KOE038

(Following Roll No. to be filled by candidate)

Roll No. | | | | | | | | | | |

B TECH
THIRD SEMESTER EXAMINATION 2020-2021
KOE038
ELECTRONICS ENGINEERING

Time: 2 Hours

Max. Marks: 100

Note:

- Attempt all questions.
- All questions are equal marks.
- All symbols have usual meaning.

1. **Attempt any four parts of the followings:** **[4x5] CO1**

a. Draw the structure of p-n junction diode & explain briefly.
b. Differentiate the conductors, insulators and semiconductors.
c. What is knee or cut-in voltage of a diode? Also write its significance.
d. Explain the different resistances of p-n junction diode.
e. What is the significance of PIV or PRV?
f. Explain the working of zener diode.

2. **Attempt any four parts of the followings:** **[4x5] CO2**

a. Determine the level of Vo for each network of Figure 1.

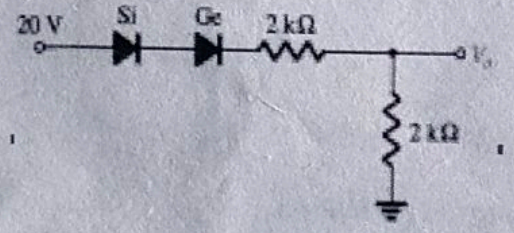

Figure 1

b. Draw the circuit of full wave bridge rectifier and explain the working.
c. Determine v_o for network of Figure 2 for the input shown.

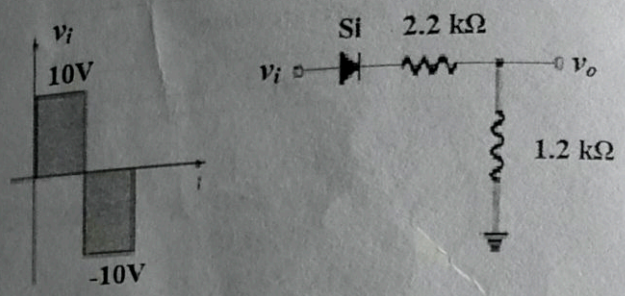

Figure 2

d. What is voltage doubler? Explain any one type.

e. Determine V_L, I_L, I_Z, and I_R for the network Figure 3 if $R_L = 180\ \Omega$.

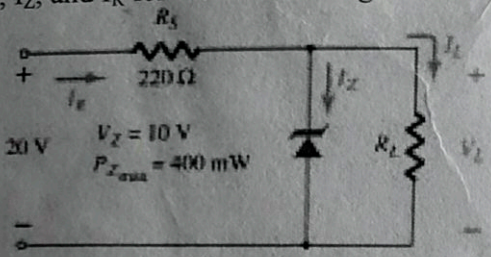

Figure 3

f. Sketch v_o for each network of Figure 4 for the input shown.

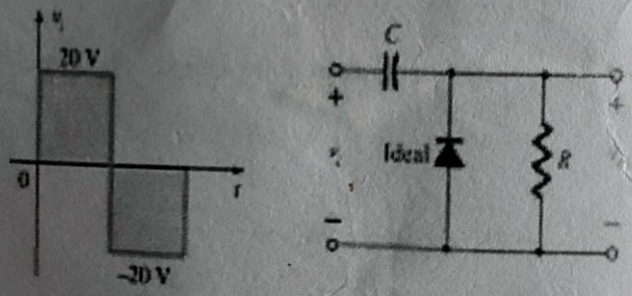

Figure 4

3. **Attempt any two parts of the followings:** [2x10] *CO3*

a. What are α and β? Derive the relation between alpha and beta?
Given the information provided in Figure 5, determine:
(a) R_C (b) R_E (c) R_B (d) V_{CE} (e) V_B

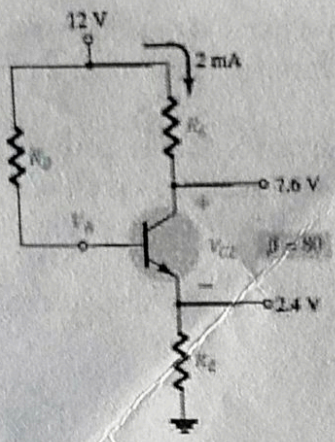

Figure 5

b. Draw and explain the characteristics of BJT common base configuration. Also define the stability factors.

c. Attempt any two:

i. Draw and explain construction and working of n-channel JFET.

ii. Draw and explain construction and working of p-channel depletion type MOFET.

iii. Draw the transfer characteristic of n-channel JFET and enhancement type MOSFET.

4. Attempt any two parts of the followings: [2x10] CO4

a. What is operational amplifier? Also derive the expression for inverting and non inverting amplifier.

b. What is unity follower? Calculate the output voltage for the circuit of Figure 6.

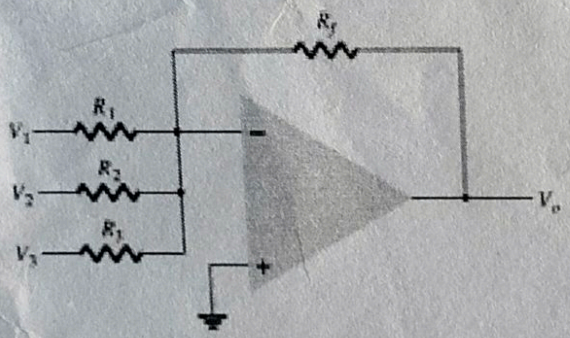

Figure 6

c. Define the CMRR. Also draw the Integrator circuit and als mathematical expression.

an

y in the tank

of the fluid?

by volumetric percent:-

5

15

10

5. **Attempt any two parts of the followings:** *[2x10] CO5*

a. Draw the functional block diagram of multimeter. Also explain the working.

b. Draw the diagram of CRT and explain the function of each part.

c. What are the general specifications of Digital Multimeter. Write advantages and disadvantages of digital voltmeter.

OR

Explain the procedure for the measurement of electrical quantities with a CRO.

5.

a. What ...
Given the in...
(a) R_C (b) ...

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B. TECH.
THIRD SEMESTER THEORY EXAMINATION, 2021-22
KCH-301
MATERIAL AND ENERGY BALANCE

Time: 03 Hours **Max. Marks: 100**

Note:

- Attempt all questions. All questions carry equal marks.
- Stare clearly your assumptions, if any
- Atomic Weights: C=12, H=1, N=14, Na=23, Fe=56, S=32, Ca=40, Mg=24, O=16.

1. Attempt any ***FOUR*** parts of the following: 4×5

a. i) The heat transfer coefficient in a heat exchanger is 1000 kcal/(hr)(m^2)(°c) Convert this value to Btu./(hr)(ft^2) °F.

ii) What do you understand by fundamental quantities and derived quantities?

b. Draw P-V-T diagram of a pure fluid and write any two equation of state for real fluids.

c. A solution, caustic soda in water contains 50% NaOH by weight at 90°C. The density of the solution is 1.1 kg/litter. Find the molarity and normality of the solution.

d. Calculate the total pressure exerted by the vapors which are in contact with a solution at 100°C containing 40% Benzene, 25 % toluene and 35% O-xylene by weight. Vapor pressures at 100°C are:
Benzene = 1340 mm Hg, Toluene = 560 mm Hg,
O-xylene = 210 mm Hg

e. Consider a half filled spherical storage tank with 12500 kg of an organic liquid at 7000 k Pa. If the total internal energy in the tank is 5.3×106 kJ. Calculate specific enthalpy of the fluid?

f. A natural gas has following composition by volumetric percent:-

Methane, CH_4	75
Ethane, C_2H_6	15
Nitrogen, N_2	10

Calculate: (i) Composition in mol percent, (ii) Composition in weight percent, (iii) Average molecular weight, (iv) Density at standard conditions as kg/m^3.

2. Attempt any ***TWO*** parts of the following: 2×10

a. Make a Psychometric chart for air-acetone system at 101.325 KPa. With the following curves:

I. Saturated absolute humidity v/s dry bulb temperature.
II. 50% relative saturation v/s dry-bulb temperature.
III. Dry volume v/s dry-bulb temperature.
IV. Humid heat v/s absolute humidity.

Data:

Specific heat, kJ/kg K	Air	Acetone vapors
	1	1.5

Vapor pressure(V.P.) of acetone:

Temp.	°C	10	20	30	40	50	60	70	80
V.P.	mm Hg	115.6	179.6	281	420	620.9	760	860.5	1200.5

b. Define and derive appropriate expression for:

(i) Percentage humidity and relative humidity
(ii) Humid volume and saturated volume
(iii) Dry volume and Dew point temperature
(iv) Adiabatic saturation temperature and Enthalpy.

c. In a process in which benzene is used as a solvent, it is evaporated into dry nitrogen. At 24 ℃ and 1 bar, the resulting mixture has a percentage relative humidity of 60. It is required to recover 80% of benzene present by cooling to 10 ℃ and compressing to a suitable pressure. What should this pressure be? Vapor pressure of benzene at 24℃ and 10℃ are 12.2 and 6.0 KN/m^2.

3. Attempt any ***TWO*** parts of the following: 2×10

a. (i) Explain the use of by-pass, recycle and purge streams in chemical processes.
(ii) a catalytic reactor is used to produce formaldehyde from methanol by the reaction

$$CH_3OH \longrightarrow HCHO + H_2$$

A single-pass conversion of 70% is achieved in the reactor. The methanol in the reactor product is separated from the formaldehyde and hydrogen in a multi unit process. The recovered methanol is recycled to the reactor. Calculate the required feed rate of methanol in K mol/hr for 600 kg/hr of formaldehyde produced.

b. Analysis of limestone gives 60 % $CaCO_3$, 33.5% $MgCO_3$, and rest inserts. It is treated with 12% aqueous H_2SO_4 to obtain pure CO_2. An excess of 15% the acid over stoichiometric amount is used to ascertain that the reaction goes to completion. Based on the treatment of 500 kg limestone, calculate-

(i) The amount of 100% H_2SO_4 required, (ii) The amount of the residue left, (iii) The K mol of CO_2 produced.

c. (i) The packed gas liquid contactor employs ceramic Intalox saddles (38mm). The gas flow rate, G= 1.5 kg/sec and gas density, ρ_G =1.5 kg/ m^3. The liquid flow rate, L=30 kg/sec and the liquid density ρ_L = 1000 Kg/m^3 .The absorption column is to be designed for a pressure drop of 42 mm H_2o.

$$K = 13.1\, G^2_W F_P (\mu_L / \rho_L)^{0.1} / \rho_G (\rho_L - \rho_G),$$ where

K = flow coefficient, μ_L = liquid viscosity=10^{-3} NS/ m^2,

G_W = gas flow rate per unit cross sectional area,

F_P= packing factor= 170m^{-1}, $m = L/G (\rho_G / \rho_L)^{0.5}$

K is given by equation K= 0.62-0.5 (m-0.5)

Calculate of diameter of contactor.

(ii) Distillation column receives two feeds: (i) 150 k mol/h, 70% liquid and 30% vapor, with 45 mole% methanol on the average; (ii)100 k mol/h, saturated liquid, with 20 mole% methanol. The top product must have a purity of 95 mole% and the bottoms must not have more than 4 mole% of the alcohol. A liquid side stream having 65 mole% methanol is to be withdrawn at a rate of 35 k mol/h. The reflux is returned to the top tray as a saturated liquid at a reflux ratio of 2.0. Calculate the amount of bottom (in k mol/ h)

4. Attempt any ***FOUR*** parts of the following: 4×5

a. Explain the vapor pressure curve for water and what do you understand by 'triple point' and 'critical point'.

b. Explain the phenomena of degree of freedom and what kinds of constrains (equation) are involved in the analysis of degree of freedom.

c. Explain the steps for solving the unsteady state material balance

problem.

d What do you understand by fundamental quantities and derived quantities?

e What do you understand by 'Excess reactant' and 'Limiting reactant' with suitable examples?

f Explain (i) Effect of temperature on heat of formation,
(ii) Effect of temperature on heat of reaction.

5. Attempt any ***ONE*** parts of the following: 1×20

a. i). Discuss the method of estimation of heat of the reaction from heats of combustion and formation data.

(ii). Flue gases leaving the boiler stack at 523 K have the following composition: CO_2-11.31%, H_2O = 13.04%, O_2 = 2.17% and N_2 = 73.48% by volume. Calculate the heat lost in 1 K mole of gas mixture above 298 K usingthe heat capacity (kJ/(kmol.K) data given as :

Gas	a	$b\times10^{-3}$	$c\times10^{6}$	$d\times10^{9}$
CO_2	21.3655	64.2841	-41.0506	9.7999
H_2O	32.4921	0.0796	13.2107	-4.5474
O_2	26.0257	11.7551	-2.3426	-0.5323
N_2	29.5909	-5.141	13.1829	-4.968

b. i) Explain Hess's law of constant heat summation and explain standard heat of combustion, formation, reaction, and neutralization.

(ii) Hydrogen gas is burned in an adiabatic reactor wit 2 times the theoretical quantity of air, both at 298 K initially. What will be temperature of reaction product? The standard heat of formation of gaseous water is -241826 KJ/ mole. The heat capacities of gaseous are given below:

Water vapor: $30.474+9.652\times10^{-3}\ T+1.189\times10^{-6}\ T^2$

Nitrogen: $27.034+5.815\times10^{-3}\ T-0.2889\times10^{-6}T^2$

Oxygen: $25.11+13.260\times10^{-3}\ T-4.2077\times10^{-6}T^2$

Total Number of Printed Pages: 03

KCH-302

(Roll No. to be filled by candidate)

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B. TECH.
THIRD SEMESTER THEORY EXAMINATION, 2021-22
KCH-302
CHEMICAL ENGINEERING FLUID MECHANICS

Time: 03 Hours **Max. Marks: 100**

Note:

- Attempt all questions.
- All questions carry equal marks.

1. Attempt any ***FOUR*** parts of the following: 4×5
   a. Define the terms Kinematic Viscosity, apparent viscosity and explain graphically the nature of dilatent fluid, pseudoplastic fluid, Bingham fluid, Newtonion and non Newtonion fluid
   b. A gauge on the suction side of the pump shows a negative pressure of 0.285 bar. Express this pressure in terms of (a) Pressure intensity KPa (b) N/m^2 absolute (c) m of water gauge (d) m of oil having specific gravity 0.85 and cm of mercury gauge.
   c. Two square flat plates with each side 70cm are spaced 10 mm apart . The lower plate is stationary and the upper plate requires a force of 120 N to keep it moving with a velocity of 3 m/s. The oil film (with specific gravity 0.90) between the plates has the same velocity as that of plates at the surface of contact. Assuming linear velocity distribution determine the dynamic Viscosity of oil in poise.
   d. Define Surface Tension ? Prove that the relationship between surface tension and pressure inside droplet of the fluid in excess of outside pressure
   e. Derive the equation for force on inclined submerged plane surface with suitable notations ?

f. How pressure can be expressed in terms of height of liquid column? Explain with suitable example

2. Attempt any ***FOUR*** parts of the following: 4×5

a. Derive continuity equation in Cartesian coordinates for two dimensional and one dimensional flow?

b. What is stream function ? If the expression of stream function is described by $\varphi = x^3 - 3xy^3$, Determine whether the flow is rotational or irrotational.

c. Write dimensionless numbers used in fluid flow operation along with its significance ?

d. A pipe PQ branches into pipes R and S. The pipe has diameter of 45 cm at P , 35 cm at Q , 25 cm at Rand 20 cm at S. Determine the velocities at Q and S , if the velocity at R is 5 m/s ? P – 2.5m/

e. Discuss in brief about rotational and irrotational flow ?

3. Attempt any ***TWO*** parts of the following: 2×10

a. Prove Euler's equation of motion and hence derive Bernoulli' s equation of motion for steady irrotational flow of fluid.

b. Write short note on Model and Prototype with suitable examples?

c. With neat Sketch explain the different types of pipe fittings used in networking of pipes in Chemical Industries. What are major and minor losses in pipe flow?

d. Derive the equation for drag force by applying Buckingham Π theorem ?

4. Attempt any ***TWO*** parts of the following: 2×10

a. Prove the derivation for Velocity distribution under laminar flow of fluid flowing through pipe?

b. Prove the correlation of pressure drop though pipe with considering friction factor?

c. Water flows over a rectangular weir 1 m at a depth of 15 cm and afterwards passess through triangular right angled weir. Find the depth of water through the triangular weir. Discharge coefficient for the rectangular and triangular weirs are 0.62 and 0.59 respectively?

d. Discuss with neat sketch construction and working principle of Rotameter? Derive its expression for flow of fluid through pipe.

5. Attempt any ***TWO*** parts of the following: 2×10

a. Explain the principle and working of centrifugal pump with suitable figures and mathematical expressions.

b. Give classification of pumps and explain with neat sketch working of positive displacement pump?

c. Write short note on the following (any three)
(i) Dispersion Operation(ii) Agitation and Mixing
(iii) Operating characteristics of pump (iv) Cavitation

d. Sulphuric acid of density 1650 Kg/m3 and viscosity 8.6 Mp.s is to be pumped for 800 m along through 40 mm internal diameter pipe at rate of 4 kg/s and then raised vertically 15 m by the pump. If the pump is electrically driven and has an efficiency of 60 %. What power will be required?

(Roll No. to be filled by candidate)									

B. TECH.
THIRD SEMESTER THEORY EXAMINATION, 2021-22
KNC-302
PYTHON PROGRAMMING

Time: 02 Hours **Max. Marks: 50**

Note:

- Attempt all questions. All questions carry equal marks.

1. Attempt any ***FOUR*** parts of the following: 4×2.5 CO

a. Differentiate between procedures oriented and object oriented programming languages. CO1

b. What do you understand by open source software? Write any five open source software name. CO1

c. What do you mean by Operators? Explain each part in details CO1

d. What is an algorithm? Make an algorithm to find the largest number among three numbers. CO1

e. Differentiate between mutable and immutable data type used in Python. CO1

f. What is the Indentation? How it is useful in Python Programming? Explain with suitable example. CO1

2. Attempt any ***TWO*** parts of the following: 2×5 CO

a. Write a Python program to convert capital letter into small letter and vice-versa CO2

b. Differentiate between break and continue with suitable example CO2

c. Write a Python program to calculate actual price on purchase of computer CO2

Price(Rs)	Discount (%)
Upto 10,000	4
>10,000 to 25,000	7
>25,000 to 40,000	9
>40,000 to 70,000	12
>70,000 to 1 lac	15
>1 lac	25

3. Attempt any *TWO* parts of the following: 2×5 CO
   a. Differentiate between for and while loop with suitable example. CO3
   b. Write a Python program to check Prime number or not. CO3
   c. Write a Python program to check whether your number is palindrome number or not. CO3

4. Attempt any *TWO* parts of the following: 2×5 CO
   a. What do you mean by Function in Python? Differentiate between actual argument and formal argument with suitable example. CO4
   b. Find factorial of given number using function. CO4
   c. What is recursion? Print Fibonacci series up to n term using recursion. CO4

5. Attempt any *TWO* parts of the following: 2×5 CO
   a. Differentiate class, object, abstraction, polymorphism, encapsulation And inheritance with suitable example. CO5
   b. What is file in python programming? Explain various operations performed on file CO5
   c. How many operations are performed on a list? Explain any one of the following. CO5

Total number of printed pages: 03 KCH 303

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B. Tech.

THIRD SEMESTER THEORY EXAMINATION, 2021-2022

KCH 303

HEAT TRANSFER OPERATIONS

Time: 3Hour **Total Marks: 100**

Note: Attempt ***ALL*** questions. All questions carry equal marks.

1	Attempt any ***FOUR*** parts of the following:	4×5	CO
a.	Name and explain briefly the various modes of heat transfer with suitable examples.		CO1
b.	State and explain Fourier's law for one dimensional conduction. What are the underlying assumptions?		CO1
c.	Define Critical thickness of insulation. Also write its application in various fields?		CO1
d.	Define thermal conductivity .What are the factors affecting the thermal conductivity of a material.		CO1
e.	A hollow cylinder of 5 c.m. I.D. and 10 c.m. has an inner surface temperature of 200^0 and outer temperature of 100^0 C .Determine the temperature of the point half way between the inner and the outer surface. Thermal conductivity of the cylinder material is 70 W/mK.		CO1
f.	A thin fin of length L has its two ends fixed to two parallel walls at temperature T_1 and T_2, the temperature of the environment being at $T\alpha$.Derive an expression for one dimensional temperature distribution along the length of the fin.		CO1

2 Attempt any ***FOUR*** parts of the following: 4×5 CO

a. Distinguish between natural and forced convection heat transfer. CO2

b. Define Reynolds, Nusselt and Prandtl number. Explain their significance in convective heat transfer. CO2

c. Using dimensional analysis obtain an expression for Nusselt in terms of Reynolds and Prandtl number CO2

d. What is Dittus-Boelter equation? When and where does it apply? CO2

e. Define 'fin efficiency' and 'fin effectiveness'. CO2

f. Calculate the functional relationship between the boundary layer thickness and the Reynolds number, for a constant property, zero pressure gradient flow over a flat plate. CO2

3 Attempt any ***TWO*** parts of the following: **2×10** CO

a. Discuss in detail, the concept of radiation shape factors in the analysis of heat exchange between two surfaces. CO3

b. A pipe carrying steam having an outside diameter of 20 cm runs in a large room and is exposed to air at a temperature of 30^0 C. The pipe surface temperature is 400^0 C. Calculate the loss of heat to surroundings per metre length of pipe due to thermal radiation. The emissivity of the pipe surface is 0.8.What would be the loss of heat due to radiation, if the pipe is enclosed in a 40 cm diameter brick conduit of emissivity 0.91? CO3

c. Explain following multiple effect evaporator arrangements with their merits and demerits: CO4

i. Forward feed arrangement
ii. Backward feed arrangement
iii. Parallel feed arrangement
iv. Mixed feed arrangement

4 Attempt any ***TWO*** parts of the following: 2×10 CO

a. With the aid of a neat sketch of a boiling curve for water (for pool boiling), explain the various regimes of boiling. CO4

b. Differentiate between film wise condensation and dropwise condensation. Using Nusselt theory, develop an expression for average heat transfer coefficient in condensation over a length of a length of a vertical plate. CO4

c. 0.6 kg/sec of a solution at 25^0 C and containing 14.1 % by weight of NaOH is to be concentrated to 24.1 % by weight in a single stage evaporator. The temperature of the heating steam is 130^0 C. Boiling point of the solution in the evaporator is 112^0 C. The heat losses of the evaporator are 40 KW. Overall heat transfer coefficient is 800 W/m^2K. CO4

Latent heat of steam =2183 kJ/kg

Latent heat of vaporization =2225 kJ/kg

Calculate:

i. The quantity of water evaporated

ii. Quantity of steam consumed

iii. Steam economy

Heat transfer area required for the evaporator

5 Attempt any ***TWO*** parts of the following: 2×10 CO

a. How are heat exchangers classified? Discuss briefly different types of heat exchangers. CO5

b. Hot oil with a capacity rate of 2500 W/K flows through a double pipe heat exchanger .It enters at 360^0 C and leaves at 300^0 C. Cold fluid enters at 30^0 C and leaves at 200^0 C. If the overall heat transfer coefficient is 800 $W/m^2.K$, determine the heat exchanger area required for CO5

i. Parallel flow, ii. Counter flow

c. Saturated steam at 100^0 is condensing on the shell side of a shell and tube heat exchanger. The cooling enters the tube at 30^0 C and leaves at 70^0 C. Calculate the effective log mean temperature difference if the arrangement is (i) Counter flow (ii) Parallel flow CO5

Total Number of Printed Pages: 03

KCH-401

(Roll No. to be filled by candidate)

B. TECH.
FOURTH SEMESTER THEORY EXAMINATION, 2021-22
KCH - 401
MECHANICAL OPERATIONS

Time: 03 Hours **Max. Marks: 100**

Note:

- Attempt all questions. All questions carry equal marks.

1. Attempt any ***FOUR*** parts of the following: 4×5 CO1
   a. Give the classification and significance of mechanical operation in the chemical process industry.
   b. Give the relevant equations for surface area measurement and statistical mean diameter.
   c. Derive the expression for the effectiveness of the screen.
   d. Define the term sphericity and calculate the sphericity of a cube of 3 mm dimension.
   e. Differentiate between differential and cumulative screen analysis with the help of a suitable example.
   f. For the following screen analysis, calculate the total number of particles per kg of the sample, if the volume shape factor of the particle is 2.0 and the density is 8 gm/cc.

Screen Aperture, mm	4.8	4.0	3.35	3.2	2.2
Mass Retained	10.0	40	20	30	5

2. Attempt any ***FOUR*** parts of the following: 4×5 CO2

a. Explain the laws of size reduction with their statement, equatio and with their limitations.

b. Define wet and dry grinding and give the advantages and disadvantages of wet grinding over dry grinding.

c. What is the power required to crush 100 ton/h of limestone if 80 percent of the feed passes a 2-inch screen and 80 percent of the product passes through a 1/8-inch screen.

Given: Work index of limestone is 12.74

d. What should be the diameter of a set of rolls to take a feed of size equivalent to 48 mm spheres and crush to 14.8 mm, if the coefficient of friction is 0.35?

e. What are the various size Enlargement techniques? Discuss the process of briquetting in detail.

f. Explain the principle of Pelletisation and Flocculation in detail.

3. Attempt any ***TWO*** parts of the following: 2×10 CO3

a. What are the various ways of particle separation? Describe the working principle of particle separation by Gravity settling and Elutriation with the help of a neat sketch,

b. Explain the utility of a classifier in chemical process industries and also discuss the working principle of the Double cone classifier and Rake classifier.

c. Discuss the principle of particle separation of the following:

i. Hydro cyclones
ii. Electrostatic precipitator
iii. Magnetic separators

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4. Attempt any ***TWO*** parts of the following: 2×10 CO4

a. Explain the characteristics of the filter medium. Derive the equation and draw the plot for t/v versus V in constant Pressure Filtration.

b. A rotary filter operating at 4 rpm filters 1000 litre/min. operating under the same vacuum and neglecting the resistance of the filter cloth at what speed must the filter be operated to give a filtration rate of 2000 litre/min.

c. Explain the process of fluidization and write short notes on the following:

i. Fluidization characteristics

ii. Terminal velocity of particles

5. Attempt any ***TWO*** parts of the following: 2×10 CO5

a. Define and distinguish the mixing, blending and kneading operations. Discuss the working principle of the Ribbon blender and Screw blender in detail.

b. Discuss different criteria for the selection of the correct conveyor for specific bulk material in a specific situation. Write the working and construction details of the belt conveyor.

c. Discuss the different techniques used to store the solids along with their merits and limitations.

(Roll No. to be filled by candidate)

B. TECH.
FOURTH SEMESTER THEORY EXAMINATION, 2021-22
KVE-401
UNIVERSAL HUMAN VALUES

Time: 03 Hours **Max. Marks: 100**

Note: Attempt all questions. All questions carry equal marks.

1. Attempt any ***FOUR*** parts of the following: 4×5 CO
   a. What is the need of universal human values? CO1
   b. Briefly discuss the process of self exploration? CO1
   c. What is the basic guideline of Universal human values? CO1
   d. What do you mean by right understanding? CO1
   e. What are basic human aspirations? CO1
   f. What do you mean by Natural acceptance? CO1

2. Attempt any ***TWO*** parts of the following: 2×10 CO
   a. Explain the human being as Self (I) and body. Explain the ten activity of self (conscious unit). CO2
   b. Verify whether intellectual resolution and physical prosperity are our needs as a human being? CO2
   c. What do you mean by happiness and prosperity? Is there any path to be happy continuously? Explain. CO2

3. Attempt any ***TWO*** parts of the following: 2×10 CO
   a. Family, society and universal order have a supportive role in the smooth functioning of self-study and practice – discuss this statement. CO3

b. Bringout the differences between intention and competence? Explain in detail with examples. CO3

c. What are the foundational values of relationship? Explain the values in Human-Human relationship. CO3

4. Attempt any ***TWO*** parts of the following: 2×10 CO

a. What do you mean by submergence? Explain how units and space exists together? Explain how submergence is expressed in all dimensions of human living. CO4

b. What are the four orders present in nature? Explain its form, property, natural characteristics and innateness. CO4

c. Give examples of some activities that occur in you- of being active, self-controlled, recognized and fulfilled under the expression of submergence. CO4

5. Attempt any ***TWO*** parts of the following: 2×10 CO

a. Is the fulfillment of duties and obligations at the individual, family and societal levels helpful in the development of our talent, sharpening of the activities of the self or is it a hindrance? Explore into this. CO5

b. What is right for the human being and Nature – to live with non-accumulation and affection or with accumulation and jealousy? Which thought of these gives us satisfaction? Living on what basis enables us to become mutually fulfilling? CO5

c. Explain the ethical human conduct. Also explain the basis for humanistic education in detail. CO5

al Number of Printed Pages: 02

(Roll No. to be filled by candidate)

B. TECH.
FOURTH SEMESTER THEORY EXAMINATION, 2021-22
KVE-401
UNIVERSAL HUMAN VALUES

Time: 03 Hours **Max. Marks: 100**

Note: Attempt all questions. All questions carry equal marks.

1.	Attempt any ***FOUR*** parts of the following:	4×5	CO
	a. What is the need of universal human values?		CO1
	b. Briefly discuss the process of self exploration?		CO1
	c. What is the basic guideline of Universal human values?		CO1
	d. What do you mean by right understanding?		CO1
	e. What are basic human aspirations?		CO1
	f. What do you mean by Natural acceptance?		CO1
2.	Attempt any ***TWO*** parts of the following:	2×10	CO
	a. Explain the human being as Self (I) and body. Explain the ten activity of self (conscious unit).		CO2
	b. Verify whether intellectual resolution and physical prosperity are our needs as a human being?		CO2
	c. What do you mean by happiness and prosperity? Is there any path to be happy continuously? Explain.		CO2
3.	Attempt any ***TWO*** parts of the following:	2×10	CO
	a. Family, society and universal order have a supportive role in the smooth functioning of self-study and practice – discuss this statement.		CO3

b. Bringout the differences between intention and competence? Explain in detail with examples. CO3

c. What are the foundational values of relationship? Explain the values in Human-Human relationship. CO3

4. Attempt any ***TWO*** parts of the following: 2×10 CO

a. What do you mean by submergence? Explain how units and space exists together? Explain how submergence is expressed in all dimensions of human living. CO4

b. What are the four orders present in nature? Explain its form, property, natural characteristics and innateness. CO4

c. Give examples of some activities that occur in you- of being active, self-controlled, recognized and fulfilled under the expression of submergence. CO4

5. Attempt any ***TWO*** parts of the following: 2×10 CO

a. Is the fulfillment of duties and obligations at the individual, family and societal levels helpful in the development of our talent, sharpening of the activities of the self or is it a hindrance? Explore into this. CO5

b. What is right for the human being and Nature – to live with non-accumulation and affection or with accumulation and jealousy? Which thought of these gives us satisfaction? Living on what basis enables us to become mutually fulfilling? CO5

c. Explain the ethical human conduct. Also explain the basis for humanistic education in detail. CO5

KCH-402

Total Number of Printed Pages: 04

(Roll No. to be filled by candidate)

B. TECH.
FOURTH SEMESTER THEORY EXAMINATION, 2021-22
KCH-402
CHEMICAL REACTION ENGINEERING - I

Time: 03 Hours **Max. Marks: 100**

Note:

- Attempt all questions. All questions carry equal marks.
- Assume suitable data if required.

1.	Attempt any ***FOUR*** parts of the following:	4×5	CO
a.	What are the factors affecting the rate equation?		CO1
b.	Explain the collision theory and Transition state theory		CO1
c.	A certain reaction has a rate given by: $-r_A = 0.005\ C_A^{\ 2}$, mol/ cm^3 min. If the concentration is expressed in mol/ lit and time in hours, what will be the value and Unit of rate constant.		CO1
d.	At 500K the rate of bimolecular reaction is ten times rate at400K. Find the activation energy for this reaction: (i) From Arrhenius law (ii) From Collision theory		CO1
e	Develop a multistep reaction model to explain the kinetics of non-Elementary reactions.		CO1
f	Write short notes on Irreversible reaction in Parallel.		CO1
2.	Attempt any ***TWO*** parts of the following:	2×10	CO
a.	The homogeneous gas decomposition of reactant A is		

$$4A_{(g)} \longrightarrow R_{(g)} + 6S_{(g)}$$

Proceed at 600 °C with the first order rate $(-r_A) = (15/hr)$ C_A what size of plug flow reactor operating 600 °C and 400 KPa can produce 80% conversion of feed consisting of 60 mole of pure A per hours

b Assuming a stoichiometry $A \longrightarrow R$ for the first order gas reaction the size of plug flow reactor was found to be 32 lit.(considering 99% conversion of pure A feed). However, the correct reaction stoichiometry was $A \longrightarrow 3R$. with this correct stoichiometry, what is the required volume

c Pure gaseous reactant A (C_{A0} =100 mili mole/ lit is feed at steady state rate into a MFR (V=0.1 lit) Where it dimerizes ($2A \longrightarrow R$). For different gas feed rate the following data are obtained.Find the rate equation for this reaction.

Run number	1	2	3	4
V_0, lit/hr	30	9	3.6	1.5
C_{A+}, mili mole/lit	85.7	66.7	50	33.4

3. Attempt any ***TWO*** parts of the following: 2×10

a. Reaction A decomposes in a batch reactor.

$$A \longrightarrow P$$

The composition of A in the reactor is measured at various time with result shown in the following Table:

Time,t (s)	0	20	40	60	120	180	300
ConcentrationC_A mol/lit	10	8	6	5	3	2	1

Find the rate equation to represent the data using differential method of analysis.

b. An aqueous solution of ethyl acetate is to be saponified with NaOH. The initial concentration ethyl acetate is0.0568

mol/lit and that of NaOH is0.10 mol/lit .The value of second order rate constant at 0^0C and 20^0C are respectively 0.235 and0.924 lit/ mol $(min)^{-1}$ .The reaction is irreversible. Calculate the time required to saponify 95% ethyl acetate at 40^0C

c. The decomposition of phosphine is irreversible and first order at 650^0C CO3

$$4PH_{3\,(g)} \rightarrow P_{4\,(g)} + 6H_{2\,(g)}$$

The rate constant in $(s)^{-1}$ is reported as

$$\log K = \frac{-18963}{T} + 2 \log T + 12.13$$

Where, T is in degree Kelvin. In Closed vessel (constant volume) containing initially Phosphine at 1 atm pressure, what will be the pressure after 50,100 and 500 seconds? The temp. is maintained at 650^0C.

4. Attempt any ***TWO*** parts of the following: 2×10 CO

a. Develop relation between constant K and temperature T for the ammonia synthesis reactions. CO4

$$\frac{1}{2} N_2 + \frac{3}{2} H_2 \longrightarrow NH_3$$

Data; ΔH_R at 298 °K = -4619 J/mol ΔG° at 298 °K = -16635 J/mol

$$\Delta C_p = -31.780 + 35.517 \times 10^{-3}\, T - 90316 \times 10^{-6}\, T^2$$

C_P is in (J/ mol °k) and temp T is in °K

b. Derive the expression for the concentration of reactant in the effluent from a series of mixed reactors of different sizes. Let the reaction follow first order kinetics and Let the holding time in i^{th} reactor is T CO4

c. Wirte short notes on: CO4

(i) Optimum Temperature Progression.

(ii) Tank in series model.

(iii) Non isothermal homogeneous reactor system

5. Attempt any ***TWO*** parts of the following: 10×2 CO

a. For the given reactor data, calculate the mean residence time of fluid in the vessel t, and find the exit age distribution E CO5

t, min	0	1	2	3	4	5	6	7	8	9	10	12	14
C_{Pulse} g/m^3	0	1	5	8	10	8	6	4	3	2.2	1.5	0.6	0

b. Wirte short on The following: CO5

(i) Compare the properties and relationship of E, C and F curve for various flow.

(ii) The dispersion model.

(iii) The residence time distribution time

c. Define the term RTD. Also explain "Tanks in series'' model with neat digram

Total Number of Printed Pages: 04

KCH 403

(Roll No. to be filled by candidate)									
2	0	0	5	3	5	1	0	1	1

B. TECH.
FOURTH SEMESTER THEORY EXAMINATION, 2021-22
KCH -403
CHEMICAL ENGINEERING THERMODYNAMICS

Time: 03 Hours **Max. Marks: 100**

Note:

- Attempt all questions. Assume missing data suitably.

1. Attempt any ***FOUR*** parts of the following: 4×5 CO

a. What are Carnot propositions? Prove that a Carnot engine has the maximum efficiency and that the efficiency is independent of the working fluid. CO1

b. An ideal gas undergoes the following reversible processes: CO1
(a) From an initial state of 343 K and 1 bar it is compressed adiabatically to 423 K.
(b) It is then cooled to 343 K at constant pressure.
(c) Finally, it is expanded to its original state isothermally.
Calculate ΔU, ΔH, W and Q for each step as well as for the entire cycle. Assume $C_V = (3/2)\,R$.

c. What are the Maxwell's equations and what is their importance in establishing relationships between thermodynamic properties? CO1

d. What are the different types of thermodynamic diagrams? List their respective fields of application. CO1

e. Derive an expression for the fugacity coefficient of a gas obeying the equation of state $P(V - b) = RT$ and estimate the fugacity of ammonia at 10 bar and 298 K, given that $b = 3.707\ 10^{-5}$ m^3/mol. CO1

f. A hot hydrocarbon oil (C_P = 2.512 kJ/kg K) is cooled from 422 K to 339 K in a heat exchanger at the rate of 2500 kg/h. Cooling water at the rate of 5000 kg/h enters the exchanger at 294 K. Assume that there is no heat loss in the exchanger. CO1
(a) What is the change in entropy of the oil?
(b) What is the total change in entropy?

2. Attempt any ***TWO*** parts of the following: 2×10 CO

a. (i) Show that for a heterogeneous multicomponent system at a definite T and P are in equilibrium when the chemical potential of each component is the same in all the phases. CO2

(ii) An equimolar solution of benzene and toluene is totally evaporated at a constant temperature of 363 K. At this temperature, the vapour pressures of benzene and toluene are 135.4 and 54 kPa respectively. What are the pressures at the beginning and at the end of the vaporization process?

b. Write notes on the following: CO2

(i) Phase rule for non-reacting systems

(ii) Ternary liquid liquid equilibrium

(iii) Bubble point and dew point temperature

c. (i) What are the salient features of an ideal liquid solution? What is Lewis-Randall rule? CO2

(ii) The enthalpy at 300 K and 1 bar of a binary liquid mixture is

$$H = 400x_1 + 600x_2 + x_1x_2(40x_1 + 20x_2)$$

where H is in J/mol. Determine pure components enthalpies and partial molar enthalpies.

3. Attempt any ***TWO*** parts of the following: 2×10 CO

a. (i) Discuss the Gibbs-Duhem Equation and its various forms. What are the major fields of application of Gibbs-Duhem Equations? CO3

(ii) The azeotrope of the *n*-propanol–water system has a composition 56.83% (mol) water with a boiling point of 360.9 K at a pressure of 101.3 kPa. At this temperature, the vapour pressures of water and propanol are respectively 64.25 kPa and 69.71 kPa. Evaluate the activity coefficients for a solution containing 20 % water through the van Laar equations.

b. The excess Gibbs free energy for cyclohexanone (1)/phenol (2) is given by CO3

$$\frac{G^E}{RT} = -2.1x_1x_2$$

where x_1 and x_2 are the mole fractions of components 1 and 2 in the liquid phase. The vapor pressures of the components at 417 K are $P_1^{sat} = 75.2$ kPa and $P_2^{sat} = 31.66$ kPa.

(a) Derive expressions for activity coefficients of each component as a function of composition.

(b) Verify whether the expressions derived in (a) satisfy the

Gibbs-Duhem equation.

(c) Determine the equilibrium pressure P and vapor composition for a liquid composition $x_1 = 0.8$ and 417 K. assume vapor phase to be ideal gas.

c. (i) What is chemical potential? Explain the effect of temperature and pressure on chemical potential. CO3

(ii) An experimental determination of vapour–liquid equilibrium state of ether (1) and acetone (2) gave the following results:

$x_1 = 0.3, y_1 = 0.42, T = 313$ K and $P = 105$ Pa

The saturation vapour pressures of the pure components at 313 K are: ether = 1.21×10^5 Pa and acetone = 0.56×10^5 Pa. The vapour phase can be assumed ideal.

(a) Calculate the liquid-phase activity coefficients.

(b) What is the value of excess Gibbs free energy G^E/RT for the liquid phase?

4. Attempt any ***TWO*** parts of the following: 2×10 CO

a. Derive the following expressions: CO4

(i) $\Delta G^0 = -RT \ln K$, (ii) $\sum \mu_i \nu_i = 0$

b. (i) What is the effect of temperature on the equilibrium constant? Using van't Hoff equation predict the effect of increasing the temperature on endothermic and exothermic reactions. CO4

(ii) Industrial grade methanol can be produced according to the reaction

$$CO\ (g) + 2H_2\ (g) \leftrightarrow CH_3OH\ (g)$$

For this reaction, $\Delta G^0_{400} = -1.3484$ kJ. If an equimolar mixture of CO and H_2 is fed to a reactor maintained at 400 K and 10 bar, determine the fraction of CO that is converted into CH_3OH at equilibrium. Assume that the reaction mixture behaves like an ideal gas.

c. A gas mixture containing 25% CO, 55% H_2 and 20% inert gas is to be used for methanol synthesis. The gases issue from the catalyst chamber in chemical equilibrium with respect to the reaction CO4

$$CO\ (g) + 2H_2\ (g) \rightarrow CH_3OH\ (g)$$

at a pressure of 300 bar and temperature of 625 K. Assume that the equilibrium mixture forms an ideal solution and K_f and K_Φ are 4.9×10^{-5} and 0.35, respectively. What is the percent conversion of CO?

5. Attempt any ***TWO*** parts of the following: 2×10 CO

a. (i) A refrigeration system requires 1 kW of power for a refrigeration rate of 3 kJ/s. Determine the coefficient of performance (COP) and the heat rejected by the system. CO5

(ii) What is COP of a refrigerator? What are the practical limitations of a Carnot cycle for refrigeration and how are these overcome in a vapour-compression cycle?

(iii) Write a note on 'choice of refrigerant'.

b. (i) An ideal vapour-compression unit with Freon-12 as refrigerant operates between an evaporator temperature of 243 K and a condenser temperature of 308 K. If the power input to the compressor is 50 kW, what is the refrigeration capacity (in tons) of refrigeration? The enthalpy of saturated liquid Freon-12 at 308 K is 69.55 kJ/kg. The enthalpy of saturated vapour at 243 K is 174.2 kJ/kg. The enthalpy of superheated vapour leaving the compressor is 200 kJ/kg. CO5

(ii) Describe the air-refrigeration cycle by a schematic diagram and also derive its COP related to the compression ratio. What are the advantages and disadvantages of air-refrigeration machines?

c. (i) What are the three general methods available for gas liquefaction? Compare the Linde process with the Claude process for air liquefaction. CO5

(ii) The low-pressure side of the throttle valve in the Linde process for the liquefaction of methane is maintained at 1 bar (the enthalpy of saturated liquid and vapour at 1 bar are 285 kJ/kg and 797 kJ/kg respectively). The gas leaves the compressor at 60 bar and 300 K (H = 1140 kJ/kg). The uncondensed gases are passed through the heat exchanger where it gets heated to 295 K (H = 1189 kJ/kg). Determine:

(a) The fraction of the gas liquefied

(b) The temperature of the gas at the high-pressure side of the valve.

KCH 403

Number of Printed Pages: 02

KNC-401

(Roll No. to be filled by candidate)

B. TECH.
FOURTH SEMESTER THEORY EXAMINATION, 2021-22
KNC-401
COMPUTER SYSTEM SECURITY

Time: 02 Hours **Max. Marks: 50**

Note:

- Attempt all questions. All questions carry equal marks.
- Assume missing data suitably.

1.	Attempt any ***TWO*** parts of the following:	2×5	CO
	a. Discuss the security mechanism used to provide security in computer system.		CO1
	b. What do you understand by format string vulnerabilities? How can we prevent format string vulnerabilities?		CO1
	c. Describe the problems related with computer security.		CO1
2.	Attempt any ***TWO*** parts of the following:	2×5	CO
	a. How are the different approaches to use Virtual OS on desktop?		CO2
	b. Explain confinement principles with its techniques.		CO2
	c. Explain the purpose of rootkit. What are the examples of rootkits?		CO2
3.	Attempt any ***TWO*** parts of the following:	2×5	CO
	a. What is Access Control list (ACL) and also define what are the technologies used in access control?		CO3
	b. Define browser isolation technology. What are browser isolation vendors?		CO3
	c. Write short notes on following: i. Cross site scripting. ii. Why is HTTPs not used for all web traffic?		CO3

4.	Attempt any ***TWO*** parts of the following:	2×5	CO
a.	Explain RSA algorithm. Perform encryption and decryption using RSA algorithm for p = 11, q = 13, e = 7, m = 9.		CO4
b.	Discuss public key distribution. Describe the various schemes used for public key distribution.		CO4
c.	What is hash function? Discuss SHA-512 with all required steps, round function and block diagram.		CO4
5.	Attempt any ***TWO*** parts of the following:	2×5	CO
a.	What is packet filtering firewall? Explain its advantage and disadvantage.		CO5
b.	Define internet infrastructure. What are different internet infrastructures?		CO5
c.	What is domain name system and explain what is DNS cache poisoning?		CO5