v$)=0.006 s^{-1}

k=50cm^3/(g)(s)

u_b=velocity of feed=10cm/s

reactor height, z = L =40 cm

ε_d =0.80 (that is 20 5 of the reactor volume is occupied by gas bubbles and 80% by the dense phase

i) Calculate the conversion in the effluent. [6]

ii) Compare conversion for plug flow and stirred tank reactor operating with same apparent bubble resistance time and compare the [4]

results.

OR

Q12. a) What is Michaelis-Menton Kinetics? Explain with suitable model parameters. [8]

b) What do you mean by slurry reactor model? Explain in details for the catalytic reaction: $A(g)+B(g)+C(g)$. [10]

UNIVERSITY OF PUNE

[4264-203]

B.E. (Chemical) Examination-2013

Chemical Process Synthesis

(2003 pattern)

Time-Three hours **Maximum Marks-100**

[Total No. of Question=12] **[Total no. of printed pages= 3]**

Instructions:

(1)Answers to the two sections should be written in separate answer books.

(2)Neat diagrams must be drawn whenever necessary.

(3)Figures to the right indicate full marks.

(4)Use of logarithmic tables slide rule,Mollier charts,electronic pocket calculator and steam tables is allowed.

(5)Assume suitable data wherever necessary.

SECTION-I

Q.1 (a)Explain two approaches of chemical process design. (8)

(b)Explain in short overall process design. (8)

OR

Q.2 (a)Explain in short different parameters in choice of vector. (8)

(b)Discuss idealized vector model. (8)

Q.3 (a)Benzene is produced from tolune according to the creation $C_6H_5CH_3 + H_2 \rightarrow C_6H_6 + CH_4$ .Some of the benzene formed undergoes a secondary reaction in series to an unwanted by product diphenyl,according to the reaction $2C_6H_6 \rightleftharpoons C_{12}H_{10} + H_2$ .The following table gives the composition of the reactor feed and effluent steams. Calculate the conversion,selectivity and reactor yield with respect to

(i)Tolune Feed and (ii)Hydrogen feed (16)

Component	Inlet flow rate kmol/h	Outlet flow rate kmol/h
H_2	1858	1583
CH_2	804	1083
C_6H_5	13	282
$C_6H_5CH_3$	372	93
$C_{12}H_{10}$	0	4

OR

Q.4 (a)Discuss Principle ,working and construction of cyclone separator and hydro cyclone separator. (8)

(b)Explain various parameters which governs reactor performance. (8)

Q.5 (a)Explain the principle degrees of freedom in evaporator design. (10)

(b)Discuss various types of dryers. (8)

OR

Q.6 Write short note on. (18)

(a)Centrifugal separation

(b)Fludized bed catalytic reactor

(c)Azrotropic distillation

SECTION-II

Q.7 (a)Discuss heuristic used for the sequence selection for simple distillation columns. (8)

(b)Discuss heat integration of sequences of simple distillation columns. (8)

OR

Q.8 (a)Discuss thermal coupling of the prefractionator arrangement. (8)

(b)Explain threshold problems in heat exchange network. (8)

Q.9 (a)What is simple furnace method. (8)

(b)Explain composite curves with suitable example related to heat recovery.(8)

OR

Q.10 (a)Discuss integration of heat pump schematically. (8)

(b)Explain heat recovery pinch. (8)

Q.11 Write in brief on. (18)

(a)Toxic release from processes.

(b)Fire Hazards

OR

Q.12 Write note on. (18)

(a)Safety devices

(b)LDSO

(c)Utility selection.

University of Pune
B.E. (Chemical)
4364-206
Examination - 2013
BIOPROCESS ENGINEERING
(2003 Pattern)

Total No. of Questions : 12 **[Total No. of Printed Pages :3]**

[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

*(1) Answer **03 question from each section.***
*(2) Answers to the **two sections** should be written in **separate answer-books**.*
(3) Figures to the right indicate full marks.
(4) Use of Electronic packet calculator is allowed.
(5) Neat diagrams must be drawn whenever necessary.
(6) Assume suitable data, if necessary.

SECTION I

Q1. A) Discuss with sketch the structure of lipids, sugar and polysaccharides, nucleotides? [9]

B) Explain the role of DNA & RNA polymerase and when during the cell life cycle is it most active? [9]

OR

Q2. A) Explain the structure and functions of biomembranes? [9]

B) Explain the concept of Cofactors and Coenzyme? [9]

Q3. Explain the different aerobic and anaerobic treatments for winery and distillery wastewater? [16]

OR

Q4. A) Explain the manufacturing process of a) Proteins and b) Penicillin. [16]

Q5. A) The following data were obtain for an enzyme-catalyzed reaction. Determine V_{max} and K_m. The initial rate data is as follows:

S(mol/l)	5×10^{-4}	2×10^{-4}	6×10^{-5}	4×10^{-5}	3×10^{-5}	2×10^{-5}	1.6×10^{-5}	1.0×10^{-5}	8×10^{-6}
γ (μmol/min)	125	125	121	111	96.5	62.5	42.7	13.9	7.5

Do these data fit into Michaelis-Menten Kinetics? If not what kind of rate expression would you suggest? Use graphical method. [8]

Q5. B) What are the factors of which influence enzyme activity? Explain each factor in detail. [8]

OR

Q6. A) What is meant by modulation of enzyme activity? What are the different modulation effects? [8]

B) Derive the Michaelis-Menten equation for describe the enzyme kinetics? [8]

SECTION II

Q7. A) What are other environmental effects on growth of microbial biomass? Discuss each factor in detail? [10]

B) Explain the typical growth curve for bacterial population? [8]

OR

Q8. A) Derive design equation for CSTR for continuous of cells and also explain Monod kinetics? [10]

B) Write a note on simple product formation kinetics. [8]

Q9. A) Compare the three modes of operation of bioreactors? [8]

B) What is the effect of agitation on fermentation efficiency? [8]

OR

Q10. A) Compare between physical and chemical methods of enzyme immobilization. State advantages and disadvantages of both? [8]

B) Discuss and compare mechanically agitated contactor and bubble column reactor as fermentor. [8]

Q11. A) Describe the importance of bioprocess economics? [8]

B) What are the various polymeric materials used as membranes in the membrane separation process? [8]

OR

Q12. A) Write short notes on: [16]

1. Crystallization
2. Reveres osmosis
3. Electrophoresis
4. Drying.

[Total No. of Questions: *12*] **[Total No. of Printed Pages:2]**

UNIVERSITY OF PUNE
[4364]-208
B.E. (Chemical) Examination - 2013
Polymer Technology(Elective –I)
(2003 Course)(409341)

[Time: *3* **Hours]** **[Max. Marks: 100]**

Instructions:

1. ***Answer*** *three questions from section I and three questions from section II.*
2. *Answer* ***Q1 or Q2, Q3 or Q4, Q5 or Q6*** *from section I and* ***Q7 or Q8, Q9 or Q10, Q11 or Q12*** *from section II.*
3. *Answers to the* ***two sections*** *should be written in* ***separate answer-books****.*
4. *Neat diagrams must be drawn wherever necessary.*
5. *Assume suitable data, if necessary.*
6. *Use of logarithmic tables, slide rule, Mollier charts, electronics pocket calculator is allowed*
7. *Black figures to the right indicate full marks.*

SECTION -I

Q.1		What is polymer? Classify the different polymers based on structure and source, crystallinity etc. Give suitable examples for each case.	[16]
		OR	
Q.2	A	Differentiate between addition polymers and condensation polymers	[8]
	B	What are factors influences the polymer properties?	[8]
Q.3		What are different polymerization techniques are used for synthesis of polymer. Explain in detail bulk polymerization alongwith limitations in Engineering aspect point of view.	[16]
		OR	
Q. 4	A	Explain suspension polymerization in detail along with engineering aspects and examples to use these techniques in Industries.	[8]

	B	What is different between suspension and emulsion polymerization. Explain merits of emulsion polymerization to form monodispersed miniemulsion small size latex synthesis.	[8]
Q. 5	A	What do you mean by polydispersity index? Explain number average molecular wt, viscosity avg mol. Wt and degree of polymerization.	[8]
	B	Explain with neat diagram different methods of determination of molecular weight.	[10]
		OR	
Q. 6		Along with neat diagram explain vapour phase osmometry and Gel permeation chromatography to determine molecular wt and it's distribution	[18]
		SECTION II	
Q. 7		Explain kinetics of free radical polymerization by considering initiation. Propagation and termination as elementary steps to find rate of polymerization R_p. what are different initiators are used in free radical polymerization, Explain role of initiator which affects conversion and rate of polymerization.	[16]
		OR	
Q. 8		Explain kinetics of step growth polymerization. Also explain kinetics of coordination polymerization.	[16]
Q. 9		Explain details along with figure for role of compounding unit Extrusion with neat temperature zones and diagrams.	[16]
		OR	
Q. 10		Explain different methods used in compounding process especially for thermoplastics and thermosets. With neat diagram explain injection molding process along with temperature zones and screw configurations.	[16]
Q. 11		With neat flowsheet diagram explain typical manufacturing process polyethylene synthesis and polystyrene synthesis.	[18]
		OR	
Q. 12		With detail flowsheet explain manufacturing process of styrene monomer.	[18]

UNIVERSITY OF PUNE

[4364]-210

S. E. (Chemical) Examination - 2013

ADVANCED SEPARATION PROCESSES

(2003 Pattern)

[Time : 3 Hours] **[Max. Marks : 100]**

Total No. of Questions : 12 **[Total No. of Printed Pages :2]**

Instructions :

*(1) Answers three questions from **Sections I** and three questions from **Section II**.*

*(2) Answers to the **two sections** should be written in **separate answer-books**.*

(3) Neat diagrams must be drawn wherever necessary.

SECTION I

Q1) a) Explain the basic concepts and phenomena of liquid chromatography process. [09]

b) Explain 'Temperature swing Adsorption' in detail. [09]

OR

Q2) a) Give the chromatographic column design and filling in details. [09]

b) Write short note on 'Adsorption Process' [09]

Q3) Explain the following terms: [16]

a) Permeability

b) Separation factor

c) Osmotic Pressure

d) Membrane fouling

OR

Q4) Explain the following processes : [16]

a) Ultrafiltration

b) Pervaporation

c) Reverse Osmosis

Q5) Explain the reactive distillation process with neat diagram and give the effect of operating parameters. [16]

OR

Q6) a) Explain the 'Reaction Crystallization' in detail. [08]

b) Write short note on 'Reactive Extraction'. [08]

SECTION II

Q7) a) Give the design and development of flotation equipment. [09]

b) Explain the modes of operation of foam fractionation equipment. [09]

OR

Q8) a) Explain the bubble and foams separations applications to protein and enzyme separation. [09]

[09]

b) Explain 'Collapse and drainage phenomena'. [09]

Q9) a) Give the industrial application of molecular sieves. [08]

b) Explain 'Clathrates' and 'Adducts'. [08]

OR

Q10) a) Explain in detail 'zone electrophoresis' with industrial application in separation processes. [16]

Q11) what are the factors to be considered for selection of separation process. Explain with suitable case study. [16]

OR

Q12) Write short notes on the following: [16]

a) Ultra Centrifugation.

b) Exchange reactions.

UNIVERSITY OF PUNE
[4364-211]
B.E.(Chemical Engineering) Examination 2013
PETROLEUM REFINING
(2003 pattern)

Time-Three hours **Maximum Marks-100**
[Total No. of Question=12] **[Total no. of printed pages= 2]**
Instructions:

(1)Answer 3 questions from section.
(2)Answer to the TWO sections should be written in separate answer books
(3)Neat diagrams must be drawn whenever necessary.
(4)Figures to the right indicate full marks.
(5)Use of logarithmic tables slide rule,Mollier charts,electronic pocket calculator and steam tables is allowed.
(6)Assume suitable data whenever necessary.

SECTION-I

Q.1 (a)Discuss the current status of Petroleum Refining in India. Also discuss about the consumption trend currently. How much total quantity is imported? (8)

(b)Why it is necessary to refine crude oil?What are the major constituents of crude oil? (8)

OR

Q.2 (a)Describe the test and properties of Gasoline. (8)

(b)What are the current challenges in front of Indian Refineries with respect to Quality of the crude received. (8)

Q.3 Distinguish Between ADU and VDU with respect to various processing parameters?Describe Atmospheric distillation Unit with suitable diagram. (16)

OR

Q.4 What are different types of pipe still heaters?Describe Heating through Exchangers and pipe still heaters with schematic diagram? (16)

Q.5 (a)Discuss the refining operations in details. Draw the neat sketch of the process of Refining. (2+10)

(b)Give the comments on the statement *"Each fraction of crude contains a Mixture of compounds with similar boiling points"?* (6)

OR

Q.6 Write short note on. (18)
(a)fluid Catalytic Cracking units
(b)Thermal cracking
(c)Hydro cracking operation

SECTION-II

Q.7 Describe HDM process with neat schematic diagram. Discuss merits and Demerits of process in details. (16)

OR

Q.8 Describe hydrodesulphurization process with Schematic diagram. Why Dedulphurization is necessary? (16)

Q.9 (a)What is the blending operation and explain the line blending operation? (8)
(b)How petroleum products are stored?what special cares are needed to store petroleum products? (8)

OR

Q.10 (a)What is importance of addition of additives in the petroleum products? Discuss in brief about the additives for gasoline and diesel. (10)
(b)How safety is prime concern in any refinery?Discuss various aspects in the refinery. (6)

Q.11 Enlist various public and private sector refiners in India?And briefly discuss on "Indian Scenario of processing of petroleum fractions." (18)

OR

Q.12 Write short notes on: (6 * 3)
(a)Integration of refinery and petrochemical plants for power generation.
(b)Recent advances in packing material used for petroleum products.
(c)Recent trends in petroleum with respect to distillation.

University of Pune
B.E (Chemical)
4364-212
Examination - 2013
Project Costing and Appraisal
(2003 Pattern)

Total No. of Questions : 12 **[Total No. of Printed Pages :3]**

[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

(1) Answers 3 Q. from each section.
(2) Answers to the 02 section should be written in separate answer books.
(3) Figures to the right indicate full marks.
(4) Neat diagrams must be drawn whenever necessary.
(5) Use of logarithmic tables slide rule, Mollier charts, Electronic packet calculator and steam tables is allowed.
(6) Assume suitable data if necessary.

Section I

Q1	A	Write note on of market survey.	8
	B	What is meant by project evaluation?	8

OR

Q2		Explain the terms in detail.	16

1. Supply and demand
2. Concept of cost
3. Margin
4. Profit

Q3	A	Discuss the statement of income and expenditure in detail	8

	B	The annual direct production costs for a operating at 80% capacity are RS. 280,000 while the sum of the annual fixed charges, overhead costs, and general expenses is Rs.200,000.What is the breakeven point in units of production per year if total annual sales are Rs 560,000 and product sells at Rs. 40 per unit? What were the annual gross earnings and net profit for this plant for at 100% capacity when corporate income taxes required at 15% tax on the first Rs.50,000 of annual gross earnings, 25% on annual gross earnings of Rs.50,000 to Rs.75,000, 34% on annual gross earnings above Rs.75,000, and 10% on gross earnings from Rs.100,000 to 335,000.	8

OR

Q4	A	Discuss with example the concept of journal and ledger entries.	8
	B	Explain the balance sheet with detailed analysis.	8
Q5	A	What are the basic factors involved in equipment costing?	8
	B	Explain the terms: 1. Basic concept of cost. 2. Prime cost.	10

OR

Q6	A	Calculate in detail the cost of any distillation column of your choice giving details about technical specifications and costing of the equipment.	8
	B	Explain how the allocation of over heads of various cost elements is worked out.	10

Section II

Q7	A	What are the different methods of raising the finance?	8

	B	Explain the terms: 1. Fixed capital 2. Working Capital	8

OR

Q8		It is desired to borrow Rs.100000 to meet a financial obligation. This money can be borrowed from a loan agency at a monthly interest rate of 2%. Determine the following : 1. The total amount of principal plus simple interest due after 2years if no intermediate payment are made. 2. The total amount of principal plus compounded interest due after 2 years if no intermediate payments are made. 3. The nominal interest rate when the interest is compounded monthly. 4. The effective interest rate when the interest is compounded monthly.	16
Q9	A	Explain in detail cash flow diagram.	8
	B	Explain the concept of taxes and their types.	8
Q10	A	Explain the terms: 1. Cash flow statement 2. Discount cash flow 3. Need for expansion & diversification 4. Capitalized cost	16
Q11	A	Define depreciation and discuss its need and significance with limitations.	8
	B	Discuss various methods of determining depreciation charge	10

OR

Q12 The original value of a piece of equipment is 2200 completely installed and ready for use. Its salvage value is estimated to be Rs200 at the end of a service life estimated to be 10 years. Determine the asset (or book) value of the equipment at the end of 5 years using: 18

1. Straight-line method.
2. Declining balance method
3. Double declining-balance (200 %)

[Total No. of Questions: *12*] **[Total No. of Printed Pages:** *4*]

UNIVERSITY OF PUNE
[4364]-213
B. E. (Chemical) Examination - 2013
Chemical plant Engineering
(2003 Course)(409351)

[Time: *3* **Hours]** **[Max. Marks: 100]**

Instructions:

1. ***Answer*** *three questions from section I and three questions from section II.*
2. *Answers to the* ***two sections*** *should be written in* ***separate answer-books****.*
3. *Neat diagrams must be drawn wherever necessary.*
4. *Assume suitable data, if necessary.*
5. *Use of logarithmic tables, slide rule, Mollier charts, electronics pocket calculator is allowed*
6. *Black figures to the right indicate full marks.*

SECTION -I

Q.1 A What are main factors should be consider in making feasibility study? Explain in detail. [9]

B Explain significance of laboratory data in process development. [9]

OR

Q.2 A Discuss the various functions of pilot plant. [9]

B Explain the importance of flow sheeting in chemical industry. [9]

Q.3 A A project engineer would like to choose a plant location for following manufacturing units. Please help him during selection of proper site giving justification. [8]

i) Sugar Industry

ii) Caustic Soda Plant

B Explain in detail the factors affecting process selection. [8]

OR

Q. 4 A What factors are to be considered for pipe design? [8]

B Explain Normal Pipe Size (NPS) [4]

C What factors govern the selection of piping and insulation? [4]

Q. 5 A Write short note on: [16]

a) Waste Water Treatment.

b) Material Selection for Equipment.

c) Capacity utilization and debottle process.

d) Process Instrumentation.

OR

Q. 6 A Write the specification sheet and design needs for a calandria type evaporator. [8]

B Explain the following terms: [4]

i) Intrasically safe process.

ii) HAZOP.

C List factors to be considered for plant layout and plant design. [4]

SECTION II

Q. 7 A Explain the factors governing the selection of piping and insulation. [6]

B Explain normal pipe size. [6]

C Give the details of colour code for piping. [6]

OR

Q. 8 Write short notes on:

A Transportation of solids in pipeline [6]

B Pipe supports. [6]

C Piping for high temp. [6]

Q. 9 A Write short note on: [16]

a) NPSH and cavitations.

b) Scale up methods.

c) Factories Act.

d) Indian Boiler Regulation.

OR

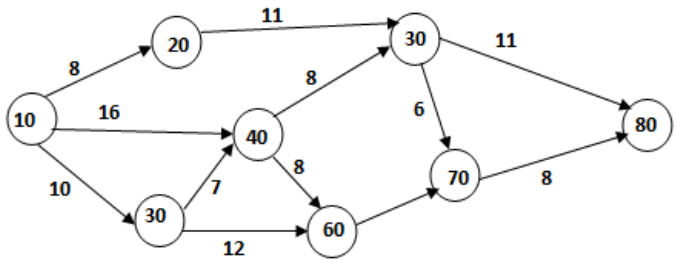
Q. 10 A Explain the characteristic of single acting and double acting reciprocating pump with neat diagram. [10]

B Explain typical characteristic curve for the fan. [6]

Q. 11 A What is float and how it is useful in CPM network. [4]

B Explain static & mobile pressure vessel. [4]

C Consider the network shown below. Determine the critical path. [8]



OR

Q. 12 A A chemical manufacturing company wants to estimate the time for the project, various activities are identified as 10,20,30…….etc. Their sequence is as under [12]

Activity Sequence	Estimated Time in Week
(10,20)	12
(10,30)	13
(10,40)	12
(20,50)	10
(30,70)	19
(40,60)	11
(50,70)	10
(50,80)	12
(60,90)	09
(70,100)	20
(80,100)	15
(90,100)	20

Draw the network for these activity and estimate the time for critical path?

B Define ''Intrinsically'' and ''Extransic'' safe process. [4]

[Total No. of Questions: 12] **[Total No. of Printed Pages: 2]**

UNIVERSITY OF PUNE

[4364]-214

B. E. (Chemical) Examination - 2013

Process Modeling & Simulation (2003 Course)

[Time: 3 Hours] **[Max. Marks: 100]**

Instructions:

1 *Answer any three questions from each section.*

2 *Answers to the **two sections** should be written in **separate answer-books**.*

3 *Neat diagrams must be drawn wherever necessary.*

4 *Black figures to the right indicate full marks.*

5 *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

6 *Assume suitable data, if necessary.*

SECTION -I

Q.1 Define model and write the classification of models. 16

OR

Q.2 A Give different uses of mathematical model. 8

B What are limitations of mathematical models? Give examples. 8

Q. 3 What are lumped or distributed parameter system. Explain with proper examples. 16

OR

Q. 4 What are State variable, Input variable, Output variable, Manipulated variable and Disturbance variable? Explain with proper examples. 16

Q. 5 Develop mathematical model of multiple effect evaporator. Use notations as usual. Write assumptions. Draw neat figure. 18

OR

Q. 6 Develop a model for Double pipe Heat exchanger 18

SECTION II

Q. 7 Develop a model for Differential distillation column. Write modeling assumptions. 18

OR

Q. 8 Develop a mathematical model for multi component Distillation column. 18

Q. 9 Consider a CSTR where an irreversible, first-order endothermic reaction of the form A $\underline{k}$ B takes place. Let CA denote the concentration of the species A in the reactor, TR ad Tin denote the temperatures of the reactor and of the inlet stream, respectively, Q, is the heat added to/removed from the reactor, CA0 is the concentration of A in the inlet stream, V is the volume of the reactor, k0,E,ΔH are the pre-exponential 16

constant, the activation energy, and the enthalpy of the reaction and C_P and ρ are the heat capacity and fluid density in the reactor.
Develop a model that describes the evolution of the concentration and temperature in the reactor, using a systematic modeling approach that also outlines all assumptions made.

OR

Q. 10 The simplest example of biological wastewater treatment involves removing a single nutrient, N, from a liquid waste stream and converting it to (solid) biomass, B. This process is used, for example, by pop manufactures to treat liquid waste from their processes, where N would be sugar (e.g. fructose). The microorganisms absorb N from the wastewater and use it to grow more and more biomass. 16

1. Draw a simple CSTR where this liquid stream enters, containing Nin [mg/L] and the stream leaving the reactor contains both liquid and solid fractions. The solids in the outlet stream can be separated, and the remaining liquid would contain much less N, allowing the company to discharge that liquid to municipal wastewater treatment systems.

   Draw the boundaries you will consider on your diagram as well.
2. Write on overall mass balance, where the flows, q, are expressed in units of liters per day, typically being in the order of mega liters per day.
3. Write a dynamic mass balance for N and B, where their units are expressed in mg/L. Assume there is no biomass in the inlet stream. The reaction rate for converting N ——B is given by rB in units of mg/(L.day).

Q. 11 Consider the modeling of a jacketed CSTR, fed with a single inlet stream. Under some fairly straightforward assumptions, one can show that the steady temperature of the fluid leaving the tank is given by: 16

$$\frac{\mathrm{Fin}}{V}[T^{in} - T] - \frac{UA_s}{\rho C_P V}[T - T_j] + \frac{2k_0(-\Delta H_r)}{\varrho C_P} C_A^2 e - \frac{E_a}{RT} = 0$$

After substituting in relevant values for the constant physical properties, and fixing the value of CA, the equation can be reduced to:

$$2.6 - 1.45T + 5X\ 10^5 e^{-\frac{2000}{7}} = 0$$

Perform 2 iterations of the Newton-Raphson algorithm for finding the roots of a nonlinear equation. A reasonable starting guess for T(0) is the same temperature as the inlet stream: i.e.T(0)= Tin = 290 K. Note: you do not need to drive the mass-balance equation above.

OR

Q. 12 A What is simulation? Give the scope of simulation. Write different forms of simulations. 8

B Discuss brief about UNISIM. 8

[Total No. of Questions: 12] **[Total No. of Printed Pages: 3]**

UNIVERSITY OF PUNE

[4364]-215/674

B. E. (Chemical) Semester II (Elective 2)Examination - 2013

COMPUTER – AIDED PROCESS CONTROL(409348) (2003 & 2008 Course)

[Time: 3 Hours] **[Max. Marks: 100]**

Instructions:

1. *Answers to the two sections should be written in separate answer-books.*
2. *Neat diagrams must be drawn wherever necessary.*
3. *Black figures to the right indicate full marks.*
4. *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
5. *Assume suitable data, if necessary.*

SECTION –I

Q.1 A Explain role of digital computer in process control 6

B Distinguish between control system used for batch and continuous processes 6

C Distinguish between DDC & DCS control systems. 6

OR

Q.2 A Explain the following architectures for computer-aided process control systems- 9

i) Centralized (supervisory)

ii) Distributed

iii) Heirarchial

B Explain the functions and essential features of HMI (or MMI) used in computer-aided process control systems 9

Q. 3 A A MIMO system is represented by state-space model in the form 8

$x(t) = Ax(t) + BU(t) + TD(t)$ $y(t) = C\,x\,(t)$

derive transfer function model of this system in the form-

$Y(s) = G(s)\,\bar{U}\,(s) + G_d(s)\,\bar{D}\,(s)$

Where the symbols have their usual meaning. How will you determine poles and zeros of transfer function G(s)

B A 2x2 process having inputs m_1, m_2 and output Y_1, Y_2 is controlled using two controllers having transfer functions Gc_1 and Gc_2 installed between (m_1-y_1) & (m_2-y_2) respectively. Sketch the closed-loop block diagram. Also derive the closed-loop servo response transfer function in the form- 8

$\bar{Y}(s) = (1+ GpGc)^{-1}\,GpGc\,\bar{Y}_{SP}(s)$ Where Y(t) & $Y_{SP}(t)$ are output and set-point vector Gp, Gc are process and controller transfer function matrices

OR

Q. 4 A If a 2x2 process has open-loop steady-state gain model 8

$Y_1 = K_{11}M_1 + K_{12}M_2$ $Y_2 = K_{21}M_1 + K_{22}M_2$

Define and derive the expression for R.G.A. of the system.

B State the properties of RGA of a MIMO system. How will you determine the best pairing of input-output variables for control purpose using RGA. 4

C Calculate the RGA for wood and Berry distillation column having steady-state gain matrix 4

$$K = \begin{array}{c} \\ Y_1 \\ Y_2 \end{array} \begin{array}{c} \begin{array}{cc} M_1 & M_2 \end{array} \\ \begin{pmatrix} 12.8 & -18.9 \\ 6.6 & -19.4 \end{pmatrix} \end{array}$$

Comment on pairing of input-output variables which will result in control loops with minimum interaction

Q. 5 A Draw and explain block diagram for computer-aided process control systems 8

B Find inverse Z-transform of the following function using long division method 8

$$\bar{Y}(z) = \frac{z^{-1}}{1+z^{-1}+z^{-2}+z^{-3}}$$

Also find corresponding sequence of sampled values y(t) at sampling interval of 1 min.

OR

Q. 6 A State BIBO criteria for stability of discrete-time system, If a system has discrete-time transfer function 8

$$D(z) = \frac{a_0+a_1z^{-1}+a_2z^{-2}+----+amz^{-m}}{1+b_1z^{-1}+b_2z^{-2}+----+bnz^{-n}}$$

Then derive the graphical condition for stability (in Z-plane) of the system.

B Derive pulse transfer functions :- $G_p(s) = \frac{10}{(0.15+1)(25+1)}$, 8

$H(s) = \frac{1-e^{-Ts}}{s}$ If a PI controller having Kc = 0.1, T_I = 1 min, T = 1min is used derive the characteristic equation of the system. Comment on stability of this closed-loop system.

SECTION II

Q. 7 A Explain the working of ADC & DAC used as process-related interfaces 8

B Explain communication hierarchy in computer-control system. 8

OR

Q. 8 A Explain the following data transfer techniques-pilling, interrupt. 8

B Explain ISO reference model for communication between computer network systems 8

Q. 9 A Explain the following basic components of DCS- 16

a) Operator's console

b) VDU
c) Keyboards & displays

OR

Q. 10 A Draw block diagram of PLC-architecture and describe function of each block 16

Q. 11 A Write short notes on the following 18
a) PLC programming using ladder diagram
b) Plantwide control systems
c) Distillation column control

OR

Q. 12 A Write short notes on the following 18
a) Decouplers used in MIMO control system
b) Temporal hierarchy of control structure in PWC
c) Process control computer software systems.

[Total No. of Questions: 12] **[Total No. of Printed Pages: 2]**

UNIVERSITY OF PUNE
[4364]-218
B. E. (Chemical) Examination - 2013
INDUSTRIAL HAZARDS & SAFETY (2003 Course)

[Time: 3 Hours] **[Max. Marks: 100]**

Instructions:

1 ***Answer three questions from each Section.***
2 *Answers to the **two sections** should be written in **separate answer-books**.*
3 *Black figures to the right indicate full marks.*
4 *Neat diagrams must be drawn wherever necessary.*
5 *Assume suitable data, if necessary.*

SECTION -I

Q.1	A	Draw a neat sketch of ingredients of successful safety program and discuss in detail?	8
	B	Discuss the different dose response curves?	8
		OR	
Q.2		Discuss all the details about Initiation, propagation and termination of accident process with suitable example?	16
Q. 3	A	Discuss the importance of Industrial Hygiene in chemical Industries?	8
	B	Explain the evaluation of worker's exposure to volatile toxicants?	8
		OR	
Q. 4		Discuss the evaluation of worker's exposure to (a)Noise (b)Dusts	16
Q. 5	A	What are the advantages and disadvantages of vacuum and pressure purging systems for inerting?	10
	B	What are the different types of fire extinguishers? Give their compositions & specific application?	8
		OR	
Q. 6	A	What are the ways by which fires and explosions prevented and controlled in processing flammable materials?	10
	B	What is the significance and importance of Limiting Oxygen Concentration (LOC)?	8

SECTION II

Q. 7		How is wetted surface useful in the estimation of vaporization rates on fire exposure?	16
		OR	
Q. 8	A	What are rupture panels? Where are they used? Discuss the materials used in making them.	16
Q. 9		Discuss in detail about risk identification and quantitative risk analysis?	16

OR

Q.10		Discuss in detail about: (a)Revealed and unrevealed failure (b)Event trees and Fault trees	16
Q.11		Write a short note on : (a)Different types of hazards associated with chemical process plants. (b)Hazard model & Risk data	18

OR

Q.12	A	Discuss and explain plant layout issues that are to be included in a hazard survey?	10
	B	Explain the concept of Risk management routines?	8

[Total No. of Questions: 12] **[Total No. of Printed Pages: 2]**

UNIVERSITY OF PUNE
[4364]-221
B.E. (Chemical) Examination - 2013
Petrochemical Engineering Elective II
(2003 Course)

[Time: 3 Hours] **[Max. Marks: 100]**

Instructions :

1. *Answers to the **two sections** should be written in **separate answer-books**.*
2. *Neat diagrams must be drawn wherever necessary.*
3. *Assume suitable data, if necessary.*
4. *Use of logarithmic tables, slide rule, Mollier charts, electronics pocket calculator is allowed*
5. *Black figures to the right indicate full marks.*

SECTION -I

Q.1 A Discuss types of crude oil distillation Explain with neat diagram the synthesis of petrochemicals [16]

OR

Q.2 A Discuss in detail about the main building blocks of petrochemical Industry [16]

Q.3 A What are hydrocarbons write down the classification of hydrocarbons [16]

OR

Q. 4 A With neat sketches, explain in detail the production of naphthalene [16]

Q. 5 A Describe the process for production of low molecular weight olefins by hydrocarbon cracking. Draw necessary diagram [18]

OR

Q. 6 A Explain cracker furnace flare [9]

B Describe the tubestill process of thermal cracking [9]

SECTION II

Q. 7 A Explain the types and uses of second generation intermediates used as solvents and formulating agents [16]

OR

Q. 8 A Along with essential reaction steps, write in detail about the production of ethylene glycol [16]

Q. 9 A Write short notes on various types of polymerization processes [16]

OR

Q.10	A	Explain Emulsion polymerization of styrene	[8]
	B	Discuss polymer synthesis and monomer purification.	[8]
Q.11	A	Discuss various pollution abatement techniques in petrochemical industry	[18]

OR

Q.12	A	Explain the control of emission from steam crackers using Best Available Technique (BAT)	[9]
	B	What do you imply by safety in oil refining industry	[9]