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DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Winter End Semester Examination – Nov 2019

Course: B. Tech in Chemical/Petrochemical Engineering **Sem: IV**

Subject: Chemical Engineering Thermodynamics –I (BTCHC 402) **Max Marks: 60**

Date: 28//2019 **Duration:3 Hr.**

Instructions to the Students:

1. *Solve ANY FIVE questions out of the following.*
2. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in front of the question.*
3. *Use of non-programmable scientific calculators is allowed.*
4. *Assume suitable dada wherever and mention it clearly.*

		Marks
Q.1	**Solve any Two of the following.**	**2x6=12**
A)	Differentiate between intensive and extensive state variable with suitable examples	
B)	Liquid water at 453.15 K and 1002.7 kPa has an internal energy of 762.0 kJ/kg and a specific volume of 1.128 cm ^{3} /gm (i) What is its enthalpy **(ii)** The water is brought to the vapor state at 573.15 and 1500 kPa , where its internal energy is 2784.4 kJ/kg and its specific volume is 169.7 cm ^{3} /gm Calculate ΔU, and ΔH for the process	
C)	Derive an equation of first law of thermodynamics Energy balance equation non flow processes	
Q.2	**Solve any Two of the following.**	**2x6=12**
A)	Three moles of nitrogen at 303.15 K (30°C), contained in a rigid vessel, is heated to 523.15 K (250°C). How much heat is required if the vessel has a negligible heat capacity? If the vessel weighs 100 kg and has a heat capacity of 0.5 kJ /kg ^{0}C (C_V= 20.8 and Cp = 29.1 J /mol C for nitrogen gas)	
B)	One kilogram of air is heated reversibly at constant pressure from an initial state of 300 K and 1 bar until its volume triples. Calculate W, Q, ΔU, and ΔH for the process. Assume for air that P V/ T = 83.14 bar cm^3 / mol K and Cp = 29 J /mol K	
C)	One mole of air, initially at 423.15 K and 8 bar , undergoes the following mechanically reversible changes. It expands isothermally to a pressure such that when it is cooled at constant volume to 323.15 K. its final pressure is 3 bar. Assuming air is an ideal gas for which C_P = (7/2) R and C_V = (5/2) R , Calculate W, Q, ΔU and ΔH	
Q.3	**Solve any One of the following.**	**1x12=12**
A)	(i)What is an adiabatic process? Write the expression for work done during reversible adiabatic process (ii) How much heat is required when 10000 kg of CaCO3 is heated at atmospheric pressure from 323.15 to 1153.15 K (50 to 880 ^{0} C) For CaCO3: A := 12.572 B = $2.637 \cdot 10^{-3}$ D = $-3.120 \cdot 10^{5}$	
B)	Derive an equation for an entropy change of ideal gas	
Q.4	**Solve any Two of the following.**	**2x6=12**
A)	State and explain second law of thermodynamics , state mathematical equation for it	
B)	What is sensible heat effect, what are latent heats, why they important ?	

C) One mole of an ideal gas with $C_V = (5/2)\,R$ and $C_P = (7/2)\,R$ is compressed adiabatic ally in a piston cylinder device from 2 bar and 25 ^{0}C to 7 bar. The process is irreversible and requires 35 % more work than reversible adiabatic compression from the same initial state to the same final pressure. What is the entropy change of the gas?

Q.5 Solve any One of the following. **1x12=12**

A) (i) What are the various steps involved in a Carnot cycle? Derive an expression for the efficiency of a Carnot cycle.

(ii) A vessel contains 1 kg of H20 as liquid and vapor in equilibrium at 1000 kPa. If the vapor occupies 70% of the volume of the vessel, determine H and *S* for the 1 kg of Water

Data

$V_{liq} := 1.127 \cdot \frac{cm^3}{gm}$ $H_{liq} := 762.605 \cdot \frac{J}{gm}$ $S_{liq} := 2.1382 \cdot \frac{J}{gm \cdot K}$

$V_{vap} := 194.29 \cdot \frac{cm^3}{gm}$ $H_{vap} := 2776.2 \cdot \frac{J}{gm}$ $S_{vap} := 6.5828 \cdot \frac{J}{gm \cdot K}$

B) (i) Discuss selection criteria of good refrigerant
(ii) State thermodynamic diagrams and any one diagram in detail

Q.6 Solve any One of the following. **1x12=12**

A) (i) Derive the following equation

$$dU = C_V\,dT + \left[T\left(\frac{\partial P}{\partial T}\right)_V - P\right]dV$$

(ii) With the help of temperature-entropy diagram and flow diagram, explain the working of a single stage vapor compression refrigeration system

B) (i) Derive the Maxwell's relations.
(ii) A refrigeration system requires 1.5 kW of power for a refrigeration rate of 4 kW.
(a) What is the coefficient of performance?
(b) How much heat is rejected in the condenser?

PAPER END

SY

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

End Semester Supplementary Examination – Dec. 2019

Course: B. Tech in Chemical Engineering **Sem: IV**

Subject Name: Strength of Materials (BTCHC404) **Marks: 60**

Date: 02/12/2019 **Duration:- 3 Hr.**

Instructions to the Students:

1. **Each question carries 12 marks.**
2. **Answer any five questions**
3. **Illustrate your answers with neat sketches, diagram etc., wherever necessary.**
4. **If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly.**

Marks

Q. 1 Solve the following.

(A) A cantilever beam AB, 2m long carries uniformly distributed load of 1.5 kN/m over a length of 1.6 m from the free end. Draw the shear force and bending moment diagrams for the beam. **06**

(B) A hollow cylinder 2 m long has outside and inside diameters of 50 mm and 30 mm respectively. Find the stress and deformation of cylinder, when it is carrying an axial tensile load of 25 kN. Take E=100 GPa. **06**

Q.2 Solve the following.

(A) Explain Modulus of rigidity and types of stresses. **04**

(B) A 1.5 m long column has a circular cross section of 50 mm diameter. One end of column is fixed in direction and position and the other end is free. Taking a factor of safety of 3 , calculate the safe load using **08**

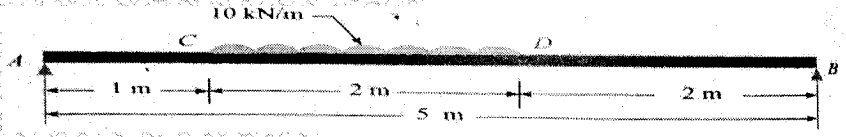
i) Rankine's formula : Take f_c=560 N/mm^2, α=1/1600

ii) Euler's formula : Young's modulus for cast iron =1.2*10^5 N/mm^2

Q.3 Solve ANY TWO of the following.

(A) Explain Macaulay's method for slope and deflection of simply supported beam with an eccentric point load. **06**

(B) A simply supported beam 5m long is loaded with a uniformly distributed load of 10 kN/m over a length of 2m as shown in fig. Draw the shear force and bending moment diagram for the beam. **06**



(C) A brass rod 2m long is fixed at both its ends. If the thermal stress is not to exceed 76.5 MPa, calculate the temperature through which the rod should be heated. Take value of of α and E as 17*10^{-6} /K and 90 GPa respectively. **06**

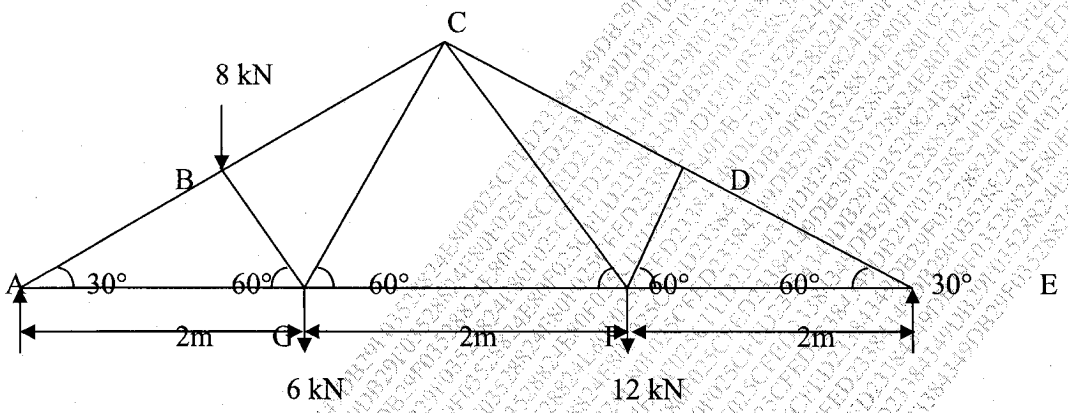
Q. 4 Solve the following.

(A) A steam boiler of 800 mm diameter is made up of 10 mm thick plates. If the boiler is subjected to an internal pressure of 2.5 MPa, find the circumferential and longitudinal stresses induced in the boiler plates. **06**

(B) A steel rod 5m long and of 40 mm diameter is used as a column, with one end fixed and the other free. Determine the crippling load by Euler's formula. Take E as 200 GPa **06**

Q.5 Solve the following.

(A) An inclined truss shown in fig. is loaded as shown. Determine the nature & magnitude of the forces in the members BC, GC and GF of the truss. **08**



(B) Which analytical methods are used for finding out forces in the members of perfect frame? Explain any one in detail. **04**

Q.6 Solve the following.

(A) A cylindrical vessel 2 m long and 500 mm in diameter with 10 mm thick plates is subjected to an internal pressure of 3 MPa. Calculate the change in volume of the vessel. Take E=200 GP and Poisson's ratio =0.3 for the vessel material. **06**

(B) A spherical shell of 2 m diameter is made up of 10 mm thick plates. Calculate the change in diameter and volume of the shell, when it is subjected to an internal pressure of 1.6 MPa. Take E=200 GPa and (1/m)=0.3 **06**

***** Paper End *****

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

End Semester Examination – Winter 2019

Course: B. Tech in **Sem: III**

Subject Name: Engineering Mathematics-III (BTBSC301) **Marks: 60**

Date: 10/12/2019 **Duration: 3 Hr.**

Instructionts to the Students:

1. *Solve **ANY FIVE** questions out of the following.*
2. *The level question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
3. *Use of non-programmable scientific calculators is allowed.*
4. *Assume suitable data wherever necessary and mention it clearly.*

		(Level/CO)	Marks
Q. 1	**Attempt the following.**		12
A)	Find $L\{cosht \int_0^t e^u coshu\, du\}$.	**Analysis**	4
B)	If $f(t) = \begin{cases} t, & 0 < t < \pi \\ \pi - t, & \pi < t < 2\pi \end{cases}$ is a periodic function with period 2π. Find $L\{f(t)\}$.	**Analysis**	4
C)	Using Laplace transform evaluate $\int_0^\infty e^{-at} \frac{sin^2 t}{t}\, dt$	**Evaluation**	4
Q. 2	**Attempt any three of the following.**		12
A)	Using convolution theorem find $L^{-1}\left\{\frac{1}{s(s+1)(s+2)}\right\}$	**Application**	4
B)	Find $L^{-1}\{\bar{f}(s)\}$, where $\bar{f}(s) = \log\left(\frac{s^2+1}{s(s+1)}\right)$	**Analysis**	4
C)	Using Laplace transform solve $y'' + 2y' + 5y = e^{-t} \sin t$; $y(0) = 0$, $y'(0) = 1$	**Application**	4
D)	Find $L^{-1}\left\{\frac{s^2+2s-4}{(s-5)(s^2+9)}\right\}$	**Analysis**	4
Q. 3	**Attempt any three of the following.**		12

A)	Express the function $f(x) = \begin{cases} \sin x, & 0 \le x \le \pi \\ 0, & x > \pi \end{cases}$ as a Fourier sine integral and hence evaluate that $\int_0^\infty \frac{\sin\lambda x \sin\lambda\pi}{1-\lambda^2}\, d\lambda$.	**Evaluation**	**4**
B)	Using Parseval's identity for cosine transform, evaluate $\int_0^\infty \frac{dx}{(x^2+a^2)(x^2+b^2)}$.	**Application**	**4**
C)	Find the Fourier sine transform of $f(x) = \begin{cases} x, & 0 \le x \le 1 \\ 2-x, & 1 \le x \le 2. \\ 0, & x > 2 \end{cases}$	**Analysis**	**4**
D)	If $F_s\{f(x)\} = \frac{e^{-as}}{s}$, then find $f(x)$. Hence obtain the inverse Fourier sine transform of $\frac{1}{s}$.	**Analysis**	**4**
Q. 4	**Attempt any three of the following.**		**12**
A)	Form the partial differential equation by eliminating arbitrary function f from $f(x^2 + y^2 + z^2, 3x + 5y + 7z) = 0$	**Synthesis**	**4**
B)	Solve $pz - qz = z^2 + (x+y)^2$	**Application**	**4**
C)	Determine the solution of one dimensional heat equation $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ where the boundary conditions are $u(0,t) = 0,\ u(l,t) = 0\ (t > 0)$ and the initial condition $u(x,0) = x$; l being the length of the bar.	**Analysis**	**4**
D	Use the method of separation of variables to solve the equation $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$, given that $u(x,0) = 6e^{-3x}$	**Application**	**4**
Q. 5	**Attempt the following.**		**12**
A)	Determine the analytic function $f(z)$ in terms of z whose real part is $\frac{\sin 2x}{\cosh 2y - \cos 2x}$	**Analysis**	**4**
B)	Prove that $u = x^2 - y^2 - 2xy - 2x + 3y$ is harmonic. Find a function v such that $f(z) = u + iv$ is analytic.	**Analysis**	**4**
C)	Find the bilinear transformation which maps the points $z = 0, -1, -i$ onto the points $w = i, 0, \infty$. Also, find the image of the unit circle $\|z\| = 1$.	**Analysis**	**4**
Q. 6	**Attempt the following.**		**12**

A)	Use Cauchy's integral formula to evaluate $\oint_C \frac{\sin\pi z^2 + \cos\pi z^2}{(z-1)(z-2)}\, dz$, where C is the circle $\|z\| = 3$.	**Evaluation**	**4**
B)	Find the poles of function $\frac{z^2-2z}{(z+1)^2(z^2+4)}$. Also find the residue at each pole.	**Analysis**	**4**
C)	Evaluate $\oint_C \frac{e^z}{\cos\pi z}\, dz$, where C is the unit circle $\|z\| = 1$.	**Evaluation**	**4**
	***** Paper End *****		

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DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

End Semester Examination – December 2019

Course: B. Tech in Chemical/Petrochemical Engineering **Sem: III**

Subject: Chemical Process Calculations (BTCHC302) **Marks: 60**

Date: 12/12/2019 **Duration:- 3 Hr.**

Instructions to the Students:

1. **Answer any five questions**
2. **Necessary data required is provided in the respective questions**

		(Level/CO)	Marks
Q. 1	**Answer the following.**		
(A)	The heat transfer coefficient for a stream to another is given by $h=16.6C_pG^{0.8}/D^{0.2}$ Where h = Heat transfer coefficient in $Btu/(h)(ft)^2(^0F)$ D = Flow diameter, in G = Mass velocity, $lb/(s)\ (ft)^2$ C_p = Specific heat, $Btu/\ (lb)\ (^0F)$ Convert this equation to express the heat transfer coefficient in $kcal/(h)(m)^2(^0C)$ With D= flow diameter in m, G= mass velocity in $kg/(m)^2s$ And Cp = Specific heat, $kcal/\ (kg)\ (^0C)$.	Apply	**06**
(B)	Differentiate between steady state and unsteady state mass balance.	Remember	**02**
(C)	A solution of caustic soda in water contains 20% NaOH by weight. The density of solution is 1196 kg/m^3. Find the Molality and Molarity of the solution.	Apply	**04**
Q.2	**Solve the following.**		
	A mixture of NH_3 and air at 730 mm Hg and 30 °C contains 5.1 % NH_3. The gas is passed through an absorption tower at the rate of 100 m^3/hr where NH_3 is removed. The gases leave the tower at 725 mm Hg and 20 °C having 0.05% NH_3. Calculate (a) the rate of flow of gas leaving the tower and (b) weight of NH_3 absorbed in kg/hr. **OR** The waste acid from nitrating process contains 23% HNO_3; 57% $H2SO_4$; 20% water. This acid is to be concentrated to 27% HNO_3, 60% % $H2SO_4$ by addition of 93% $H2SO_4$ and 90% HNO_3. Calculate the weight of acids needed to obtain 1000kg of desired acid.	Evaluate	**12**
Q.3	**Solve <u>any two</u> of the following.**		
(A)	Natural gas has the following composition in volumetric percent: CH_4 – 80%; C_2H_6 – 15%; N_2 – 5% Calculate (a) composition in weight %, (b) average molecular weight, and (c) Density at standard condition.	Apply	**06**
(B)	Hypo crystals $Na_2S_2O_3$. $5H_2O$ are to be produced at a rate of 2000 kg/h. A 60% $Na_2S_2O_3$ solution is cooled to 293 K from 333 K. The solubility at 293 K is 70 parts anhydrous salt per 100 parts of water. Estimate the amount of feed needed.	Apply	**06**
(C)	A solution of organic colloids is to be concentrated from 20 to 60 percent solids in an evaporator. The evaporator must evaporate 20 000 kg of water per hour. What is the rate of feed and concentrated solutions per hour?	Apply	**06**

Q. 4 Answer the following:

An evaporator concentrates 10,000 kg/hr of 20% KNO_3 solution to 50% KNO_3. The concentrated liquor is sent to a crystallizer where crystals of KNO_3 are formed and separated. The mother liquor from the crystallizer is recycled and mixed with the evaporator feed. The recycle stream is a saturated solution containing 0.6 kg KNO_3/ kg water. The crystals carry 4% water. Compute water evaporated and crystals formed. Evaluate **12**

OR

In a process for concentration of 1000 kg of freshly extracted orange juice containing 12.5 wt % solids, the juice is strained, yielding 800 kg of strained and 200 kg of pulpy juice. The strained juice is concentrated in a vacuum evaporator to give an evaporated juice of 58 % solids. The 200 kg of pulpy juice is bypassed around the evaporator and mixed with the evaporated juice in a mixer to improve the flavor. This final concentrated juice contains 42 wt % solids. Calculate the concentration of solids in the strained juice, the kg of final concentrated juice, and the concentration of solids in the pulpy juice.

Q.5 Solve <u>any two</u> of the following.

(A) A well stirred storage vessel contains 10,000 kg of a dilute methanol solution having a methanol concentration of 5% (by wt). A constant flow of 500 kg/min of pure water is suddenly introduced into the tank and a constant rate of withdrawal of 500 kg/min of solution is started. These two flows are continued and remain constant. Calculate the time required for the alcohol to drop to 1.0 % (by wt). Also, calculate the concentration of methanol in the tank after one hour. Apply **06**

(B) A butane isomerization process produces 70 kmol/h of pure isobutane. A purge stream removed continuously contains 85% n butane and 15% impurity (mole %). The feed stream is n-butane containing 1% impurity (mole %). If once through conversion is 70%, find the flow rates of the feed, purge and recycle streams. Apply **06**

(C) In the Deacon process for manufacturing chlorine, hydrochloric acid gas is oxidized with air. The reaction taking place is: $4\,HCl + O_2 \rightarrow 2\,Cl_2 + 2\,H_2O$. If the air is used in excess of 30% of that theoretically required, and if the oxidation is 80% complete, calculate the composition by volume of dry gases leaving the reaction chamber. Apply **06**

Q.6 Answer the following.

(A) Heat capacity of air can be approximately expresses as $Cp = 26.693 + 7.365 \times 10\text{-}3\ T$ where Cp is in J/(mol)(K) and T is in K. Find the heat given off by 1 mole of air when cooled at 1 atmospheric pressure from 500 °C to -100 °C. Apply **06**

(B) One mole of methane undergoes complete combustion in a stoichiometric amount of air. The reaction proceeds as $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$. Both the reactants and the products are in gas phase. $\Delta H°_{298} = -730$ kJ/mol of methane. If the average specific heat of all the gases/vapour is 40 J/(mol k), Find the maximum temperature rise of the exhaust gases in °C. Apply **06**

*****Paper End *****

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Winter End Semester Examination – 2019

Course: B. Tech in Chemical/Petrochemical Engineering **Sem: III**

Subject Name: Fluid Flow Operation(BTCHC303) **Marks: 60**

Date: 14/12/2019 **Time: 3 Hrs.**

Instructions to the Students:

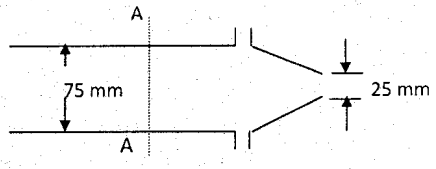
1. Solve ANY FIVE questions out of the following.

2. The level question/expected answer as per OBE or the Course Outcome (CO) on which
the question is based is mentioned in front of the question.

3. Use of non-programmable scientific calculators is allowed.

4. Assume suitable data wherever necessary and mention it clearly.

		(Level/CO)	*Marks*
Q. 1	Solve the following.		2x6=12
A)	State Bernoulli equation without friction. Explain corrections made to this equation for its practical use.	Remember	
B)	Determine the discharge through the nozzle fitted at end of pipe, through which water is discharged into atmosphere. Pressure at plane AA is 1.2 M Pa, neglect friction loss.	Apply	



Q. 2	Solve the following.		2x6=12
A)	Derive the Hagen Poiseuolli Equation and prove that $f = 16 / (NRe)$, for laminar flow.	Remember	
B)	Water is to be pumped from pond to top of the hill 30m above the water level in pond It is desired to deliver water at rate 0.35 m3/min.and at a pressure 2.0 Kg/cm2.The pipe line consists of 750m length of straight pipe having dia.7.5cm in the pipeline there are 8 elbows 10 bends 2 globe valves and 2 gate valves calculate hp of pump required if efficiency of pump is 65% Data: Equivalent length for one elbow = 30xD Equivalent length for one bend = 8xD Equivalent length for one gate valve=7xD Equivalent length for one globe valve=250xD	Apply	

Q. 3 Solve Any One of the following. 1x12=12

A) i) Explain the flow of incompressible fluid through sudden contraction and derive equation for head loss — Remember

ii) Define friction factor and with sketch explain friction factor chart i.e. Moody's diagram. — Remember

B) i) What is fluidization? State applications of fluidization. — Apply

ii) A tubular catalytic reactor is to be back washed with water. The bed height of spherical catalytic particles is 250 cm. the diameter of particles is 6 mm and density is 1400 kg/m3 . Calculate the Reynolds Number and minimum fluidization velocity. — Analyzing

Data: $\mu = 0.86$ cp, $\Phi s = 1.0$, $\varepsilon m = 0.4$

Q. 4 Solve the following. 2x6=12

A) What are Positive displacement and Centrifugal pumps? Explain with sketch Reciprocating pump. — Remember

B) A solution of specific gravity 1.5 is drawn from a large storage tank through a pipe of 70 mm ID. The average velocity in suction line is 1.25 m/s the pump discharges through 50 mm ID pipe. The end of discharge line is at 30 m above the level of solution in feed tank. Friction loss in entire piping system amounts to 7.5 m head of solution. If efficiency of pump is 60% — Apply

a. Calculate power required
b. Calculate pressure required to develop by the pump.

Q. 5 Solve the following. 1x12=12

A) i) Differentiate between variable head meter and variable area meter. Explain with sketch working of Rotameter. — Understand

ii) A sharp edged orifice having diameter of 0.0566 m is inserted in a 0.1541m I.D. pipe carrying oil having density 878 kg/m3. Measured pressure difference across orifice is 93.2 KN/m2 Evaluate Volumetric flow rate, assume Co = 0.61 — Analyzing

Q. 6 Solve Any One of the following. 1x12=12

A) i) State Power number, Froud number and Reynolds Number in agitation. — Remember

ii) A tank 1 m diameter and height 1.5 m is filled to a depth 1.1m with latex having viscosity 9 cp. and density 800 kg/m3. A three blade propeller 300 mm diameter is installed in which turns at 250 RPM. Determine power required for agitation. — Apply

Data : At NRe = 30000 , Np = 4.2
NRe = 31875 , Np = 4.0
NRe = 33750 , Np = 3.6

B) i) What is NPSH? Why NPSH (Available) should be greater than NPSH (Required)? — Remember

ii) A differential pressure is measured by a simple U tube manometer across an orifice. Manometer is filled with CCl4 and through the orifice water is flowing. If manometer reads 27cm , calculate ΔP. (ρ CCl4 = 1600 Kg / m3). If pressure in upstream leg of manometer is 1.8 atm, calculate downstream leg pressure in Pascal. — Apply

----------Paper End----------

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AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Winter End Semester Examination – Dec.2019

Course: B. Tech. in Chemical/**Petrochemical Engineering** **Sem: III**

Subject Name: Mechanical Operations **Subject Code: BTCHC304**

Max Marks: 60 **Date:- 17/12/2019** **Duration:- 3.00Hr.**

Instructions to the Students:
1. Each Question carries 20 Marks.
2. Attempt any Three questions from the following
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is observed to be missing, you may appropriately assume it and should mention it clearly

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Que	Solve the following Questions	(Level/ CO)	Marks
Q.1	a) Differentiate between unit operation and unit process. What are the basic unit operations involved in chemical industries and discuss the functional role of ANY TWO	CO2	**06**
	b) Give an account of the fluid energy mill used in size reduction with schematic diagram.	CO2	**06**
Q.2	a) Calculate the operating speed of the ball mill from the following data 1) Diameter of ball mill=800mm. 2) Diameter of balls = 60mm Critical speed is 55% less than critical speed and Operating speed is 40% more than operating speed.	CO4	**04**
	b) Power required to crush 100tons/hr. of limestone is 123kW. If 80% of feed passes through a 5mm screen and 80% of product passes through a 5mm screen, find out the work index of limestone.	CO2	**04**
	c) Differentiate between Open circuit and Close circuit grinding	CO2	**04**
Q.3	a) Define effectiveness, explain the factors affecting performance of screens, and one screening equipment in details.	CO2	**06**
	b) A sample of limonite is produced by crushing and screening to a 14 mesh screen. The screen analysis (in wt.%) given below. Calculate i) Capacity ii) Effectiveness of the Screen	CO4	**06**

Mesh	Feed (%)	Undersize (%)	Oversize (%)
On 4	1.3	-	20
On 8	2.0	-	28
On 14	1.0	0	28
On 28	8.5	40	24
On 48	6	30	Through 28 mesh
On 65	7	20	-

Through 100	2.9	10	

Q.4a) **ai)** Explain construction, working and application of plate & f... CO2 **04**

aii) A plate and frame press, filtering a slurry gave a total of 8... CO3 **04**
sec and 11m^3 in 3600sec, when filtration stopped. Estimate the ...
of wash water used. The resistance of the cloth can be negl...
pressure is used throughout.

OR

Q.4a) Filtration is carried out in a plate and frame filter press, with 20... CO3 **08**
and 50 mm thick, and the rate of filtration is maintained consta...
During this period, the pressure is raised to 350 kN/m^2, and o...
filtrate per cycle is obtained. At the end of the constant rate ...
continued at a constant pressure of 350 kN/m^2 for a further 18...
frames are full. The total volume of filtrate per cycle is 0.7 m^3...
refitting of the press takes 500 s. It is decided to use a rotary dr...
and 2.2 m in diameter, in place of the filter press. Assuming that ...
cloth is the same in the two plants and that the filter cake is inco...
the speed of rotation of the drum which will result in the same ov...
as was obtained with the filter press. The filtration in the rotary f...
a constant pressure difference of 70 kN/m^2, and the filter operate...
the drum submerged in the slurry at any instant.

Q.4b) Define filtration operation, its types and differentiate in cake an... CO2 **04**
filtration

Q.5 a) Define membrane. Give the classification of membrane filtra... CO3 **06**
according to their driving forces and separation size range.

b) Explain the following term CO3 **06**
i)Fouling of membrane
ii)Molecular weight cutoff

Q.6 **Solve any three:** CO3 **04**

a) Outline the procedure to find height of thickener from batch s...

b) Define concept of swirling and vortex formation, describe the ... CO3 **04**
to prevent vortex formation.

c) A soil containing 14% moisture was mixed in large Muller mi... CO4 **04**
percent of a tracer consisting of dextrose and pictric acid. After ...
random samples were taken from the mix and analyzed for t... the
measured concentrations in the sample were ,in weig... ...ver
10.24,9.30,7.94,10.24,11.08,10.03,11.91,9.72,9.20,10.76,10.97,10.5...
Calculate the mixing Index Ip

d) Find the terminal settling velocity for particles of40-micron si... ...sphe... CO3 **04**
gravity of 2.6 falling through still water if the settling zone is la... ...particles
should be assumed to be spherical and wall effect may be neg... ...ty of
water may be taken as 1cp.

Paper End

SY

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY,LONERE

Winter End Semester Examination – Dec. 2019

Course: Second Year B. Tech **Sem: III**
Subject: Advanced Engineering Chemistry (BTBSC305/BTBSE3405A) **Marks: 60**
Date: 19/12/2019 **Duration: 3 Hr.**

Instructions to the Students:

1. Each question carries 12 marks.
2. Attempt any five questions of the following.
3. Illustrate your answers with neat sketches, diagrams etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it.

		(Level /CO)	Marks
Q.1	**Solve Any Two of the following.**		
	a] Write a note on Galvanic corrosion.	01	06
	b] What is Cathodic protection? Explain methods to minimise the rate of corrosion.	01	06
	c] Explain Proper Designing method to prevent corrosion.	01	06
Q.2	**Solve Any Two of the following**		
	a] Explains the different laws of Photochemistry.	02	06
	b] What are Thermal reactions? Give mechanism of Cope reaction.	02	06
	c] Explain the term Fluorescence and Phosphorescence with the help of a Jablonski diagram.	02	06
Q.3	**Solve Any One of the following**		12
	a] Describe Addition polymerisation and Co-polymerisation Reaction.	03	
	b] Explain in details Moulding of plastics by Injection method.	03	
Q.4	**Solve Any Two of the following**		
	a] Write a short note on: Carbocation and Carbanion.	04	06
	b] Explain the mechanism of the following reaction. (i) Beckmann Rearrangement (ii) Orton Rearrangement.	04	06
	c] Explain Homolytic and Heterolytic bond fission with suitable example.	04	06
Q.5	Solve **Any Two** of the following		
	a] Explain the laws of Absorption. [i] Lamberts law [ii] Beers law [iii] Beer-Lamberts law.	05	06
	b] Explain the instrumentation and working of Infrared (IR) Spectrophotometer.	05	06
	c] Explain the instrumentation of single beam UV-Visible Spectrophotometer.	05	06
Q.6	Solve **Any Two** of the following.		
	a] Write a note on Adsorption Chromatography and Partition Chromatography.	06	06
	b] Explain Instrumentation and Applications of Thermo gravimetric analysis.	06	06
	c] Explain principle and components of Thin Layer Chromatography.	06	06

SY

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE - RAIGAD -402 103
Semester Examination - Winter- 2019

Branch: B. Tech in Chemical Engineering **Sem.:- III**

Subject with Subject Code: - Renewable Energy Sources (BTCHE306B)

Marks: 60 Date:- **21/12/ 2019** **Time:- 3 Hr.**

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Instructions to the Students

1. Each question carries 12 marks.
2. Attempt **any five** questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., **wherever necessary.**
4. If some part or parameter is noticed to be missing, you may **appropriately assume** it and should mention it clearly

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Marks

Q.1 Solve any Two of the following. **12**

A) Define renewable energy sources. List out renewable energy sources available in India.

B) What are the various types of biomass conversion technologies? Explain any one in brief

C) What are the components of biogas? List out the factors affecting generation of biogas.

Q.2 Solve the following. **12**

A) Give the types of Pyranometer. Explain Eppley Pyranometer with neat figure

B) Determine sun set hour angle and day length at location of latitude 32^0 on March 30

Q.3 Solve any Two of the following. **12**

A) Discuss in brief about basic principle of wind energy conversion and derive the wind power formula.

B) Explain with block diagram : Components of wind energy conversion system

C) Give the applications of wind energy in detail.

Q.4 Solve any one of the following. **12**

A) What is OTEC? What is its basic principle? Explain open cycle and closed cycle system with neat schematic.

B) A tidal power plant of single-basin type has a basin area of 24 km^2. The tide has a range of 10 m. The turbine stops operation when the head on it falls below 3m. Calculate the average power generated during one filling/emptying process in MW if the turbine-generator efficiency is 75 percent.
Data: Density of sea water = 1025 kg/m^3; g = 9.8 m/s^2.

Q.5 Solve the following. **12**

A) With neat flow sheet, Explain hybrid geothermal power plant.

B) What are the various types of hydrothermal resources? Give an account of vapor dominated system.

Q.6 Solve any one of the following. **12**

A) Explain in detail about : Hydrogen production and Hydrogen storage

B) Give the applications of geothermal energy, solar energy and biomass energy in detail

**********End of Paper **********