

2014/Ch/87. - 320(N)

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(21214) Roll No. ....

B.Tech.-III Sem.

TU-352

B.Tech. Examination, Dec. 2014

C.H. Branch

Engineering Chemistry

BT-320(N)

Time : Three Hours / [Maximum Marks : 100]

**Note:** Attempt any **five** questions. **All** questions carry equal marks.

1. Discuss the mechanism of the following reactions: 5×4
  - (a) Benzoin condensation
  - (b) Hoffmann bromide reaction
  - (c) Knoevenagel reaction
  - (d) Wittig reaction
2. (a) Describe the reduction of nitrobenzene in different mediums. 8

P.T.O.

2

(b) What is diazotization? Arylamines are diazotized but not alkylamines why? Describe the preparation of at least four compounds from benzene diazonium chloride.

2+2+8

3. Discuss  $(4n+2)$   $\pi$  electrons rule for the aromaticity with suitable examples. Describe the applications for the preparation of different types of compounds from Grignard reagent.

4+16

4. Describe the various terms used in conformational analysis. Discuss the conformation of cyclohexane and 1,2 disubstituted cyclohexane.

Explain stereoselective and stereo specific reactions with examples.

14+6

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5. (a) Define the term surface tension along with its unit. Describe its determination by Traube's method and applications.

2+8

(b) What are the colloids? Give any two methods for its preparations. Describe dialysis method for its purification. Discuss Hardy and Schulz's rules as well as electrophoresis for role.

2+2+6

6. Name the different colligative properties with their brief description. Determine the lowering in vapour pressure by Ostwald and Walker's method.

6+8

An aqueous solution of a non-volatile solute boils at  $100.17^{\circ}\text{C}$ . At what temperature would it freeze? for water  $k_b = 0.52 \text{ K kg mol}^{-1}$  and  $K_f = 1.86 \text{ K kg mol}^{-1}$

6

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P.T.O.

- (1)
7. (a) What are equivalent and molar conductance's? Describe conductometric titrations for acids and bases along with its merits. 2+8
- (b) Describe atomic absorption spectroscopy in detail. 10
8. What is chromatography? Describe its different types. Discuss GLC and HPLC along with their applications. 2+4+14
9. What are amino acids and how are proteins synthesized from these? Explain nucleosides and nucleotides. Discuss the structure of Proteins. 4+4+12
10. What are carbohydrates? Discuss their classification. Describe the formation of osazone of glucose and fructose. Discuss the open and closed chain structure of glucose. 2+2+4+12



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B.Tech. III Sem.

**TU-358**

**B.Tech. Examination, Dec - 2014**

**EC, EI, CH Branches**

**Human Values & Professional Ethics**

**BT-326(N)**

*Time : Two Hours ]*

*[ Maximum Marks : 50*

**Note:** Attempt any **five** questions out of the following.

1. Critically examine our state today in terms of fulfilment of relationships and physical facilities. What has gone wrong according to you? What is the solution?
2. "I will learn and improve only if I am unhappy. If I become happy, my learning will stop." Explore the validity of this view point.

10

P.T.O.

3. What do you mean by the statement "Human being is more than just the body"? Distinguish between the needs of the self and the needs of the body. 10
4. "The problem today is that the desires, thoughts and expectations are largely set by pre-conditionings or sensations" Examine this statement. 10
5. Indicate a few feasible steps to promote harmony in the society and co-existence with nature. 10
6. What exactly is implied by the term-nature? What are the four orders in nature? Explain. 10
7. Where is the scope of development in nature? How have we come to wrongly place our developmental programs? 10

8. What is ethical human conduct? Explain it in terms of values, policies and character. 10
9. What do you mean by universal human order? What are its implications on the different dimensions of a society? 10
10. What do you mean by 'Profession'? Why is it required to acquire ethical competence in profession? 10

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B.Tech. III Sem.

TU-372

B.Tech. Examination, Dec. 2014

CH Branch

Electrical Measurement &amp; Measuring Instrument

BT-314(N)

Time : Three Hours ]

[Maximum Marks : 100

**Note:** Attempt all **five** questions. As per instructions given in each question separately.

Answer any **four** parts of the following:

5×4=20

1. (a) Explain the Following terms:
  - (i) Accuracy
  - (ii) Precision
  - (iii) Reproducibility
  - (iv) Resolution
  - (v) Range
- (b) What is meant by burden of current transformer?

P.T.O.



- (c) What is the principle of working of flux meter?
- (d) Discuss the working of any one type of digital voltmeter with block diagram.
- (e) Discuss how CRO can be used for frequency and phase displacement measurement?
- (f) Explain the working of electron resonance type power factor meters.

2. Attempt any **two** parts of the following:

$$2 \times 10 = 20$$

- (a) Describe the construction and working of a co-ordinate type a.c. potentiometer. How is it standardized? Explain how an unknown voltage can be measured with it?
- (b) A current transformer with a bar primary has 300 turns in its secondary winding the resistance and reactance of secondary circuit are  $1.5 \Omega$  and  $1.0 \Omega$  respectively including the transformer winding with 5A flowing in the secondary winding the magnetizing mmf is 100 A and the iron loss is 1.2 W. Determine the ratio and phase angle error.

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- (c) What are the different factors which affects the precision measurement of medium resistances with Wheatstone bridge? Explain how their effects are minimized?

3. Attempt any **two** parts of the following:

$$2 \times 10 = 20$$

- (a) Derive the equation of balance for modified De-sauty bridge. Draw the phasor diagram for balance condition.
- (b) A galvanometer with an undamped period of 8 seconds and a current sensitivity of  $1.1 \text{ mA/div.}$  is connected to a search coil in a circuit of  $3500 \Omega$  resistance. Determine the flux linkage change in search coil to produce a first swing of 80 divisions if the logarithmic decrement is 0.18.
- (c) Explain analog and digital modes of operation of instruments. Explain how the resolution of digital instruments can be increased.

4. Attempt any **two** parts of the following:

$$2 \times 10 = 20$$

- (a) Explain clearly the difference between operating principles of integrating type and successive approximation type of digital voltmeters.

P.T.O.

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- (b) Describe the principle of working and circuit diagram of digital oscilloscope, Also discuss the advantage and disadvantages of digital oscilloscope.
- (c) In a CRT, the anode to cathode voltage is 2500V. the parallel deflection plates are 1.5 cm. long and space 5mm. The screen is 50 cm. from the centre of deflecting plates. If mass of electron is  $9.109 \times 10^{-31}$  kg and charge on electron  $1.602 \times 10^{-19}$  C, find (i) the beam speed (ii) the deflection sensitivity of the tube.
5. Attempt any **two** part of the following:
- $2 \times 10 = 20$
- (a) Describe the construction and working of wave analyzers used for audio frequency and megahertz ranges.
- (b) Explain briefly with the help of neat diagrams the use of electronic multimeter.
- (c) Explain the operation of a flux meter. How does a flux meter differ from a Ballistic Galvanometer?

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B.Tech. III Sem.

**TU-373**

B.Tech. Examination, Dec. 2014

CH Branch

Fluid Mechanics

BT-315(N)

Time : Three Hours ]

[Maximum Marks : 100

**Note :** (i) Attempt any **five** questions.

(ii) All questions carry equal marks.

1. (a) A 15 cm long cylinder metal rod slides inside a tube filled with oil. The inner diameter of tube is 5 cm and clearance is 0.05 mm, the mass of bar is 0.5 kg, when immersed in oil. What is the viscosity of oil, if steady state velocity of the rod is 0.1 m/s.

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P.T.O.

above the centre line of pipe, consider all minor losses and take  $f = 0.009$ . 20

9. (a) Explain the characteristic curve of pump with physical significance of characteristic curve. 10
- (b) Differentiate the single and double acting reciprocating pumps. 10
10. (a) How pumps are classified? Discuss the difference between brake horse power and water horse power. Also, define the pump efficiency in terms of these quantities. 10
- (b) Define Net positive suction head (NPSH) and write these equation for the actual NPSH. How is NPSH used to ensure that cavitation doesn't occur in a pump? 10

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B.Tech. III Sem.

**TU-79**

**B.Tech. Examination, Dec - 2014**

**C.E. Branch**

**Applied Engineering Chemistry**

**BT-315**

*Time : Three Hours*

*[ Maximum Marks : 100 ]*

**Note:** Attempt any **five** questions. All questions carry 20 marks each.

1. Discuss any **two** of the following reactions with their mechanism: 20
  - (i) Reformatsky Reaction
  - (ii) Wittig Reaction
  - (iii) Hofmann Bromide Reaction
  - (iv) Benzoin Condensation

P.T.O.



2. How is nitrobenzene prepared in laboratory?  
Give the reduction of nitrobenzene under different conditions. 20
3. What are phenols? Describe its preparation and properties. How do they differ from alcohols? 20
4. Write down the preparations, properties and structure of Lithium aluminium hydride. 20
5. What is catalysis? Discuss briefly Acid-base catalyzed reactions, Enzyme catalyzed reactions and Heterogeneous catalyzed reactions. 20
6. Write an essay on Adsorption-isotherms. 20
7. What is osmotic pressure? How is it determined? How is molecular weight determined by its help. 20

8. Describe the general methods of preparations and properties of colloids. 20
9. Give a brief introduction and applications of conductometric titration. 20
10. Write a short account on RNA and DNA both. 20

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B.Tech.-III Sem.

**TU-80****B. Tech. Examination, Dec. 2014****C.E.****Process Calculation****(BT-316)***Time : Three Hours ]**{Maximum Marks : 100*

**Note :** Attempt any **five** of the following questions. Each question carry equal marks. Use of scientific calculator (Not Programmable) is allowed. Humidity chart can be used.

1. A 40 ml sample of a mixture of  $H_2$  and  $O_2$  was placed in a vessel at 291K ( $18^\circ C$ ) and 101.325 kpa. A spark was applied so that the formation of water was complete. The remaining pure gas had a volume of 10 ml

P.T.O.

at 291k (18°C) and 1101.32 kpa pressure.  
If the remaining gas was  $H_2$ , what was the  
initial mole %  $H_2$  in the mixture. 20

2. (a) Define : 10

- (1) Daltons Law
- (2) Amagat's Law
- (3) Raoult's Law
- (4) Henry's Law

(b) When 2g of gas A is introduced into a  
evacuated flask at 298k (25°C), the  
pressure is found to be 101.325 kpa. If  
3g of another gas B is then added to  
the same flask, the total pressure be-  
comes 151.986 kpa. Assuming ideal  
Behaviour, Calculate the Ratio of mol.  
weights as  $N_A : N_B$ . 10

3. A spent solution of chloroacetic acid  
[ $CH_2ClCOOH$ ] in ether [ $C_2H_5OC_2H_5$ ] contains  
20 mole% chloroacetic acid. It is derived to  
prepare 500Kg of saturated solution at 298K  
(25°C). Calculate the quantities of spent

TU-80\60\2

solution and chloroacetic acid that are required  
to make the above solution. The solubility  
of chloroacetic acid in ether at 298K (25°C)  
is 190g per 100g.

4. In the preparation of working liquor for a sul-  
phite pulp mill, an absorption tower is used  
for absorbing  $SO_2$  in a weak liquor. The weak  
liquor enters the tower at a rate of 20l/s  
from top with  $SO_2$  concentration of 0.5%  
by weight and leaves from bottom with  $SO_2$   
concentration of 1% by weight. The gas  
steam entering the bottom of the tower con-  
tains 17% by volume  $SO_2$ . Where the gas  
leaves the tower from top, 75% of  $SO_2$  gets  
absorbed. The pressure in the tower be-  
comes 50kpa g and operates isothermally  
at 308K (35°C). Assuming that the liquor  
has a sp. gravity of 1 calculate :

- (a) Molar flow rate of entering gas and
- (b) Volumetric flow rate of entering gas.

TU-80\60\3

P.T.O.



5. (a) Wet solids containing 50% water and 50% solids are to be dried to get solids with 5% water by weight. Fresh air contains 0.01Kg water vapour per kg dry air and the air leaving the dryer contains 0.05Kg water vapour per Kg dry air. If 100 Kg of dry air enters the dryer for every kg of dry solids, calculate the quantity of fresh air and the fraction of air recirculated and Recycle Ratio. 10
- (b) The waste acid from a nitrating process contains 30%  $H_2SO_4$ , 35%  $HNO_3$  and 35%  $H_2O$  by weight. The acid is to be concentrated to contain 39%  $H_2SO_4$  and 42%  $HNO_3$  by addition of concn. sulphuric acid containing 98%  $H_2SO_4$  and concn. nitric acid containing 72%  $HNO_3$ . Calculate the quantities of three acids to be mixed to get 1000kg of desired mixed acid. 10

TU-8016014

6. (a) Discuss the following terms : 10
- Dew point → DBT
  - Relative humidity → AST
  - Yield and selectivity
- (b) A storage tank contains 10,000kg of a solution containing 5% acetic acid by weight. A fresh feed of 500 Kg/min. of pure water is entering the tank and dilutes the soln. in the tank. The mixture is stirred well and the product leaves the tank at the rate of 500kg/min. At what instant of time the acid concn. the tank will drop to 1% acetic acid by weights. After one hour of operation what will be the concn. in the tank? 10
7. (a) A tank contains 10 kg of salt at a concn. 2% by weight. Fresh soln. enters the tank at a rate of 2Kg/min. at a salt concn. of 3% by weight. The contents are stirred well and the mixture leaves

TU-8016015

P.T.O.

the tank at a rate of 1.5 Kg/min. Express the salt concn. as a function of time.

10

- (b) A mixture of dry flue gases and acetone at a pressure of 750 mm Hg has a dew point of  $25^{\circ}\text{C}$ . It is proposed to condense 90% of acetone by cooling to  $5^{\circ}\text{C}$  and compressing. Calculate the final pressure in psl. For acetone vapour pressure at  $25^{\circ}\text{C}$  and  $5^{\circ}\text{C}$  are 229.2 mm and 89.1 mm Hg.

10

8. A gas analysing  $\text{CO}_2=5.5\%$ ,  $\text{CO}=25\%$ ,  $\text{H}_2=14\%$ ,  $\text{CH}_4=0.5\%$  and  $\text{N}_2=55\%$  is burnt in flurance with air which is 10% excess over that required to burn  $\text{CO}$ ,  $\text{H}_2$  and  $\text{CH}_4$  completely. Give the analysis of the product gas mixture, assuming all reactions proceed to completion.

20

TU-8016016

9. (a) The heat of reaction at 300K and 1 atm for  $\text{A(g)} + 3\text{B(g)} \rightarrow \text{C(g)}$  is  $-209.35$  KJ/mol. A reacted. The heat capacities of the compenents in J/(mol k) are  $C_p$  for A =  $-1.6748 + 33.496 \times 10^{-2} T$  (T is in k)  $C_p$  for B = 29.309 and  $C_p$  for C = 108.862 calculate the heat of Reaction at 500K and at 1 atm.

10

- (b) An inventor thinks he has developed a new catalyst which can make the gas phase reaction

$\text{CO}_2 + 4\text{H}_2 \rightarrow \text{CH}_4 + 2\text{H}_2\text{O}$  proceed to 100% conversion. Estimate the heat that must be provided or removed if the reactants enter and product leave at  $-500^{\circ}\text{C}$ .

Speres	$\text{CH}_4$	$\text{CO}_2$	$\text{H}_2\text{O}$
$\Delta h$ (Kcal/Kmol)	-17889	-94052	-57798
at 298K			

TU-8016017

P.T.O.

$$C_p \text{ for } CO_2 = 6.339 + 10.14 \times 10^{-3} T - 3.415 \times 10^{-6} T^2$$

$$H_2 = 6.424 + 1.039 \times 10^{-3} T - 0.078 \times 10^{-6} T^2$$

$$CH_4 = 6.47 + 3.464 \times 10^{-3} T - 0.483 \times 10^{-6} T^2$$

$$H_2O = 3.204 + 18.14 \times 10^{-3} T - 4.48 \times 10^{-6} T^2$$

10. (a) A hydro carbon is burnt with excess air.

Theorist analysis of the flue gas shows

10.81%  $CO_2$ , 3.78%  $O_2$  and 85.40%  $N_2$ .

Calculate the atomic ratio of C:H in the hydrocarbon and % excess air. 10

(b) Air at  $30^\circ C$  and 150 KPa in a closed container is compressed and cooled. It is

found that the first droplet of water condenses at 200 KPa and  $15^\circ C$ . Calculate

% Relative humidity of original 0.4. The VP of water at  $15^\circ C$  and  $30^\circ C$  are

1.7051 kPa and 4.246 kPa resp.

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B.Tech.-III Sem.

**TU-374**

**B. Tech. Examination, Dec. 2014**

**C H Branch**

**Process Calculation**

**BT-316(N)**

*Time : Three Hours / [Maximum Marks : 100*

**Note :** Attempt any **five** out of Ten. **All** questions carry equal marks.

1. (a) The available nitrogen in a urea ( $\text{NH}_2\text{CONH}_2$ ) sample is found to be 45% by weight. Find the actual urea content in the sample. 10
- (b) A solution of caustic soda in water contains 30% NaOH, by weight at  $50^\circ\text{C}$ . The density of the solution is  $1.20 \text{ Kg/l}$ . Find the Molarity and normality of the solution. 10

**P.T.O.**

2. (a) Calculate the total pressure exerted by the Vapors which are in contact with a solution at  $100^{\circ}\text{C}$  containing 36%  $(\text{C}_6\text{H}_6)$  benzene, 40% toluene,  $(\text{C}_6\text{H}_5\text{CH}_3)$ , and 24% O-xylene  $(\text{C}_6\text{H}_4(\text{CH}_3))$  by weight.

Benzene = 1340 mm Hg

Toluene = 560 mm Hg

O-xylene = 210 mm Hg

10

- (b) What do you understand by fundamental quantity and derived quantities? 5
- (c) Write Dalton law and Amagat's law. 5
3. (a) What do you understand by Conversion, yield, selectivity and excess reactant. 10
- (b) A Combustion chamber is fed with butane and excess air. Combustion of butane is complete. The composition of combustion gases on volume basis is given below :
- $\text{CO}_2 = 9.39\%$ ,  $\text{H}_2\text{O} = 11.73\%$ ,  
 $\text{O}_2 = 4.70\%$ ,  $\text{N}_2 = 74.18\%$
- find % excess air used and mole ratio of air to butane used. 10

TU-374112012

4. (a) Explain the following : 10

- (i) Wet bulb temperature
- (ii) Dry bulb temperature
- (iii) Relative humidity
- (iv) Dew Point
- (v) Adiabatic saturation temp.

- (b) The dry bulb temperature and dew point of ambient air were found to be  $30^{\circ}\text{C}$  and  $20^{\circ}\text{C}$  calculate. 10

- (i) Molal Humidity
- (ii) Absolute Humidity
- (iii) Percentage Humidity
- (iv) Relative Humidity

5. (a) A wet Paper Pulp is found to contain 71% water. After drying it was found that 60% of original water has been removed calculate. 10

- (i) Composition of dried pulp
- (ii) The amount of water removed per kg of wet pulp.

- (b) Write the merits and demerits of recycling and bypassing operation. 10

6. Explain the followings : 20

- (i) Effect to temperature on heat of formation.

TU-374112013

P.T.O.



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(ii) Effect of temperature on heat of reaction.

7. Calculate the standard heat of reaction of the following : 20



The heat of combustion is given as follows at standard conditions :

$$\text{C}_2\text{H}_5\text{OH}, \Delta H^\circ_{\text{C}} = -326700 \text{ Cal}$$

$$\text{CH}_3\text{COOH}, \Delta H^\circ_{\text{C}} = -208340 \text{ Cal}$$

$$\text{C}_2\text{H}_5\text{OOCCH}_3, \Delta H^\circ_{\text{C}} = -538760 \text{ Cal}$$

8. Explain the steps for solving the unsteady state material balance problem. 20

9. A square tank 4m on a side and 10 m high is filled to the brim with water. Find the time required for it to empty through a hole in the bottom .5 cm<sup>2</sup> in area. 20

10. It is desired to have a mixed acid containing 40% HNO<sub>3</sub>, 43% H<sub>2</sub>SO<sub>4</sub> and 17% H<sub>2</sub>O by weight. Sulphuric acid of 98% by weight is readily available. Calculate

(a) The strength of nitric acid and

(b) The wt. ratio of sulphuric acid to nitric acid. 20



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B.Tech. III Sem.

**TU-81**

**B.Tech. Examination, Dec. 2014**

**C.E. Branch**

**Mechanical Operations**

BT-317

*Time : Two Hours ]*

*[Maximum Marks : 50*

**Note:** Attempt any **Five** of the following questions. Each question carry equal marks. Use of scientific calculator (Non Programmable) are allowed.

1. (a) Give the classification of unit operations. Discuss the role of unit operations in the Chemical Process Industries. 5
- (b) What should be the diameter of a set of rolls to take feed of size equivalent to 38mm spheres and crush to 12.7mm if the coefficient of friction is 0.35? 5

P.T.O.

2. (a) Define the following: 5

- (i) Mesh Number of a screen
- (ii) Equivalent diameter of a particle
- (iii) Santer-Mean diameter
- (iv) Cumulative screen analysis

(b) Calculate the equivalent diameter and sphericity of the following particles: 5

- (i) A cubical particle of side 2cm.
- (ii) A hollow cylindrical particle of diameters, outer and inner, 2cm and 1 cm and length 3 cm.
- (iii) A conical solid of dia. 2mm & height 5mm.

3. (a) Discuss the various size reduction techniques used. Also mention the size reducing Machines. 5

(b) Discuss the various laws of crushing. 5

TU-81\60\2

4. (a) What rotational speed in revolutions per minute, would you recommend for a ball mill of 1200mm in diameter charged with 75mm balls? Show how you arrived to the conclusion. 5

(b) Write the construction and working principle of gyratory crusher with proper diagram. 5

5. (a) Discuss the working and constructional details of belt conveyors. 5

(b) Write short notes on different weighing equipments used. 5

6. (a) Discuss the utility of piles, hoppers and silos. 5

(b) Write the working and constructional details of an apron conveyor. 5

7. (a) Give the construction details of a gravity thickener with proper diagram. 5

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P.T.O.

- (b) Derive the Expression for rate of filtration at constant pressure. 5
8. (a) Explain the working and construction of a cyclone separator briefly. 5
- (b) What do you understand by screening? Mention any one screening equipment briefly. 5

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B.Tech. III Sem.

TU-351

B.Tech. Examination, Dec. 2014

CH Branch

Mechanical Operations

BT-317(N)

Time : Two Hours ]

[Maximum Marks : 50]

**Note:** (1) Attempt **all** questions.

(2) Assume any data (If Missing) in numerical problems.

1. (a) State and explain the different laws of size reduction with the importance of the work index in the size reduction.

10

**OR**

- (b) Define Minimum fluidization velocity. Describe various types of fluidization.

10

P.T.O.



- 1/12
2. (a) Explain filter medium resistance and derive mathematical expression for constant pressure filtration. 10

**OR**

- (b) Explain various methods used for sub sieve analysis. 10
3. (a) Define agitation and mixing. Explain different types of flow patterns induce in an agitated vessel (liquid). 10

**OR**

- (b) Explain in detail plate and frame press with its neat diagram, Also explain its Advantages and Limitations. 10
4. (a) Explain the Principle of Ribbon Blender and muller mixer with their different industrial applications. 10

**OR**

- (b) Explain hindered settling in detail with its modified equation. Also explain the criteria of settling regime. 10

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5. (a) A ball mill of diameter 2000 mm uses steel balls of 100mm diameter for grinding rocks. The ball mill operates at 15 rpm. At what speed will the mill have to be run if the 100mm balls are replaced by 50 mm balls, All the other conditions remaining the same. 10

**OR**

- (b) A set of crushing roll used to crush rock has rolls of 150cm diameter by 50cm width of face and rolling at 100 RPM. They are set so that the crushing surfaces are 1.25cm apart at the narrowest point. The angle of Nip  $30^\circ$ . What is the maximum permissible size of the feed? Also calculate the theoretical capacity of the crusher. Sp. gravity of rock = 2.4 10

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B.Tech. III Sem.

**TU-351**

**B.Tech. Examination, Dec. 2014**

**CH Branch**

**Mechanical Operations**

**BT-317(K)**

*Time : Two Hours ]*

*[Maximum Marks : 50*

**Note:** (1) Attempt **all** questions.

(2) Assume any data (If Missing) in numerical problems.

1. (a) State and explain the different laws of size reduction with the importance of the work index in the size reduction.

10

**OR**

- (b) Define Minimum fluidization velocity. Describe various types of fluidization.

10

P.T.O.

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2. (a) Explain filter medium resistance and derive mathematical expression for constant pressure filtration. 10

OR

- (b) Explain various methods used for sub sieve analysis. 10
3. (a) Define agitation and mixing. Explain different types of flow patterns induce in an agitated vessel (liquid). 10

OR

- (b) Explain in detail plate and frame press with its neat diagram, Also explain its Advantages and Limitations. 10
4. (a) Explain the Principle of Ribbon Blender and muller mixer with their different industrial applications. 10

OR

- (b) Explain hindered settling in detail with its modified equation. Also explain the criteria of settling regime. 10

5. (a) A ball mill of diameter 2000 mm uses steel balls of 100mm diameter for grinding rocks. The ball mill operates at 15 rpm. At what speed will the mill have to be run if the 100mm balls are replaced by 50 mm balls, All the other conditions remaining the same. 10

OR

- (b) A set of crushing roll used to crush rock has rolls of 150cm diameter by 50cm width of face and rolling at 100 RPM. They are set so that the crushing surfaces are 1.25cm apart at the narrowest point. The angle of Nip  $30^\circ$ . What is the maximum permissible size of the feed? Also calculate the theoretical capacity of the crusher. Sp. gravity of rock = 2.4 10