

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-214
FACULTY OF SCIENCE & TECHNOLOGY
S.E. (Chemical) (Sem-II)
Mechanical Operations
[OLD]

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

Please check whether you have got the right question paper.

N.B

1. Q.no.1 and Q.no.6 are compulsory
2. Answer any two questions from remaining of each section.
3. Draw well labeled diagram if necessary.

Section – A

- | | | |
|-----|---|----|
| Q.1 | Define the following | 10 |
| | <ul style="list-style-type: none"> a) Kicks law b) Tyler series c) Porosity d) Work index e) Closed circuit grinding | |
| Q.2 | a) Draw a diagram of jawcrusher with neat label and explain its working. | 07 |
| | b) Derive the formula $n_c = \frac{1}{2\pi} \sqrt{\frac{g}{R-r}}$ for calculating critical speed of ball mill. | 08 |
| Q.3 | a) Differentiate between closed circuit grinding and open circuit grinding. | 08 |
| | b) Calculate the operating speed of ball mill if diameter of mill is 800mm and diameter of ball is 60mm. If operating speed is 55% less than critical speed and if critical speed is 40% more than operating speed. | 07 |
| Q.4 | a) With a neat labeled diagram explain construction and working of a screw conveyor. | 08 |
| | b) What are the problems associated with handling of solids. | 07 |
| Q.5 | Write notes on | 15 |
| | <ul style="list-style-type: none"> a) Pneumatic conveying b) Smooth rolled crusher c) Standard screen | |

Section – B

- Q.6 Explain the following 10
- Frothing agent
 - Mixing index
 - Power member
 - Reverse osmosis
 - Medium Resistance
- Q.7 a) Describe the construction and working of a hydraulic jig 08
b) Give the principal and working of a mechanical jig. 07
- Q.8 a) What is the difference between constant pressure and constant rate filtration? 07
b) Derive an expression for calculating power consumption in agitating Newtonian fluid by dimensional analysis. 08
- Q.9 a) How the problem of swirling /vortexing in agitation tank can be solved 07
b) What are filter aids? Give examples. 08
- Q.10 Write short notes on 15
- Magnetic separator
 - Gravity settler
 - Cyclone separator

Total No. of Printed Pages:03

SUBJECT CODE NO:- H-143
FACULTY OF SCIENCE AND TECHNOLOGY
S.E. (Chemical) (Sem-II)
Engineering Chemistry
[Revised]

[Time: Three Hours]

[Max. Marks:80]

N.B

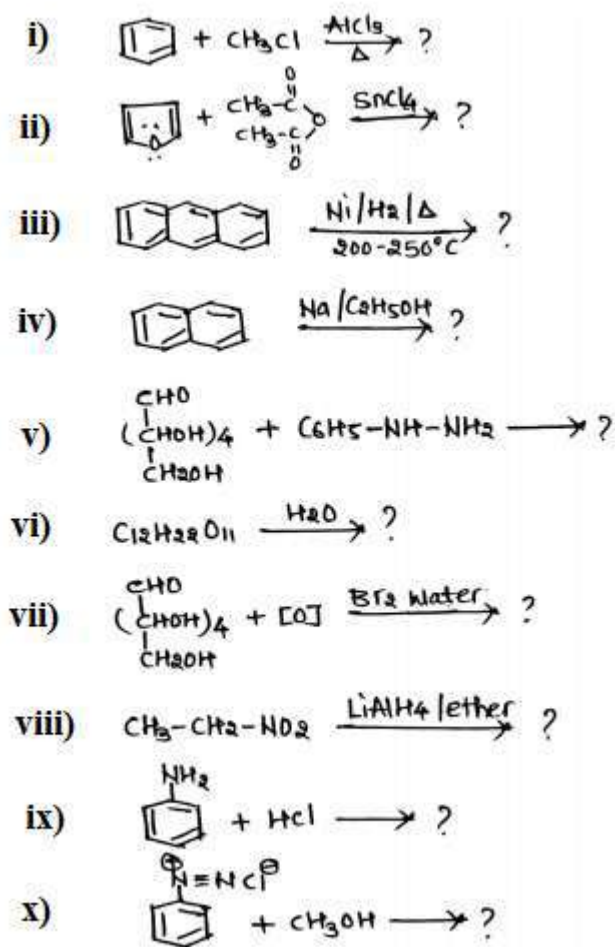
Please check whether you have got the right question paper.

- i) Question number 01 and 06 are compulsory.
 ii) Solve any two questions from remaining each section.

SECTION - A

Q.1 Predict the product (any five)

10



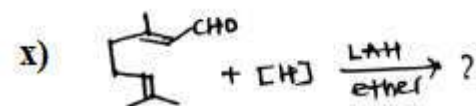
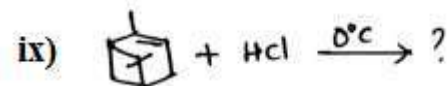
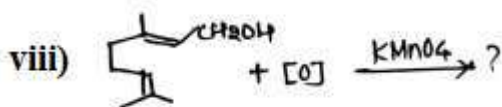
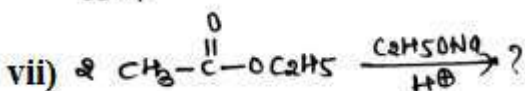
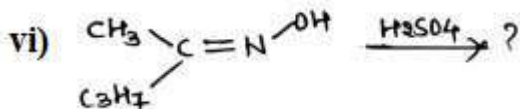
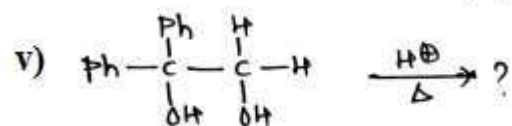
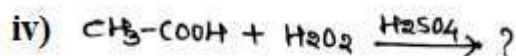
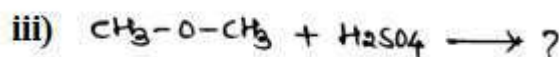
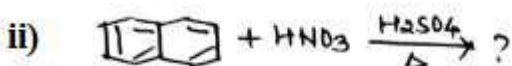
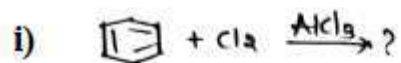
- Q.2
- a) Write any one preparation method and three chemical properties of Anthracene.
- b) Discuss any five chemical properties of furan.
- c) Explain in brief Friedlanders synthesis of quinoline.

06
 05
 04

- Q.3 a) Discuss any one preparation method and four chemical properties of glucose. 06
 b) Discuss the synthesis and mode of application of Alizarin. 05
 c) Explain general physical properties and uses of sucrose. 04
- Q.4 a) Write any one preparation method and four chemical properties of primary amines. 06
 b) How diazonium salts are made? Discuss their three chemical properties. 05
 c) Discuss any four chemical properties of Aniline. 04
- Q.5 Write a short note on (any three) 15
 i) Electrophilic substitution reactions of benzene.
 ii) Indigotin
 iii) Hinsberg method for separation of amines.
 iv) Preparation methods for secondary amines.
 v) Synthesis of thiophene from 1,4-dialdehyde and 1,4-diketone.

SECTION - B

- Q.6 Predict the product (any five) 10



- Q.7 a) How can you prepare nitrobenzene from benzene? Explain with mechanism. 06
 b) Give any five uses of Lithium Aluminium hydride. 05
 c) Write a short note on sulphonation of lauryl Alcohol. 04
- Q.8 a) How Benzil is converted into Benzilic Acid? Explain with mechanism. 08
 b) What is Knoevenagel reaction? Explain with mechanism. 07
- Q.9 a) What is isoprene rule? Give complete classification of terpenes based on number of isoprene units. 06
 b) Discuss any five chemical properties of α - pinene. 05
 c) How terpenoids are isolated from plant source using steam distillation method? 04
- Q.10 Write a short note on (any three) 15
 i) Preparation and uses of peracids.
 ii) DDT and BHC.
 iii) Claisen condensation
 iv) Chemical properties of geraneol
 v) Michael reaction

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-144
FACULTY OF SCIENCE AND TECHNOLOGY
S.E. (Chemical) (Sem-II)
Process Instrumentation & Analytical Tech.
[OLD]

[Time: Three Hours]

[Max. Marks:80]

Please check whether you have got the right question paper.

N.B

- (1) Q.1 & Q.6 are compulsory.
- (2) Solve any two from remaining in each section.
- (3) Draw neat sketches wherever required.

SECTION- A

- | | | |
|-----|--|----------|
| Q.1 | Solve any five
(1) Precision
(2) Drift
(3) Seebach effect
(4) Spectral emissivity
(5) absolute pressure
(6) Flow Nozzle. | 10 |
| Q.2 | (a) Describe liquid expansion thermometers.
(b) Describe principle, construction & working of optical pyrometer. | 07
08 |
| Q.3 | (a) Describe construction & working of McLeod gauge.
(b) Write various direct level measurement instruments. | 08
07 |
| Q.4 | (a) Write down classification of instruments.
(b) Write down various static & dynamic characteristics of Instruments. | 08
07 |
| Q.5 | Write Short Note:
(a) Inductive transducers
(b) Various temp. Scale
(c) Buoyancy methods. | 15 |

SECTION - B

- | | | |
|-----|--|----------|
| Q.6 | Solve any five:
(1) Stationary phase
(2) Thermal conductivity Detector
(3) Monochromator
(4) Saturated calomel electrode
(5) Transmittance
(6) Reference electrode | 10 |
| Q.7 | (a) Describe in detail thin layer chromatography.
(b) Write down application of Karl Fischer titrimeter. | 08
07 |

- Q.8 (a) Write down application of coulometric titration.
(b) Describe titration procedure of Amperometric titration.
- Q.9 (a) Describe in detail conductometric titration.
(b) Write down tools of analyst & preliminaries to analyst.
- Q.10 Write Short Note:
(a) Application Gas liquid chromatography
(b) Potentiometry
(c) Instrumental arrangement of coulometry

08
07
08
07
15

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-178
FACULTY OF SCIENCE AND TECHNOLOGY
S.E. (Chemical) (Sem-II)
Physical Chemistry & Thermodynamics
[Revised]

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

Please check whether you have got the right question paper.

N.B

- i) Solve any three questions from each section.
- ii) Assume suitable data wherever necessary.
- iii) Question no.1 and question no.6 are compulsory.

Section A

- | | | |
|-----|---|----------|
| Q.1 | Explain the following terms. (any five) | 10 |
| | <ol style="list-style-type: none"> 1. Emulsions 2. Heat of adsorption 3. Viscosity 4. Crystalloids 5. Galvanic cells 6. Ionic mobility 7. Quantum yield | |
| Q.2 | <ol style="list-style-type: none"> a) Explain B.E.T. theory & its equation in detail. b) Explain Debye Huckel theory of strong electrolytes by explaining relaxation effect & electrophoretic effect. | 08
07 |
| Q.3 | <ol style="list-style-type: none"> a) Explain the term surface tension by liquids drop method. b) Explain in detail about the preparation methods of colloids and its applications. | 08
07 |
| Q.4 | <ol style="list-style-type: none"> a) Explain in different laws of photochemical reactions. (all three) b) Explain the kinetics of photochemical reactions of HI molecule. | 08
07 |
| Q.5 | Write notes on the following. <ol style="list-style-type: none"> a) Photosensitized reactions b) Applications of Gels and foams c) Stark Einstein's law of photochemistry | 15 |

Section B

- | | | |
|-----|--|----------------|
| Q.6 | <ol style="list-style-type: none"> a) Distinguish between system and supporting. b) Distinguish between steady state and equilibrium. c) Distinguish between Reversible and irreversible process | 03
03
04 |
| Q.7 | <ol style="list-style-type: none"> a) How do you state mathematically the first law as thermodynamics? That can be used for solving steady-state fluid flow problems. b) What is enthalpy of a system? How it is related to the internal energy. | 10
05 |

- Q.8 a) Water is flowing in a straight horizontal insulated pipe of 25mm inner diameter. There is no device present for adding or removing energy as work. The upstream velocity is 10m/s. The water flows in a section where the diameter is suddenly increased.
- What is the change in enthalpy if the downstream diameter is 50mm?
 - What is maximum enthalpy change for a sudden enlargement in pipe?
- b) How is the standard heat of reaction is evaluated using the standard heat of formation. 07
- Q.9 a) What is the expression for the work done in an adiabatic process. in terms of the pressure ratio? 07
- b) Give the Kelvin-planck statement and clausius statement of second law of thermodynamics and show that they are equivalent. 08
- Q.10 Write notes on 15
- Entropy and irreversibility
 - Polytropic process
 - Joule's experiments

Total No. of Printed Pages:3

SUBJECT CODE NO:- H-179
FACULTY OF SCIENCE AND TECHNOLOGY
S.E. (Chemical) (Sem-II)
Strength of Materials
[OLD]

[Time: Three Hours]

[Max.Marks:80]

N.B

Please check whether you have got the right question paper.

- i) Q.No.1 from section A and Q.No.6 from section B are compulsory.
- ii) Solve any two questions from remaining questions of each section.
- iii) Assume suitable data if required & state it clearly.

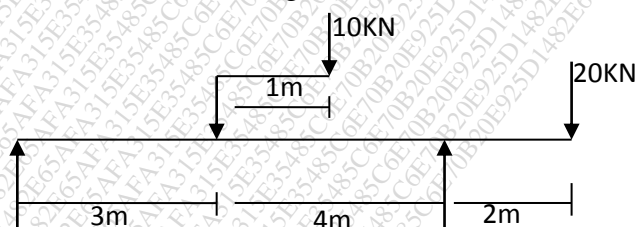
Section A

Q.1 Attempt any five. 10

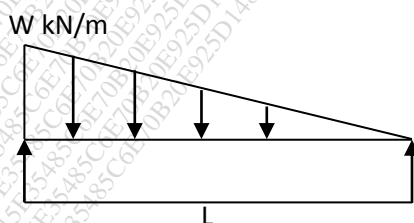
- a) Define linear strain & lateral strain.
- b) Enlist all elastic constant define any one of them.
- c) Define temperature stress.
- d) Define principle stress & strain.
- e) Define angle of obliquity.
- f) Write down relationship between SF & BM. SF & loading.
- g) Derive $S_L = \frac{PL}{\Delta E}$
- h) Draw shear stress distribution diagram for I & T section.
- i) What is pure bending?
- j) Write down flexural formula & formula to calculate shear stress. State each term included:

Q.2 a) Derive the relationship between shear force, bending moment & intensity load intensity. 05

b) Draw SFD & BMD for the figure shown. 10



Q.3 a) Draw SFD & BMD for the beam subjected to UVL. 05



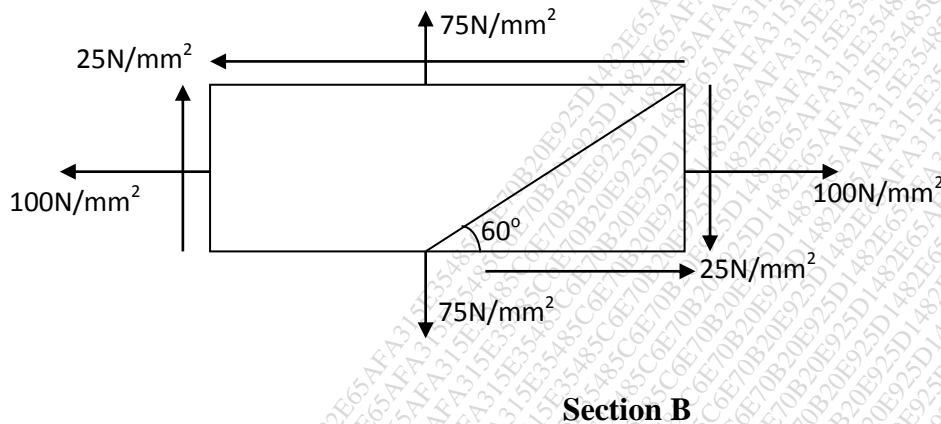
- b) Write down the assumptions made in flexural theory & derive the flexural formula. 10

Q.4

- a) Derive $\tau = \frac{S\bar{A}\bar{Y}}{Ib}$ 07
 b) Find the value of shear stress for 'T' section having flange 300mm×30mm & web 30mm×300mm. to carry a shear force of 10KN. 08

Q.5

A machine component is subjected to the stresses as shown in fig. below. Find Normal stress, shear stress, resultant stress & magnitude of maximum shear stress. 15



Q.6

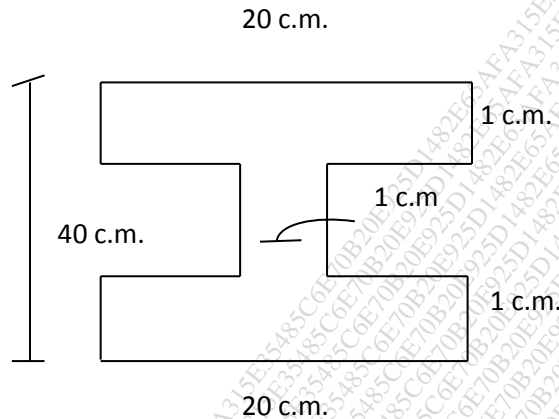
Attempt any five. 10

- Define kern' point or core of a section.
- Define proof resilience.
- Define effective length.
- What is the effect of slenderness ratio on load carrying capacity of column?
- Define polar moment of Inertia.
- Explain briefly lame's theory.
- What is limiting value of eccentricity for a rectangular section for no tension condition?
- What are the different loading conditions used to calculate strain energy?
- Define longitudinal stress & circumferential stresses.
- Define combined stresses.

Q.7

- a) Derive an expression to calculate the maximum tensile stress & minimum tensile stresses induced due to an internal pressure in a thin cylindrical shell. 10
 b) What are the assumptions made in theory of torsion? 05

- Q.8 a) Derive torsional formula. 08
 b) What are the assumptions made in Euler's formula? 05
 c) Define Hoop stresses. 02
- Q.9 Determine Euler's crippling load for I section 40c.m×20c.m×1c.m & 5m long. Which is used as a strut with one end fixed & one end hinged. Take $E = 2.1 \times 10^5 \text{ N/mm}^2$. 15



- Q.10 a) Derive Euler's formula of crippling load for a column with both end fixed. 10
 b) What are the assumptions made in torsional theory? 05

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-213
FACULTY OF SCIENCE AND TECHNOLOGY
S.E. (Chemical) (Sem-II)
Heat Transfer
[Revised]

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

Please check whether you have got the right question paper.

N.B

1. Q.no.1 and Q.no.6 are compulsory
2. Solve any two from remaining in each section.
3. Assume suitable data wherever required.

Section – A

- | | | |
|-----|--|----|
| Q.1 | Solve any five | 10 |
| | 1) Thermal conductivity
2) Semi-infinite solid
3) Film Heat transfer coefficient
4) Optimum thickness
5) Stanton number
6) Energy thickness | |
| Q.2 | a) Describe in detail mode of heat transfer. | 07 |
| | b) Derive exp. For temperature distribution under steady state heat conduction for plane wall. | 08 |
| Q.3 | a) Explain term Augmentation techniques. | 07 |
| | b) Explain efficiency of fin & effectiveness of fin | 08 |
| Q.4 | a) Derive momentum & energy equations for laminar free convection Heat transfer on a vertical flat plate | 10 |
| | b) Describe Colburn equation | 05 |
| Q.5 | a) An exterior wall of a house may be approximated by a 0.1m layer of common brick ($K=0.7 \text{ W/m}^0\text{c}$) followed by a 0.1m layer of gypsum plaster ($K=0.48 \text{ W/m}^0\text{c}$) what thickness of loosely packed rock wool insulation ($K=0.065 \text{ W/m}^0\text{c}$) should be added to reduce the heat loss or gain through wall by 80% . | 08 |
| | b) It is required to heat oil to about 300^0c for frying purpose. A ladle is used in the frying the section of the handle is 5mm X 18mm surrounding are at 30^0c the conductivity of the material is $205 \text{ W/m}^0\text{c}$ if the temperature at a distance of 380mm from the oil should not reach 40^0c determine convective heat transfer coefficient | 07 |

Section – B

- Q.6 Solve any five 10
- 1) Boiling
 - 2) Burnout point
 - 3) Kirchoff's law
 - 4) Opaque body
 - 5) LMTD
 - 6) Heat pipe
- Q.7 a) Write down Reynolds analogy between heat & momentum transfer. 07
- b) Explain briefly condensation mechanism 08
- Q.8 a) Describe Absorptivity Reflectivity and transmissivity. 08
- b) Explain radiation heat exchange between non-black surfaces. 07
- Q.9 a) With neat sketch explain working of shell & tube heat exchanger. 08
- b) Explain heat transfer in evaporations single & multiple effects 07
- Q.10 Water is boiled at the rate of 25 hg/n in a polished copper pan 280 mm in diameter at atmospheric pressure assuming nucleate boiling conditions calculate temperature of the bottom surface of pan 15
- Data properties of water at atm. Pressure
- $t_{\text{sat}} = 100^{\circ}\text{C}$, $\rho_l = 958.4 \text{ kg/m}^3$
- $\rho_v = 0.5955 \text{ kg/m}^3$, $C_{pl} = 4220 \text{ J/KgK}$
- $\mu_l = 279 \times 10^{-6}$
- $Pr_l = 1.75$, $h_{fg} = 2257 \text{ KJ/Kg}$
- $\sigma = 58.9 \times 10^{-3} \text{ N/m}$: $n = 1$ (for water)

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-334
FACULTY OF SCIENCE AND TECHNOLOGY
S.E. (Chemical) (Sem-I)
Fluid Mechanics
[OLD]

[Time: Three Hours]

[Max. Marks:80]

Please check whether you have got the right question paper.

N.B.:

- i. Q. No. 01 and 06 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 | Define: | 10 |
| | <ol style="list-style-type: none"> a) Density. b) Dynamic viscosity. c) Kinematic viscosity. d) Fluid. e) Pressure. | |
| Q.2 | <ol style="list-style-type: none"> a) State and explain Pascal's law. b) Write short note on friction factor chart. | 07
08 |
| Q.3 | <ol style="list-style-type: none"> a) an open tank contain water up to a depth of 3 m and above it an oil of specific gravity 0.8 for a depth of 1.5 m. find the pressure intensity at the surface of the two liquids and at the bottom. b) Derive an expression for hydrostatic equilibrium in a centrifugal field. | 08
07 |
| Q.4 | <ol style="list-style-type: none"> a) Write note on turbulence. b) State and explain Newton's law of viscosity. What is effect of temperature on viscosity of gas? | 07
08 |
| Q.5 | Write short note on: <ol style="list-style-type: none"> a) Boundary layer formation. b) Kinetic energy correction factor. c) Application of Bernoulli's equation. | 05
05
05 |

SECTION B

- | | | |
|-----|--|----------------|
| Q.6 | Explain following terms: <ol style="list-style-type: none"> a) Skin friction and form friction. b) What is mean by roughness and roughness parameter? c) Mach Number. | 04
04
02 |
| Q.7 | With neat sketch explain principal, working and application of centrifugal pump. | 15 |
| Q.8 | <ol style="list-style-type: none"> a) Compare the merits and demerits of orifice and venture meter for the case of fluid flow measurements. | 05
10 |

- b) at sudden enlargement of a water main from 240 mm to 480 mm diameter, the hydraulic gradient rises by 10 mm. estimate the rate of flow.

Q.9 With a neat sketch explain the process of fluidization and types of fluidization.

15

Q.10 Write short note on

- Stagnation pressure.
- Flow through beds of solids.
- Stagnation point.

05

05

05

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-335
FACULTY OF SCIENCE AND TECHNOLOGY
S.E(CHEMICAL) (Sem-I)
Fluid Mechanics
[Revised]

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

N.B

1. Q.no.1 and 06 are compulsory.
2. Answer any two questions from remaining of each section.
3. Assume suitable data, if required and draw neat sketches whenever needed.

Section -A

- | | | |
|-----|---|----|
| Q.1 | a) State and explain Newton's law of viscosity. | 03 |
| | b) What are the properties of manometric fluid? | 03 |
| | c) Distinguish between Newtonian and non Newtonian fluids. | 04 |
| Q.2 | a) State and explain hydrostatic law. | 07 |
| | b) Write short note on friction factor chart. | 08 |
| Q.3 | a) A pipeline carrying oil of specific gravity 0.87 changes in diameter from 200mm diameter at position A to 500 mm diameter at position B which is 4 meter at higher level if the pressure at A and B are 9.81 N/cm ² and 5.886N/cm ² respectively and discharge is 200 lit/sec. determine loss of head. | 08 |
| | b) The diameter of pipe at section 1 and 2 are 10 cm and 15cm respectively. Find the discharge through the pipe if the velocity of water through the pipe at section 1 is 5m/s Determine velocity at section 2. | 07 |
| Q.4 | a) Distinguish between Laminar and Turbulent flow. | 07 |
| | b) With neat sketch explain simple u- tube manometer | 08 |
| Q.5 | Write short note on | |
| | a) Boundary layer separation and wake formation | 08 |
| | b) Effect of temperature on viscosity of gases and liquid | 07 |

Section – B

- Q.6 Explain following terms:
- i) Cavitation and NPSH 04
 - ii) Drag and Drag coefficient 04
 - iii) Mach Number 02
- Q.7 Derive the Ergun equation from fundamental. 15
- Q.8 a) Derive Darcy- Weisbach equation for frictional head loss. Find the head loss due to friction in pipe of diameter 300mm and length 50m through which water is flowing at a velocity of 3m/s using Darcy-Weisbach equation. 10
- b) With neat sketch explain Pitot tube. 05
- Q.9 With a neat sketch explain the process of fluidization. State any two applications in detail. 15
- Q.10 With neat sketch explain the working of :
- a) Centrifugal pump. 08
 - b) Piston pump. 07

Total No. of Printed Pages:02

SUBJECT CODE NO:- H-403
FACULTY OF SCIENCE AND TECHNOLOGY
S.E. (Chemical) (Sem-I)
Physical Chemistry & Thermodynamics
[OLD]

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

- N.B Please check whether you have got the right question paper.
- i) Question No. 1 & 6 is compulsory.
 - ii) Solve any two questions from remaining of each section.
 - iii) Assume suitable data if necessary.

SECTION – A

- | | | |
|-----|---|----|
| Q.1 | Explain the following terms. | 10 |
| | <ol style="list-style-type: none"> a) Electrode potential b) Dipole movement c) Gels d) Ionic mobility e) Quantum efficiency | |
| Q.2 | State and explain in detail. | 15 |
| | <ol style="list-style-type: none"> a) Lambert's law b) Bear's law c) Stark Einstein law | |
| Q.3 | a) Explain Debye Huckel Theory. | 07 |
| | b) Derive and explain B.E.T. equation. | 08 |
| Q.4 | a) Explain any two preparation methods of colloidal solution. | 08 |
| | b) Write note on photosensitized reaction. | 07 |
| Q.5 | Write note on:- | 15 |
| | <ol style="list-style-type: none"> a) Heat of absorption b) Langmuir adsorption isotherm. c) Ionization by radiation | |

SECTION – B

- | | | |
|-----|--|----|
| Q.6 | Answer the following terms. | 10 |
| | <ol style="list-style-type: none"> a) Enthalpy as a state function b) Thermodynamic system c) Isobaric process d) Isolated system. e) Point function in thermodynamics. | |

- Q.7 a) 'A reversible process is never attained in practice. It can only be approached'. What are the factor that make thin statement true? 07
- b) A system consisting of some fluid is stirred in a tank. The rate of work done on the system by the stirrer is 2.25 hp. The heat generated due to stirring is dissipated to the surroundings. If the heat transferred to the surrounding is 3400 kg/h, determine the change in internal energy. 08
- Q.8 a) What is the change in internal energy in a cyclic process? What is it in a static non – flow process? 07
- b) What is the expression for the work done in an adiabatic process in terms of the pressure ratio. 08
- Q.9 a) Prove that a carnot engine has the maximum efficiency and that the efficiency is independent of the working fluid. 07
- b) If the standard heat of reaction at are temperature is known, how would you evaluate the standard heat of reaction at any other temperature. 08
- Q.10 Write note on 15
- a) PVT behavior of pure fluids.
- b) Third law of thermodynamics
- c) Lost work

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-404
FACULTY OF SCIENCE AND TECHNOLOGY
S.E. (Chemical) (Sem-I)
Mechanical Operation
[Revised]

[Time: Three Hours]

[Max.Marks: 80]

- N.B Please check whether you have got the right question paper.
- i) Q. no.1 and Q. no.6 are compulsory.
 - ii) Solve any two questions from remaining of each section.
 - iii) Draw well labeled diagram.

SECTION – A

- Q.1 Explain the following
- a) Mesh No 03
 - b) Kicks law 03
 - c) Open circuit operation 04
- Q.2
- a) Derive the formula $n_c = \frac{1}{2\pi} \sqrt{\frac{g}{R-r}}$ for calculating critical speed of ball mill. 08
 - b) What are the factors which affect size reduction of raw material in a ball mill? Explain. 07
- Q.3 Explain any four separation equipments which work on the principal of surface properties of particle. 15
- Q.4 Explain the construction and working of following size reduction equipment 15
- a) Jumbling Mill
 - b) Jaw crusher
- Q.5 Write notes on: 15
- a) Screen motions
 - b) Necessity of size reduction
 - c) Problem associated with handling of solids

SECTION – B

- Q.6 Explain the following:
- a) Filter Media 03
 - b) Jigging 03
 - c) Filtration 04
- Q.7 Discuss basic principle involved in separation of ore by forth flotation method. What is the role of collectors, frothers and modifiers? 15
- Q.8
- a) What are preventive measures for reducing swirling in agitated tanks? 08
 - b) What are different types of impeller commonly used for agitation of liquids. 07

- Q.9 a) What is the importance of mixing in industrial operations.
b) What is the principle and working of centrifugal separation?

08

07

Q.10 Write notes on:

15

- a) Muller Mixer
b) Cyclone separator
c) Paramagnetic material

Total No. of Printed Pages:02

SUBJECT CODE NO:- H-441
FACULTY OF SCIENCE AND TECHNOLOGY
S.E. (Chemical) (Sem-I)
Chemical Process Calculations
[OLD]

[Time: Three Hours]

[Max.Marks: 80]

Please check whether you have got the right question paper.

- N.B
- i. Q.1 & 6 are compulsory.
 - ii. Solve any two questions from remaining question in each section.
 - iii. Assume suitable data wherever required.
- Q.1 Solve any five 10
- 1) Dew point
 - 2) Kopp's rule
 - 3) Bypass operation
 - 4) Limiting reactants
 - 5) Phase rule
 - 6) Amagat's Law
- Q.2 05
- 1) Calculate the equivalent weights of KMnO_4
 - 2) Sodium chloride weighing 200 kg is mixed with 600 Kg potassium chloride. Calculate composition of the mixture in weight 1 & mole 1. 10
- Q.3 05
- a) Write down application of psychrometric chart.
 - b) The dry bulb temperature & dew point of ambient air were found to be 303K & 289 K resp. calculate a) absolute molar humidity b) absolute humidity c) 1. RH d) 1 saturation Data. 10
- Vapour pressure of water at 289 K = 1.818 KPG
 Vapour pressure of water at 303 K = 4.243 KPG
 Barometric pressure = 100KPG
- Q.4 07
- a) 2000 Kg of wet solids containing to % solids by weight are fed to tray dryer where it is dried by hot air the product finally obtained is found to contain 1.1 Moisture by weight. Calculate 1) kg of water removed from wet solids 2) kg of product obtained. 10
 - b) Ethylene oxide is produced by oxidation of ethylene. 100 Kmol of ethylene are fed to reactor & product is found to contain. 80 Kmol ethylene oxide & 10 Kmol CO_2 Calculate 08
- 1) % conversion of ethylene
 - 2) % yield of ethylene oxide

- Q.5 Write shorts notes 15
- % Excess
 - Stoichiometric relation
 - Humid volume

Section B

- Q.6 Solve any five 10
- Heat of formation
 - Heat of Neutralization
 - NCV
 - Theoretical air
 - Kinetic energy
 - Law of conservation of energy

- Q.7 a) The GHV of gaseous n-butane is 2877. 40 KJ /mol at 298K calculate its Net heating value in KJ/mol & KJ/kg Latent heat of water vapour At 298 K= 2442.5 KJ/kg 07

- b) The orsat analysis of the flue gas from boiler house chimney by volume is as given below 08
- CO₂ – 11.4 %, O₂ – 4.2 %, & N₂ – 84.4 %
- Assuming complete combustion takes place
- Calculate % excess air
 - Find C:H ration in the fual

- Q.8 a) Explain Effect of temperature on Heat of reaction 07
- b) Methane gas is heated from 303 K to 523 K at atmospheric pressure. Calculate heat added per kmol methane using c_p^o data given below $c_p^o = a + bT + cT^2 + dT^3$ 08
- KJ/kmol k

Gas	a	b×103	c×106	d×109
Methane	19.24	52.11	11.973	-11.3173

- Q.9 a) Calculate the std. heat of formation of n-propanol liquid using the following data. 10
- Std. heat of formation of 102195=-393.51 KJ/mol std. Heat of formation of H₂O(l)= -285.83 KJ/mol. Std. heat of combustion of n-propanol liquid = -2028.19 KJ/mol

- b) Describe unsteady material Balance & energy balances & its applications 05

- Q.10 Write short note 15
- Heat of combustion
 - Heating values of fuels
 - Temperature of reaction

Total No. of Printed Pages:3

SUBJECT CODE NO:- H-442
FACULTY OF SCIENCE AND TECHNOLOGY
S.E. (Chemical) (Sem-I)
Chemical Process Calculations
[Revised]

[Time: Three Hours]

[Max.Marks:80]

N.B

Please check whether you have got the right question paper.

- i) Q.1 & 6 are compulsory.
- ii) Solve any two from remaining in each section.
- iii) Assume suitable data wherever required.

Section A

- | | | |
|-----|--|---------------------|
| Q.1 | Solve any five. | 10 |
| | <ol style="list-style-type: none"> 1) Molarity 2) System of units 3) Limiting reactants 4) Yield 5) Absolute humidity 6) Heat of fusion | |
| Q.2 | <ol style="list-style-type: none"> a) The cone of an aqueous solution of acetic acid is specified as 30% on weight basis. Find the molality of solution. b) A natural gas has following composition by volume $\text{CH}_4 = 82\%$, $\text{C}_2\text{H}_6 = 12\%$, $\text{N}_2 = 6\%$. Calculate the density of gas at 288k & 101.325 KPa and composition in weight percent. | <p>05</p> <p>10</p> |
| Q.3 | <ol style="list-style-type: none"> a) An evaporator system conc. a weak liquor from 5% to 50% solids handles 100kg of solids per hour. If same system is to concentrate a weak liquor from 4% to 35%. Find the capacity of system in terms of solids that can be handled per hour. Assuming water evaporation capacity to be same in both the cases. b) Discuss bypass operation in detail. | <p>10</p> <p>05</p> |
| Q.4 | <ol style="list-style-type: none"> a) The dry bulb temp. dew point of ambient air were found to be 302k & 291k resp. Barometer reads 100KPa Calculate <ol style="list-style-type: none"> 1. Absolute molal humidity 2. Absolute humidity 3. % RH 4. % saturation 5. The Humid heat 6. Humid volume <p>Data – Vapour pressure of water at 291K = 2.0624 KPa
 Vapour pressure of water at 302K = 4.004 KPa.</p> b) Explain Kopp's rule. | <p>10</p> <p>05</p> |

Q.5 Write short note

- Laws of Dalton
- Vaporization & consideration
- Excess reactants

15

Section B

Q.6 Solve any five.

- Heat of reaction
- Neutralization
- NCV
- Excess air
- Latent heat
- Adiabatic process

10

Q.7 a) The ultimate analysis of coal sample is as given below: carbon = 61.5%, H₂ = 3.5%, S = 0.4%, ash = 14.2, Nitrogen = 1.8% & rest oxygen calculate

- Theoretical O₂ requirement per unit weight of coal
- Theoretical dry air requirement per unit at of coal
- Orsat analysis of flue gases when coal is burned with 90% excess air

10

b) The GHV of gaseous propane at 298K is 2219.71 kJ/mol. Calculate its neat heating value (NHV)

05

Q.8 a) A stream containing 10% CH₄ & 90% air by volume is to be heated from 373K to 573K at a rate of 0.05m³ NTP per second. Calculate the heat required to be added using meal molal heat capacity data given below.

08

Gas	C _{pm} (373-298k)	C _{pm} ^o (573-298k)
CH ₄	37.5974	43.0821
Air	29.2908	29.6132

b) Calculate the heat must be removed in cooling 32kg of oxygen from 488 k to 313k using cp data.

07

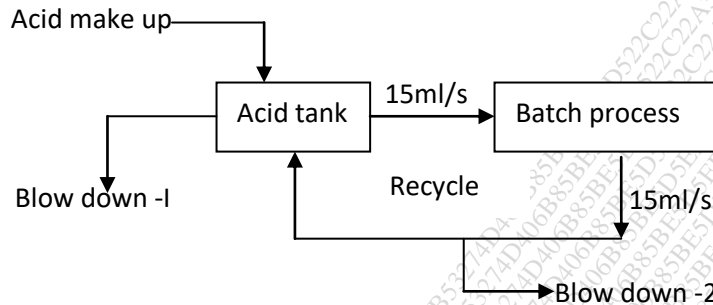
$$C_p = a + bt + ct^2 + dt^3 \text{ kJ/kmol K.}$$

Gas	a	b×10 ³	c×10 ⁶	d×10 ⁹
O ₂	26.057	11.7551	-2.34	-0.5623

Q.9 a) In a batch process, the reaction takes place in the presence of acid medium. The process is shown acid is drained at rate of 15ml/S from reaction vessel as result of density difference of acid from reacting component, so as to avoid wastage of acid, it is recycled to an acid tank having capacity of 1000l. The acid is drained from the reaction vessel picks up 50 g/l of the solids from reactor. Acid is fed once again to the process from acid tank. When batch is started acid in the tank is almost pure as a result of filtration as the reaction

15

proceeds acid in the tank becomes more & more contaminated with the solids from process
 pt of view conc. of solids should not exceed 100mg/l. the batch time is 15h. check
 concentration of the solids will exceed 100g/l during the batch reaction.



Q.10 Write short note

- 1) Temperature of reaction
- 2) Air requirement
- 3) Hess law

15