

SUBJECT CODE NO:- K-18
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E. (Chem.) Examination Oct/Nov 2016
Process Modelling and Simulation
(Revised)

[Time: Three Hours]

[Max.Marks:80]

N.B

Please check whether you have got the right question paper.

- 1) Q. No 1 and 6 are compulsory.
- 2) Solve any two questions from remaining of each section.
- 3) Figures to right indicate full marks.
- 4) Figure mentioned in statement of problem are given at last pages of question paper.
- 5) Assume suitable data whenever required.

Section A

- Q.1 a) What do you understand by mathematical model? 03
 b) Write a model equation for system described by non-linear model. 03
 c) Write an equation of motion in rectangular co-ordinate system. 04
- Q.2 a) Write a short note on contents of numerical routine library. 06
 b) A fluid of constant density ρ is pumped into a cone- shaped tank of total volume $\frac{H\pi R^2}{3}$. The flow out of the bottom of the tank is proportional to the square root of the height h of liquid in the tank. Derive the model equation describing the system. 09
- Q.3 a) Give classification of mathematical models. 06
 b) Hot steel ball of diameter d , specific heat C_p , thermal conductivity k & density ρ , is initially at temperature T_i . It is suddenly placed in an isothermal convective environment having film coefficient, h . Assuming internal resistance to the heat conduction to be negligible, model the system for estimation of temperature as function of time. 09
- Q.4 a) A Slurry reactor as shown in figure 1. Is to be used to carry out a catalytic reaction. The reactor is well stirred and with catalyst particles well dispersed. Reaction is zero order and rate is function of temperature, given by equation. 09
 1. The contents of the reactor are heated using steam. Develop mathematical model to simulate temperature response of the tank content, to change in steam temperature. $r = a + bT + cT^2, \frac{\text{mol}}{\text{s.cm}^3}$

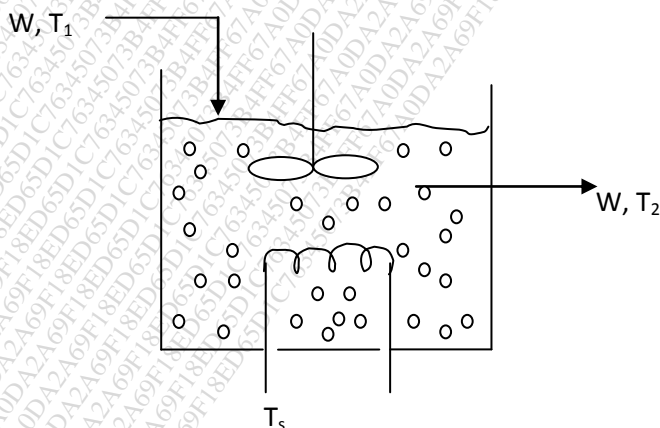


Figure 1: Slurry Reactor Q.4 (a)

- b) The heat capacity of carbon dioxide is given by, $C_p = 1.716 - 4.257 \times 10^{-6}T - \frac{15.04}{\sqrt{T}}$ where C_p is in KJ/kg K and T is in K, determine the temperature at which heat capacity of carbon dioxide is 1 KJ/kg K. Use direct substitution (Successive approximation) method. 06

- Q.5 a) For continuous flow through a tank. Unsteady mass balance results in following $A \frac{dh}{dt} = F_1 - F_2$ Where F_1 & F_2 are inflow rate and outflow rate. Initially $F_1 = 0.27 \text{ m}^3/\text{min}$, $F_2 = 0.27 \text{ m}^3/\text{min}$, $Z = 30 \text{ m}$ and $A = 0.9 \text{ m}^2$. suddenly the inflow rate is raised to $F_1 = 0.5 \text{ m}^3/\text{min}$. Determine the change in height using Euler's method for step size of 0.05min, determine the height of liquid in the tank after four steps. 07
- b) Solve the problem in Q. 5a using Runge-Kutta fourth order method. 08

Section-B

- Q.6 a) For a centrifugal pump for pumping incompressible fluid. List parameters and variables required for modelling and simulation. 03
- b) Write and explain equations required to model continuous binary packed distillation column. 03
- c) Write a short note on components of software for chemical process simulation. 04
- Q.7 a) A packed bed absorber is used for adsorbing polluting gas in gases stream. Draw a neat sketch of the labelled system and model system for concentration of pollutant (one component adsorbed) gas at the exit stream. Make use of suitable equations for gas-solid equilibrium. Assume operation to be isothermal. 06
- b) Using figure 2, explain working of multicomponent flash distillation. Assuming that. Operating temperature and pressure are known for flash unit, model system for three components. 09

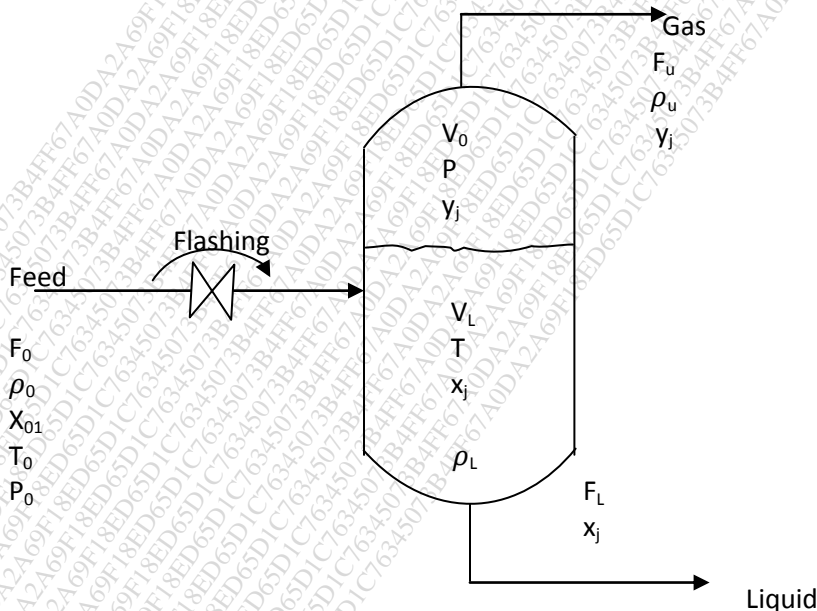


Figure 2: Multicomponent flash distillation Q.7(b)

Q.8 With neat sketch explain working of ideal binary tray distillation column and develop mathematical model using 15
total continuity and component balance equations for feed plate, plate in rectifying & stripping section,
condenser, reflux drum and reboiler. Also include appropriate equations for liquid holdup on plate. Make suitable
assumption and mention them clearly.

Q.9 a) Figure 3 gives diagram for a vaporizer, which is provided with liquid level controller and a pressure 09
controller included. Model a system for liquid and vapour phase dynamics by developing total and
component continuity equations. Make suitable assumptions and state them clearly.

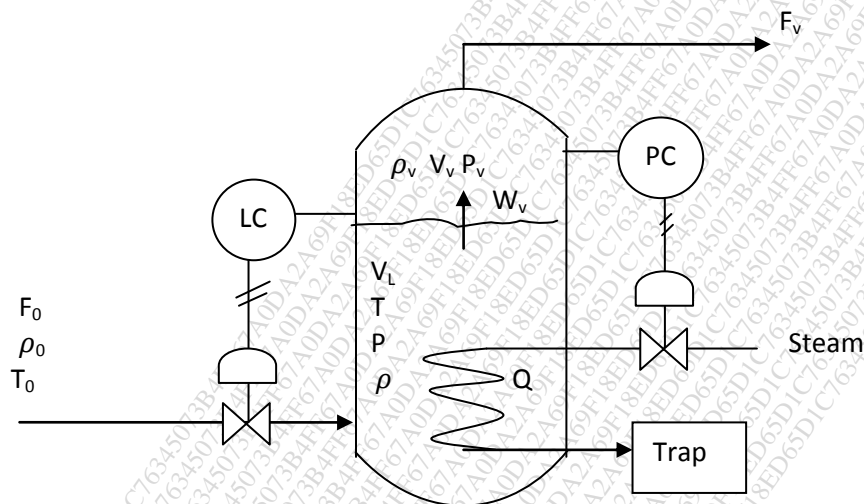


Figure 3: Single phase Vaporizer Q.9 (a)

b) Derive a model for an ideal batch reactor for carrying out uni-molecular reaction under isothermal 06
conditions.

Q.10 a) Draw neat labelled sketch of DPHE and write an algorithm for simulation of DPHE for prediction of steady 05
state outlet temperature of hot fluid as flow of hot fluid changes.
b) Describe the functioning of fluidized bed reactor with neat labelled sketch. Discuss fundamentals 10
equations required for modelling of fluidized bed reactor.

SUBJECT CODE NO:- K-47
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E. (Chem) Examination Oct/Nov 2016
Advanced Separation Processes
(Revised)

[Time: Three Hours]**[Max.Marks:80]**

Please check whether you have got the right question paper.

- N.B
- i) Q.No.1 and Q.No.6 are compulsory.
 - ii) Answer any two questions from the remaining of each section.
 - iii) Assume suitable data. If required and draw neat sketches wherever needed.

Section A

- | | | |
|-----|--|----|
| Q.1 | Explain following terms. | |
| | a) Types of membranes and permeability of membrane. | 05 |
| | b) Principle of TSA and PSA | 05 |
| Q.2 | a) Give details selection of column for liquid chromatography. Also list its applications. | 08 |
| | b) What do you mean by concentration polarization? How to minimize it. | 07 |
| Q.3 | Explain following separation processes with their principle and mechanism. | 15 |
| | a) Reactive distillation | |
| | b) Electro dialysis | |
| Q.4 | A reverse osmosis membrane to be used at 25 ⁰ C for a NaCl feed solution containing 2.5 g NaCl per liter with its density of 999Kg per m ³ and has a water permeability constant 4.81 x 10 ⁻⁴ Kg/s.m ² . atm and a solute i.e. NaCl permeability constant is 4.42 x 10 ⁻⁷ m/sec. Calculate the water flux and solute flux through the membrane using pressure drop of 27.20 atm and the solute rejection R. Also calculate concentration of the product solution. | 15 |
| Q.5 | Write note on | 15 |
| | i. Ultrafiltration | |
| | ii. Column design for liquid chromatography | |
| | iii. Ion exchange and its resins | |

Section – B

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|------|--|----|
| Q.6 | Explain following terms | |
| | i. Principle and mechanism of froth floatation. | 05 |
| | ii. Molecular sieves. | 05 |
| Q.7 | Give detail design of froth floatation equipment and list industrial application of foam separation process. | 15 |
| Q.8 | a) Compare zone electrophoresis and zone refining. | 07 |
| | b) Explain in detail the process of foam formation, its collapse and drainage. | 08 |
| Q.9 | Describe in details with neat sketch, the principle, mechanism and application of ultracentrifugation. | 15 |
| Q.10 | Write note on | 15 |
| | a) Nanotechnology for separation | |
| | b) Adductive crystallization | |
| | c) Industrial applications of ultra centrifugation | |

SUBJECT CODE NO:- K-48
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E. (Chem) Examination Oct/Nov 2016
Industrial Pollution and Control
(Old)

[Time: Three Hours]**[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B

- 1) Solve any three questions from each section.
- 2) Give necessary diagram, equation & flow diagram wherever necessary.
- 3) Assume suitable data, if necessary.

Section A

- | | | |
|-----|--|----------|
| Q.1 | Explain in detail following environmental registration | 16 |
| | <ol style="list-style-type: none"> a) Air act 1982 b) Water act 1974 | |
| Q.2 | Explain the types of pollutions, classification & sources in chemical process industrials. | 16 |
| Q.3 | How the control of SO ₂ & NO _x is done to prevent the damage of environment explain in detail one method each. | 16 |
| Q.4 | <ol style="list-style-type: none"> a) Explain in detail global warming & its effect on eco system. b) How the selection of equipment is made for air pollution control equipment | 08
08 |
| Q.5 | Write short note on | 18 |
| | <ol style="list-style-type: none"> a) Acid rain b) Gaussian plume model c) Gravity settlers | |

Section B

- | | | |
|------|---|----|
| Q.6 | Explain the procedure for following characteristics of waste water | 16 |
| | <ol style="list-style-type: none"> a) TOC b) DO | |
| Q.7 | Explain following effluent water treatment processes. | 16 |
| | <ol style="list-style-type: none"> a) Stabilisation pond b) Rotating biological am factors | |
| Q.8 | Discuss in detail sources of pollution & its control measure for ammonia manufacturing unit. | 16 |
| Q.9 | Explain in detail following advance treatment method reverse osmosis & electro dialysis | 16 |
| Q.10 | Write note on | 18 |
| | <ol style="list-style-type: none"> a) Natural and artificial aeration b) Aerated lagoons c) Hazards solid waste management | |

SUBJECT CODE NO:- K-79
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E. (Chem) Examination Oct/Nov 2016
Petrochemical Engineering
(Revised)

[Time:Three Hours]

[Max. Marks:80]

Please check whether you have got the right question paper.

- N.B
- i) Q.1 & Q.6 are compulsory.
 - ii) Solve any two questions from remaining questions in section-A & section –B.
 - iii) Draw neat sketches & use data wherever required.

Section A

- | | | |
|-----|---|----------|
| Q.1 | Solve <u>any five</u> . | 10 |
| | <ol style="list-style-type: none"> 1) Write down composition of petroleum. 2) Indian crude types. 3) Define polymerization. 4) What is petroleum derivation? 5) Classification of petrochemicals. 6) Application of formaldehyde. | |
| Q.2 | <ol style="list-style-type: none"> a) Explain in brief petrochemical industry in India. b) What are main building blocks of petrochemical industry? | 08
07 |
| Q.3 | <ol style="list-style-type: none"> a) Write down production process of methanol with neat sketch. b) Write down ethylene & acetylene production process via steam cracking. | 08
07 |
| Q.4 | <ol style="list-style-type: none"> a) What are different techniques involved in petrochemical manufacture? b) Economic aspects of petrochemical industry in India. | 08
07 |
| Q.5 | <p>Write short note.</p> <ol style="list-style-type: none"> a) Propylene derivative b) Reserve & deposits of world c) Production process of synthetic ethanol | 15 |

Section B

- | | | |
|-----|--|----------|
| Q.6 | Solve <u>any five</u> . | 10 |
| | <ol style="list-style-type: none"> 1) Define thermosetting polymer. 2) Cross linked polymer. 3) Ethylene cracker. 4) Define BHC. 5) Uses of maleic anhydride 6) Emulsion | |
| Q.7 | <ol style="list-style-type: none"> a) With neat sketch. Write down production process of nitro benzene. b) Pthalic anhydride | 08
07 |

- Q.8 a) Mention merits & demerits of emulsion polymerization w.r.t other polymerization processes. 08
b) With neat sketch, write down PVC manufacturing process. 07
- Q.9 a) Brief description on safety in petrochemical industry. 08
b) What is integrated petrochemical complex? 07
- Q.10 Write short note. 15
a) Pollution control norms in petrochemical industry
b) Suspension polymerization
c) Adipic acid

SUBJECT CODE NO:- K-192
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E.(CHEM) Examination Oct/Nov 2016
Process Dynamics and Control
(Revised)

[Time:Three Hours]

[Max. Marks:80]

Please check whether you have got the right question paper.

- N.B
- i) Q.No.1 and 6 are compulsory.
 - ii) Answer any two questions from remaining of each section.
 - iii) Assume suitable data, if required and draw neat sketches whenever needed.

Section- A

- | | | |
|-----|--|---------------------|
| Q.1 | Explain following terms | 10 |
| | <ol style="list-style-type: none"> i) Impulse Forcing Function ii) Damping Coefficient iii) Mathematical model for process iv) Overshoot v) Second order System. | |
| Q.2 | <ol style="list-style-type: none"> a) Explain in details with the help of proper example the concept of linearization in process control. b) Derive transfer function for two tank interacting system. | <p>08</p> <p>07</p> |
| Q.3 | <ol style="list-style-type: none"> a) Explain the mechanism of PI controller in detail with the help of flapper and nozzle arrangement. State the application of different controllers. b) A mercury bulb thermometer having time constant 0.1 min is placed in the bath at 100°C and allowed to come to equilibrium with bath. At time t=0 temperature of bath begins to vary sinusoidal way about its average temperature 100°C with an amplitude of 2°C. If frequency of oscillation is $10/\pi$ cycles per min. Plot ultimate response of thermometer reading as function of time. What will be values of phase lag in time unit? | <p>08</p> <p>07</p> |
| Q.4 | <ol style="list-style-type: none"> a) The overall transfer function of system is given as $G(S) = 5/(2 S^2 + 1.63 S + 5)$. If a step change of magnitude 5 is given to its input. Find <ol style="list-style-type: none"> i) Decay ratio ii) Time rise iii) Ultimate values of response iv) Maximum values of response. b) Explain the pure capacitive system in process control. | <p>12</p> <p>03</p> |
| Q.5 | Write note on : <ol style="list-style-type: none"> i) Mixing Process ii) Damped Oscillator iii) Step response for non-interacting system | 15 |

Section- B

- Q.6 Explain following terms. 10
- i) Open loop pole and zero
 - ii) Corner frequency
 - iii) Characteristic equation of control system
 - iv) Bode stability criterion
 - v) Stable control system
- Q.7 Draw root locus diagram for control system whose open loop transfer function is 15
- $$G(s) = K_c (4S+1)/S(S+3) (6S+1)$$
- Q.8 Sketch Bode diagram for control system whose open loop transfer function is given as. 15
- $$G(s) = 10e^{-0.5s} / (S+1) (2S+1) (3S+1)$$
- Q.9
- a) Explain in details mechanism of cascade control system with the help of an example. 08
 - b) Explain in detail the Routh Hurwitz's stability criteria. 07
- Q.10 Write note on. 15
- a) Feed forward control system
 - b) Gain margin and Phase margin
 - c) Servo control mechanism for negative feedback system.

SUBJECT CODE NO:- K-193
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E.(CHEM) Examination Oct/Nov 2016
Chemical Reaction Engg. II
(Old)

[Time: Three Hours]

[Max. Marks:100]

Please check whether you have got the right question paper.

- N.B
- i. Answer any three questions from each section.
 - ii. Assume suitable data, if required and draw sketches wherever needed

Section A

- Q.1 Explain following terms.
- a. Arrhenius law of temperature dependence of reaction rates. 06
 - b. Heat effect in adiabatic reaction. 05
 - c. Mixing of macro fluid and micro fluid. 05
- Q.2
- a. Discuss in details the concept of RTD for non- ideal flow. 06
 - b. Explain in details tank in series model – ideal flow and list out its usefulness. 10
- Q.3 What do you mean by progressive conversion model? For chemical reaction controlling derive expression for relation, for time required and conversion, assuming unreacted core model for spherical particles of unchanging size. Also find time required for complete conversion. 16
- Q.4
- a. How will you determine rate controlling step for fluid particle reaction? 10
 - b. Draw neat sketches for contacting pattern for fluid particle reaction. 06
- Q.5 Write note on. 18
- a. Dispersion model.
 - b. Optimum temperature progression.
 - c. Conversion from tracer information.

Section B

- Q.6 Explain following terms.
- a. Langmuir's isotherm. 05
 - b. Film conversion parameter. 05
 - c. Catalyst poisoning and regeneration. 06
- Q.7 Compare the performance of fluidized – bed, trickle – bed and slurry reactors. 16
- Q.8 The concentration of undesirable impurity in air (at 1 bar = $10^5 Pa$) is to be reduced from 0.1 (or $100 Pa$) to 0.02% (or $20 Pa$) by absorption on pure water. Find the height of tower required for counter current operations. Data. For consistency let us use SI units throughout. For the packing $k_{Ag,a} = 0.32 \text{ mol}/(\text{hr} \cdot \text{m}^3 \cdot Pa)$, $k_{Al,a} = 0.1/\text{hr}$. Solubility is given by Henry's law constant, $H_A = p_{Ai}/C_{Ai} = 12.5 Pa \cdot \text{m}^3/\text{mol}$
- Flow rate per unit meter squared cross section of tower $F_g/A_{cs} = 1 \times 10^5 \text{ mol}/\text{hr} \cdot \text{m}^2$ and $F_l/A_{cs} = 7 \times 10^5 \text{ mol}/\text{hr} \cdot \text{m}^2$
- Molar density of liquid remains constant though out the column, $C_T = 56000 \text{ mol}/\text{m}^3$.
- Q.9
- a) Discuss in detail catalyst preparation and selection for industrial reactions. 08
 - b) Derive rate expression for instantaneous fluid – fluid reaction. 08
- Q.10 Write note on. 18
- i. Global rate of reaction.
 - ii. Bioreactor kinetics.
 - iii. BET method.

SUBJECT CODE NO:- K-352
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E.(Chem) Examination Oct/Nov 2016
Elective-I: Biochemical Engineering
(Revised)

[Time: Three Hours]

[Max. Marks:80]

Please check whether you have got the right question paper.

- N.B
- I. Q.No.1 and Q.No.6 are compulsory.
 - II. Answer any two questions from remaining in each section.
 - III. Draw neat sketches where required.
 - IV. State clearly any assumptions made.

Section A

- | | | |
|-----|---|----|
| Q.1 | Define the following. | 10 |
| | <ol style="list-style-type: none">a) DNA.b) Enzyme inhibition.c) Biocatalyst.d) Yeast.e) Protozoan motility. | |
| Q.2 | With neat sketch explain the details of primary and secondary protein structures. | 15 |
| Q.3 | Describe the factors that influence enzyme catalyzed reactions. | 15 |
| Q.4 | Discuss giving specific examples what are the different methods of enzyme immobilisation. | 15 |
| Q.5 | Write notes on: | 15 |
| | <ol style="list-style-type: none">a) Electrophoresis.b) Michaelis menten kinetics.c) Amino acids as building block for protein. | |

Section B

- | | | |
|-----|---|----|
| Q.6 | Define the following: | 10 |
| | <ol style="list-style-type: none">a) Substrate.b) Passive diffusion.c) Orientation effect.d) Optimization.e) Isoelectric point. | |
| Q.7 | Explain with a neat sketch growth cycle phases for batch cultivation. Also explain how these phases would affect the design parameters. | 15 |

Q.8 Give the design equations of a fermenter.

15

Q.9 Explain the following:

15

- a) Antibiotics
- b) Single cell protein

Q.10 Write notes on:

15

- a) Medium formulation.
- b) Sterilization of reactors.
- c) Monod growth kinetics

SUBJECT CODE NO:- K-353
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E.(Chem) Examination Oct/Nov 2016
Elective-I: Industrial Piping
(Revised)

[Time: Three Hours]

[Max. Marks:80]

N.B

Please check whether you have got the right question paper.

- i) Solve any three questions from each section.
- ii) Question 1 & 6 are compulsory.
- iii) Solve any two questions from remaining questions in each section.
- iv) Assume suitable data wherever necessary.

Section A

- | | | |
|-----|---|--------------|
| Q.1 | Solve <u>any five</u> . | 10 |
| | <ol style="list-style-type: none">1) NPSH2) NPS3) Blind4) Anchor5) Hanger support6) Importance of color code | |
| Q.2 | <ol style="list-style-type: none">1) What are various piping diagrams? Explain any one with neat sketch.2) Draw different std. Symbols & notations & explain. |
08
07 |
| Q.3 | <ol style="list-style-type: none">1) What are different types of corrosion in process industry? Explain any two.2) Differentiate between pipe & tubing, Newtonian & Non Newtonian fluids. |
08
07 |
| Q.4 | <ol style="list-style-type: none">a) What are differential types of pressure values? Explain any one with neat sketches.b) Find the size of a pipe which has to discharge oil at a rate of $2\text{m}^3/\text{sec}$ of sp. Gravity 0.8 with velocity of 3m/s. |
07
08 |
| Q.5 | Write short note | 15 |
| | <ol style="list-style-type: none">1) Propess piping arrangement2) Equivalent pipe3) Cathode protection | |

Section B

Q.6	Solve any four	10
	<ol style="list-style-type: none"> 1) Homogenous slurries 2) Adiabatic flow 3) Insulation materials 4) Piping for compressor 5) Reactor piping 	
Q.7	<ol style="list-style-type: none"> 1) Design of pipeline in sea water. 2) Explain rheology for homogenous slurries. 	10 05
Q.8	Two sharp ended pipes of diameters 50mm and 100mm respectively. Each of length 100mm resp. Are connected in parallel between two reservoirs which have difference of level of 10m. If friction factor for each pipe is 0.32 calculate. <ol style="list-style-type: none"> 1) Rate of flow of each pipe 2) Diameter of a single pipe 100m long which would give same discharge. If it were substituted for original two pipes. 	15
Q.9	<ol style="list-style-type: none"> 1) Derive an equation to estimate optimum thickness of insulation. 2) What are various types of insulation used in process industry? 	08 07
Q.10	Write short note <ol style="list-style-type: none"> 1) Design steps for slurry pipeline 2) Fluid dynamics 	10 05

SUBJECT CODE NO:- K-354
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E.(Chem) Examination Oct/Nov 2016
Elective-I: Energy Engineering
(Revised)

[Time:Three Hours]**[Max. Marks:80]**

Please check whether you have got the right question paper.

- N.B
- Q.No.1 and Q.No.6 are compulsory.
 - Answer any two questions from the remaining questions in each section.
 - Assume suitable data, if required and draw neat sketches wherever needed.

Section A

- Q.1 Explain following terms:
- Thermodynamic energy efficiency indices. 05
 - Scope of biogas as large scale of energy source. 05
- Q.2 What are the conventional & non-conventional energy sources? Describe briefly. 15
- Q.3 Explain the socio-economic importance of biogas production. Give details of production and biological.Mechanism involved in biogas production. 15
- Q.4
- Describe in detail the design of wind machine for power generation. 08
 - Give statistical review of availability and utilization of different energy resources. 07
- Q.5 Write notes on :
- Scope of Biodiesel production in India. 15
 - Energy conservation Act-2001.
 - Solar Dryers.

Section –B

- Q.6 Explain following terms:
- Analysis of energy recovery systems. 05
 - Concept of CECF. 05
- Q.7 Discuss in detail energy conservation in fertilizer industry. 15
- Q.8 Define energy audit. What is its need? Give in detail the methodology and steps involved energy audit. 15
- Q.9 Explain in detail energy co-generation technology for paper industry. 15
- Q.10 Write note on :
- Thermal wheels as energy recovery systems. 15
 - Optimizing the input energy requirements.
 - Heat exchanger network synthesis.

SUBJECT CODE NO:- K-225
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E.(CHEM) Examination Oct/Nov 2016
Process Equipment Design & Drawing- II
(Revised)

[Time: Three Hours]

[Max. Marks:80]

Please check whether you have got the right question paper.

N.B

- i) Solve any one question from section A.
- ii) Solve any two questions from section B.
- iii) Assume suitable data, if necessary & state it clearly. Steam table & heat mass transfer data book are allowed.
- iv) Answer with neat sketches will give weightage.

Section A

- Q.1 A solution is concentrated from 10% to 15%. Solid of 1.25 kg/sec in triple effect evaporator. Steam at 393k & boiling point in third effect 325k. Feed initially at 297k, forward feed is used. What will be steam consumption, temp. in effects heat transfer area in each effect. Assume each effect is identical CP=4.18 kJ/kg⁰c over given temp range & concentration. 40
- $U_1=2.5 \text{ kw/m}^2\text{k}$
 $U_2=2.0 \text{ kw/m}^2\text{k}$
 $U_3=1.6 \text{ kw/m}^2\text{k}$
Take tube of OD=1.9cm & 2mm trick 28mm triangular pitch with length 2.6m
- Q.2 Design shell & tube heat exchanger for following 12,000 kg/hr of water at 93⁰c is to be cooled 50⁰c in a shell & tube heat exchanger. This heat is to be utilized for preheating of water from 15⁰c to 45⁰c cold water tube side & hot water shell side. Tube ID=20mm thickness 3.0mm velocity should not exceed 0.5m/s through tube, Tube length 3.2m $U=1450 \text{ w/m}^2\text{k}$ fowling resistance & metal wall resistance may be neglected. $F_t=0.86$, 20% clearance, triangular pitch =29mm, $f=0.079(N_{Re})^{-0.25}$ 40

Section B

- Q.3 Sketch & design packed bed tower. What are different factor to be considered 20
- Q.4 Give the detail design of 20
- 1) Distillation column
 - 2) DPHE
- Q.5 Explain the following in detail 20
- 1) Vessel with external coil
 - 2) Pipe sizing for liquid
 - 3) Design of overhead piping
 - 4) Entrainment & flooding
 - 5) Fluidised bed dryer

SUBJECT CODE NO:- K-256
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E.(CHEM) Examination Oct/Nov 2016
Transport Phenomena
(Revised)

[Time: Three Hours]**[Max. Marks:80]**

Please check whether you have got the right question paper.

- N.B
- i) Answer to Q. no.1 and Q. No. 6 is compulsory.
 - ii) Solve any two each from remaining in each section.
 - iii) Make suitable assumptions required.

Section A

- | | | |
|-----|--|----------|
| Q.1 | Define the following | 10 |
| | <ol style="list-style-type: none"> a) Viscosity b) Creeping flow c) Thermal conductivity d) Equation of continuity e) Fourier's law | |
| Q.2 | Derive the equation for molecular theory of the viscosity of gases at low density as $\mu = \frac{2}{3\pi} \frac{\sqrt{\pi mRT}}{\pi d^2}$ With usual notation. | 15 |
| Q.3 | <ol style="list-style-type: none"> a) The density of liquid CCl_4 at 20°C and 1 atm is 1.595 g/cm^3 and the isothermal compressibility is $90.7 \times 10^{-6} \text{ atm}^{-1}$. What is its thermal conductivity? b) with help of relevant equations explain effective thermal conductivity of composite solids | 08
07 |
| Q.4 | Derive an-equation for flow of a falling film | 15 |
| Q.5 | Write notes on: | 15 |
| | <ol style="list-style-type: none"> a) Pressure & temperature dependency of viscosity. b) Velocity distributions. c) Connective transport of energy | |

Section-B

- | | | |
|-----|---|----------------|
| Q.6 | Explain: | |
| | <ol style="list-style-type: none"> a) Momentum transport b) Fick's law c) Porous catalyst | 03
03
04 |
| Q.7 | Estimate C_{DAB} for a mixture of 80 mole% CH_4 and 20 mole% C_2H_6 at 136 atm and 313 K. at 1 atm and 293 K the molar density is $4.17 \times 10^{-5} \text{ gmole/cm}^3$ and diffusivity $0.163 \text{ cm}^2/\text{sec}$. | 15 |
| Q.8 | Heat conduction with a chemical heat source plot and derive equation for temperature profile. | 15 |

- Q.9 Estimate the viscosity of nitrogen at 50°C and 854 atm. Given $M=28 \text{ g/gmole}$ 15
 $P_c=33.5 \text{ atm}$ and $T_c=126.2\text{K}$
- Q.10 Explain & derive equations for 15
- a) Shell mass balance
 - b) Molar transport by convection.
 - c) Heat conduction with an electrical heat source.

SUBJECT CODE NO:- K-288
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E.(Chem) Examination Oct/Nov 2016
Industrial Safety and Management
(Revised)

[Time: Three Hours]

[Max. Marks:80]

- Please check whether you have got the right question paper.
- N.B
- i) Q.No.1 and Q.No.6 are compulsory.
 - ii) Answer Any two questions from remaining of each section.
 - iii) Assume suitable data, if required and draw neat sketches whenever needed.

SECTION A

- | | | |
|-----|--|----|
| Q.1 | Explain following terms (Any two) | |
| | I. Gas Cylinder Rules. | 05 |
| | II. Fire triangle. | 05 |
| | III. Process Hazards. | 05 |
| Q.2 | Discuss in detail Factories Act 1948 and Factories Rule 1963. | 15 |
| Q.3 | What is concept of Ignition? And Define 1) Ignition Energy 2) Auto ignition. | 15 |
| Q.4 | a) What are factors contributing to fire and explosion? | 08 |
| | b) Describe HAZAN in Detail. | 07 |
| Q.5 | Write short note on: | 15 |
| | I. MSIHC Rules. | |
| | II. Non Respiratory PPE. | |
| | III. Risk assessment. | |

SECTION B

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|------|---|----|
| Q.6 | Explain following terms (Any two) | |
| | I. X and Y Theory. | 05 |
| | II. Capital Intensity. | 05 |
| | III. Controlling Behaviour. | 05 |
| Q.7 | What are different theories for Motivation? Explain any two. | 15 |
| Q.8 | What is contribution of Elton and Mayo and Skinner to behaviour sciences? | 15 |
| Q.9 | What is Process Management? What are factors involved in it. | 15 |
| Q.10 | Write note on | 15 |
| | I. Job Evaluation and Merit rating. | |
| | II. Customer Involvement. | |
| | III. Goal oriented behaviour. | |