THIRD SEMESTER B.TECH DEGREE EXAMINATION

(2013 Scheme)

13.301 ENGINEERING MATHEMATICS-II (ABCEFHMNPRSTU)

MODEL QUESTION PAPER

Time: 3 hours   Maximum marks: 100

PART-A

*Answer **all** questions. **Each** question carries 4 marks*

1. A particle moves so that its position vector is given by

    $\vec{r} = coswt\ \hat{\imath} + sinwt\ \hat{\jmath}$, show that the velocity $\vec{V}$ of the particle is perpendicular to $\vec{r}$.

2. If $f(x) = x$, $o < x < \frac{\pi}{2}$

    $= \pi - x$, $\frac{\pi}{2} < x < \pi$. Show that $f(x) = \frac{4}{\pi}\left(sinx - \frac{sin3x}{3^2} + \frac{sin5x}{5^2} - \cdots\right)$

3. Find the cosine transform of $f(x) = sinx$ in $0 < x < \pi$.

4. Solve the partial differential equation if $\frac{\partial z}{\partial x} = 6x + 3y$; $\frac{\partial z}{\partial y} = 3x - 4y$.

5. State the assumptions involved in the derivation of one dimensional Heat equation.

PART-B

*Answer **one full** question from **each** module. **Each** question carries **20** marks.*

MODULE-I

6. a) Find the constants a and b so that the surfaces $5x^2 - 2yz - 9x = 0$ and $ax^2y + bz^3 = 4$, may cut orthogonally at the point $(1, -1, 2)$.

    b) If φ is a scalar point function, use Stoke's theorem to prove that $Curl(grad\ \varphi) = 0$.

    c) Evaluate by Green's theorem in the plane for $\int_C (y - sinx)dx + cosx\ dy$ where C is the boundary of the triangle whose vertices are $(0,0), (\frac{\pi}{2},0)\ and\ (\frac{\pi}{2}, 1)$.

7. a) If $\vec{r} = x\ \hat{\imath} + y\ \hat{\jmath} + z\ \hat{k}$ prove that $\nabla r^n = nr^{n-2}\ \vec{r}$ where $r = |\vec{r}|$.

    b) Show that $\vec{F} = e^x\left[(2y + 3z)\hat{\imath} + 2\hat{\jmath} + 3\hat{k}\right]$ is irrotational and find its scalar potential.

    c) Using divergence theorem, evaluate $\iint_S F.n\hat{}\ ds$ where $\vec{F} = 4x\hat{\imath} - 2y^2\hat{\jmath} + z^2\hat{k}$ and S is the surface bounding $x^2 + y^2 = 4, z = 0$ and $z = 3$

MODULE-II

8. a) Obtain the Fourier series of the function $f(x) = \left(\frac{\pi-x}{2}\right)^2$ in $(0,2\pi)$

b) Find the Fourier transform of $f(x) = 1$, $|x| < a$

$$= 0 , |x| \geq a$$

Hence evaluate $\int_0^\infty \frac{sinx}{x} dx$

9. a) Find the Fourier series of $f(x) = -x + 1$, $-\pi \leq x \leq 0$

$$= x + 1 \quad , \quad 0 \leq x \leq \pi$$

b) Find the Fourier cosine transform of $f(x) = e^{-4x}$ and

hence show that $\int_0^\infty \frac{cos2x}{x^2+16} dx = \frac{\pi}{8} e^{-8}$

MODULE-III

10. a) Solve the pde $\quad pxy + pq + qy = yz$.

b) Solve the pde $(D^2 - DD' + 2D'^2)z = e^{3x+4y} + \sin(x - y)$

11. a) Solve the partial differential equation $x(y^2 - z^2)p - y(z^2 + x^2)q = z(x^2 + y^2)$

b) Solve the pde $(D^2 + DD' - 6D'^2)z = ycosx$

MODULE-IV

12. a) Using the method of separation of variables, solve $\frac{\partial u}{\partial x} - 2\frac{\partial u}{\partial t} = u$ given that

$$u = 3e^{-5x} + 2e^{-3x} \text{ when } t = 0 .$$

b) A string of length l is fixed at both the ends. The midpoint of the string is taken to a height b and then released from rest in that position. Find the displacement of the string.

13. a) Solve $\frac{\partial u}{\partial t} = \alpha^2 \frac{\partial^2 u}{\partial x^2}$ subject to the condition, $u(0, t) = 0 = u(\pi, t)$ and

$$u(x, 0) = \pi x - x^2 \text{ in } (0,\pi)$$

b) A rod of length l has its ends A and B kept at 0^0C and 100^0C respectively until steady conditions prevail. The temperature at A is suddenly raised to 25^0C and at the same time that B is lowered to 75^0C and the end temperatures are thereafter maintained. Find the temperature function $U(x, t)$.

THIRD SEMESTER BTECH DEGREE EXAMINATION 2014

(SCHEME: 2013)

Branch: Chemical Engineering

13.302 PHYSICAL AND INORGANIC CHEMISTRY (H)

MODEL QUESTION PAPER

Time: 3 hours   Maximum marks: 100

PART-A

*Answer **all** questions. **Each** question carries 2 marks*

1.   What are critical constants? Explain.

2.   Explain the term critical solution temperature using phenol water system.

3.   What are isotonic solutions? A 5% solution of cane sugar is isotonic with 0.877% solution of urea. Find out the molecular weight of urea.

4.   State and explain Kohlrauches law

5.   Distinguish between physical adsorption and chemical adsorption?

6.   Draw and explain the ESR spectrum of methyl free radical.

7.   What is the principle of spectroscopy?

8.   Write notes on the stability of colloids

9.   What is zone refining? Explain.

10.   What are fats and oils?

(10 x 2 Marks = 20 Marks)

PART-B

*Answer **one full** question from **each** module. **Each** question carries **20** marks.*

MODULE - I

11.   (a) Discuss the important postulates of Kinetic theory of gases. Derive the expression $KE = 1/3nmu^2$.   (10 Marks)

  (b) Prove that elevation of boiling point is a colligative property, and find out the molecular weight of solute using this colligative property.   (10 Marks)

12.   (a) Derive Vander Waals equation for real gases. Give the relationship between the critical constants and Van der Waals constants for gases.   (10 Marks)

  (b) What is osmotic pressure? Prove that osmotic pressure is a colligative property. What are isotonic solutions?   (10 Marks)

MODULE - II

13. (a) Deduce the expression for Langmuir's unimolecular adsorption isotherm. Discuss the importance and limitations of this theory. (12 Marks)

(b) What is Ostwald's dilution formula? Explain its applications. (8 Marks)

14. (a) What is transport number? Explain the determination of transport number of ions by Hittoff's method. (12 Marks)

(b) Write notes on the following

    i)   Solubility product.

    ii)   Henderson equation (2 x 4 Marks=8Marks)

MODULE - III

15. (a) Write notes on the following:

    i)   Zeta potential (4 Marks)
    ii) Electrophorosis (3 Marks)
    iii) Electro osmosis (3 Marks)

(b) i) Distinguish between homogeneous and heterogeneous catalysis

    ii) Explain Langmuir- Hinshelwood mechanism. (2 x 5 Marks=10Marks)

16. (a) Explain the important theories of

    i)   Distillation
    ii) Fractional distillation
    iii) Steam distillation
    iv) Sublimation (3 x 4 Marks=12Marks)

(b) State and explain Nernst distribution law. How it is modified when the solute undergo association and dissociation in one of the liquids? (8 Marks)

MODULE - IV

17. (a) Explain briefly about the important aspects of Raman spectroscopy. (10 Marks)

(b) Explain the important modern methods used for drug analysis. (10 Marks)

18. (a) Explain the theory of the analysis of milk and butter. (11 Marks)

(b)Write notes on

    i)   Iodine value
    ii) Iodine-bromine value
    iii) Saponification value (3x3Marks=9 Marks)

THIRD SEMESTER BTECH DEGREE EXAMINATION 2014

(SCHEME: 2013)

Branch: Chemical Engineering

13.303 FLUID FLOW OPERATIONS I (H)

MODEL QUESTION PAPER

Time: 3 hours   Maximum marks: 100

PART-A

*Answer **all** questions. **Each** question carries 2 marks*

1.   Give two situations where continuum hypothesis fails.

2.   Show how Pascal's law can be verified in the case of a stationary fluid.

3.   Explain the term adiabatic lapse rate.

4.   Distinguish between steady state and unsteady state flow.

5.   Sketch the velocity distribution for flow of an incompressible fluid in laminar flow through circular pipes.

6.   What are the various types of roughness in pipes?

7.   Explain the concept of equivalent diameter and hydraulic radius.

8.   Write a note on Schedule Number and BWG.

9.   Briefly discuss about the limitations of centrifugal pumps.

10.   Write a note on check valves.

(10 x 2 Marks = 20 Marks)

PART-B

*Answer **one full** question from **each** module. **Each** question carries **20 marks**.*

MODULE - I

11. (a) A thin plate of very large area is placed in a gap of height 'h' with oils of viscosity μ_1 and μ_2 on the two sides of the plate. The plate is pulled at a constant velocity V. Calculate the position of the plate so that (i) the shear force on the two sides of the plate is equal, (ii) the force required to drag the plate is minimum. Assume viscous flow and neglect all end effects.   (10 Marks)

(b) A bowl of 30cm diameter rotates at a speed of 3500 rpm and the density of the liquid in the bowl is 1200 kg/m^3. Calculate the pressure difference, if the thickness of the liquid film at the wall is 3cm.   (10 Marks)

12. (a) A block of wood of specific gravity 0.7 floats in water. Determine the metacentric height of the block if its size is 2m x 1m x 0.8m. (10 Marks)

(b) If 5 m^3 of a certain oil weighs 4000 kg(f), calculate its specific weight, mass density and specific gravity. (6 Marks)

(c) Compare the compressibility of a gas for isothermal and adiabatic conditions.

(4 Marks)

MODULE - II

13. Derive Bernoulli's equation starting from the basic principles. (20 Marks)

14. (a) Given that $u = -4ax(x^2 - 3y^2)$;[ ]$v = 4ay(3x^2 - y^2)$; estimate whether these velocity components represent a physically possible two-dimensional flow, if so whether the flow is irrotational or rotational. (10 Marks)

(b) A crude oil of viscosity 0.97 poise and relative density 0.9 is flowing through a horizontal circular pipe of diameter 100mm and of length 10m. Calculate the difference of pressure at the ends of the pipe, if 100 kg of oil is collected in a tank in 30 seconds. (10 Marks)

MODULE - III

15. (a) State and explain the Buckingham's pi theorem. Why this theorem is considered superior over the Rayleigh's method for dimensional analysis? (7 Marks)

(b) For an isothermal laminar flow of an incompressible fluid through a circular pipe, derive an expression relating the local velocity and maximum velocity. (13 Marks)

16. (a) Water is flowing through a pipe of diameter 200mm with a velocity of 3m/s. Find the head loss due to friction for 5m length of pipe if the coefficient of friction is given by $f = 0.002 + 0.09\,\text{Re}^{-0.3}$. The kinematic viscosity of water is 0.01 stoke. (12 Marks)

(b) Explain the terms Reynold's stresses and Boundary layer separation. (8 Marks)

MODULE - IV

17. (a) A venturi meter having a throat diameter of 100mm is fitted into a pipeline which has a diameter of 250mm through which oil of specific gravity 0.95 flows. The pressure difference between the entry and the throat tapings is measured by a manometer

containing mercury. The connections were filled with oil flowing in the pipeline. If the difference in level indicated by mercury in 0.63m, calculate the theoretical volumetric flow rate. (10 Marks)

(b) Discuss in detail the characteristic curves of a centrifugal pump. (10 Marks)

18. (a) Develop an equation to find the discharge over a triangular notch. (8 Marks)

(b) Write notes on

        iv) Expansion joint

        v) Priming

        vi) Water hammer

        vii) Rotameter (4x3Marks=12 Marks)

(SCHEME: 2013)

Branch: Chemical Engineering

13.304 MACHINE DRAWING (H)

MODEL QUESTION PAPER

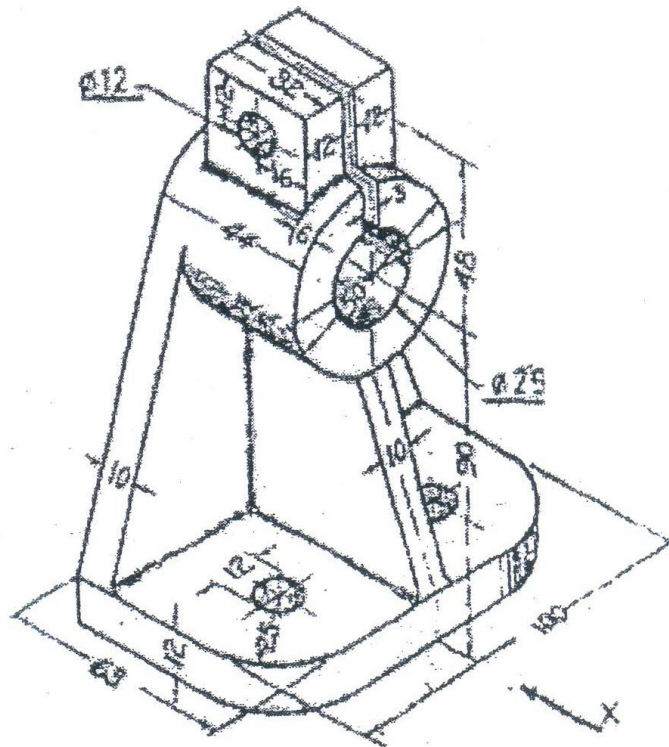Time: 3 hours   Maximum marks: 100

PART-A (MODULE I & II)

*Answer **any ONE** question. **Each** question carries 20 marks*

1. Draw the front view and plan of the component shown in figure below.

(20 Marks)

2. (a) Sketch a Lewis foundation bolt for 20mm diameter.

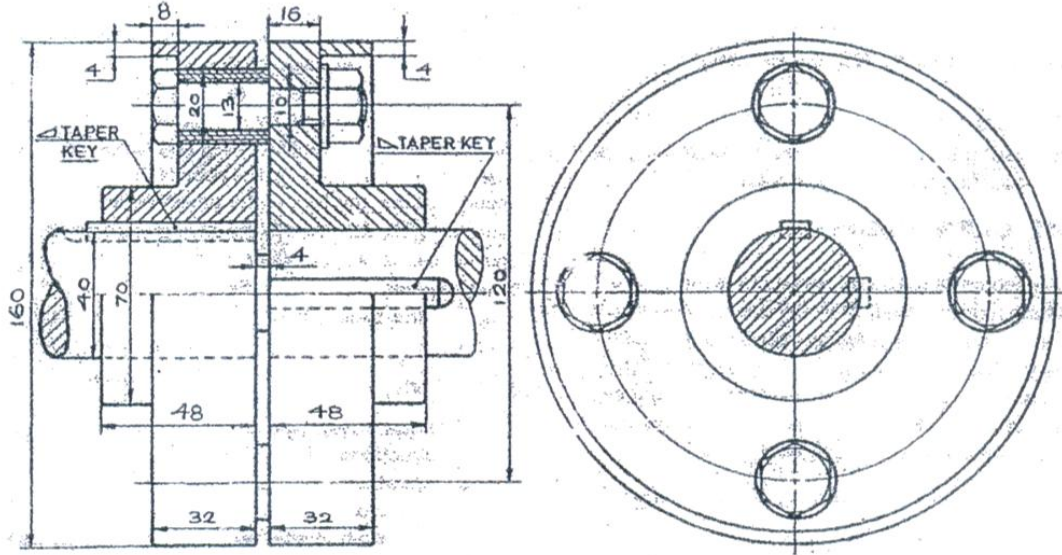   (b) Sketch a double riveted lap joint for 10mm plate.

   (2 x 10 Marks = 20 Marks)
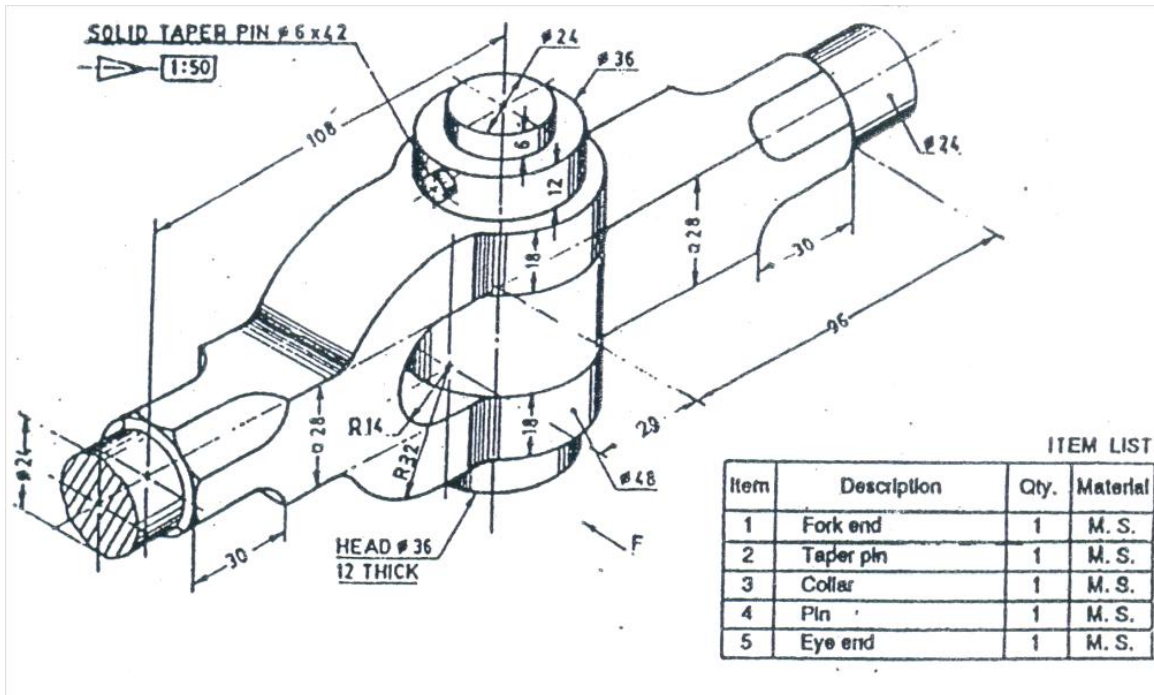
PART-B (MODULE III & IV)

*Answer Any **one full** question. **Each** question carries **80** marks.*

3. (a) Two vews of a pin type flexible coupling are given below. Draw the following views:

      (i)   Full sectional elevation.

      (ii)   Plan

  (b) Isometric view of a knuckle joint is given below. Draw the full sectional elevation and end view from right.

Item	Description	Qty.	Material
1	Fork end	1	M. S.
2	Taper pin	1	M. S.
3	Collar	1	M. S.
4	Pin	1	M. S.
5	Eye end	1	M. S.

(2 x 40 Marks = 80 Marks)

4. The parts of a Rams bottom safety valve are given below. Assemble the parts and draw the elevation right half section.

(80 Marks)

THIRD SEMESTER BTECH DEGREE EXAMINATION 2014

(SCHEME: 2013)

Branch: Chemical Engineering

13.305 COMPUTER PROGRAMMING IN C++ (H)

MODEL QUESTION PAPER 1

Time: 3 hours   Maximum marks: 100

PART-A

*Answer **all** questions. **Each** question carries 2 marks*

1. What is a reference variable? What is its major use?

2. Which manipulator is used to control the precision of floating point numbers? Support your answer with the help of an example.

3. What are the various members of a class?

4. What is a friend function?

5. How to access a class member?

6. How is dynamic initialization of objects achieved?

7. Describe the syntax of single inheritance in C++.

8. What is a virtual function?

9. What are manipulators?

10. What are the steps involved in using a file in a C++ program?

(10 x 2 Marks = 20 Marks)

PART-B

*Answer **one full** question from **each** module. **Each** question carries 20 marks.*

MODULE - I

11. (a) What is object oriented programming? How is it differing from procedure oriented programming? List a few areas of application.   (10 Marks)

    (b) With the help of a C++ program show how an *if* structure can be replaced by a case structure?   (10 Marks)

12. Write a C++ program to determine inverse of a matrix.   (20 Marks)

MODULE - II

13. (a) Differentiate between *pass by value* and *pass by reference*.   (5 Marks)

(b) Write advantages of Inline function? Explain the concept of inline function with example. Describe the restriction of inline function. (15 Marks)

14. (a) What do we mean by overloading of a function? (5 Marks)

(b) Write a program in C++ which has a function add that is able to concatenate two strings, if values passed are strings and can perform addition, if values are numbers.

(15Marks)

MODULE - III

15. (a) What are the rules for operator overloading? (5 Marks)

(b) Describe in details the two methods of overloading operators. Demonstrate unary and binary operator overloading. (15 Marks)

16. Write a C++ program, using overload constructor, to add two complex numbers.

(20 Marks)

MODULE - IV

17. (a) Write a program to find the smallest element of an array using pointers. (10 Marks)

(b) What is a file? What are the various file stream classes? (10 Marks)

18. Explain the following with examples.
    i)   Pointers and functions. (7 Marks)
    ii) Pointers to objects. (7 Marks)
    iii) Pointer to pointer. (6 Marks)

(SCHEME: 2013)

Branch: Chemical Engineering

13.305 COMPUTER PROGRAMMING IN C++ (H)

MODEL QUESTION PAPER 2

Time: 3 hours   Maximum marks: 100

PART-A

*Answer **all** questions. **Each** question carries 2 marks*

1. Mention the use of the *break* statement.

2. What do you mean by dynamic initialization of a variable?

3. How do we achieve function overloading?

4. How is a member function of a class defined?

5. Describe the importance of destructors?

6. A friend function cannot be used to overload the assignment operator =. Explain why?

7. When do we make a class virtual?

8. What are input and output streams?

9. Both cin and getline() function can be used for reading a string. Comment.

10. What is the use of *this* pointer?

(10 x 2 Marks = 20 Marks)

PART-B

*Answer **one full** question from **each** module. **Each** question carries **20** marks.*

MODULE - I

11. (a)   With an example explain the different loops available in C++.   (10 Marks)

    (b) Any integer is input by the user. Write a program to find out whether it is an odd number or even number.   (10 Marks)

12. (a) Explain the structure of an object oriented C++ program.   (8 Marks)

    (b) Write a C++ program to find solution to the following series:

$$1 + \frac{X}{2!} + \frac{X^2}{4!} + \frac{X^3}{6!} + \ldots\ldots\ldots + \frac{X^n}{2n!}$$

(12 Marks)

MODULE - II

13. (a) What is the purpose of default arguments? (5 Marks)

(b) Write a program to sort the set of strings using call by value and call by reference.

(15 Marks)

14. (a) Describe about storage class variables. (5 Marks)

(b) Create a class 'Student' which consists of name, roll no., sex and subject marks. Find the total marks and average of each student. Achieve this using Array. (15Marks)

MODULE - III

15. Explain single inheritance and *multiple inheritance* with example. (20 Marks)

16. Write a C++ program to overload operators +, −, *, == for a matrix class for matrix operations. (20 Marks)

MODULE - IV

17. (a) Explain the various file stream classes needed for file manipulations. (10 Marks)

(b) Explain with an example, the concept of virtual functions. (10 Marks)

18. Give detail description about files in C++. Write a program for read, write, update and display operations for the personal details using file. (20 Marks)

THIRD SEMESTER BTECH DEGREE EXAMINATION 2014

(SCHEME: 2013)

Branch: Chemical Engineering

13.305 CHEMICAL TECHNOLOGY I (H)

MODEL QUESTION PAPER 1

Time: 3 hours   Maximum marks: 100

PART-A

*Answer **all** questions. **Each** question carries 2 marks*

1. Distinguish between unit operations and unit processes. Give examples for each.

2. Write down the reactions in the manufacture of phosphoric acid by wet process.

3. Mention any four applications of argon.

4. Write down the reactions involved in the manufacture of urea.

5. What is triple super phosphate?

6. What are bitterns? List any six salts obtained from sea water.

7. Give the reactions involved in the Dual Process for soda ash.

8. List the important properties and uses of graphite.

9. What is pozzolona cement? Explain in brief.

10. List and briefly explain different types of glasses.

(10 x 2 Marks = 20 Marks)

PART-B

*Answer **one full** question from **each** module. **Each** question carries **20** marks.*

MODULE - I

11. (a) Describe the manufacture of oxygen by Kellogg process.   (15 Marks)

    (b) List any four important source material used for commercial production of carbon dioxide and give various uses of both solid and gaseous carbon dioxide.   (10 Marks)

12. With the help of a neat flow sheet explain the production of nitric acid by ammonia oxidation process. Discuss the major engineering problems involved.   (20 Marks)

MODULE - II

13. (a) Give the reactions involved in the manufacture of urea. Draw a process flow diagram and explain commercial manufacture of urea.   (10 Marks)

(b) What are mixed and complex fertilizers? With the help of a schematic flow diagram explain the commercial production of mixed or complex fertilizer. (10 Marks)

14. (a) Explain the manufacture of diammonium phosphate with the help of a neat flow sheet. (10 Marks)

(b) How is ammonium nitrate manufactured commercially? Discuss in detail about its uses. (10 Marks)

MODULE - III

15. What are the principal uses of chlorine? Describe the electrolytic mercury cell process for the chlorine manufacture. Compare this process with other methods. (20 Marks)

16. (a) Discuss the merits and demerits of diaphragm cell, mercury cell and membrane cell methods of production of caustic soda. (5 Marks)

(b) What are the uses of soda ash? (5 Marks)

(c) Explain with the help of a neat flow diagram, the method of production of sodium sulphate. (10 Marks)

MODULE - IV

17. (a) How do you manufacture carbon disulphide by electro thermal process? (10 Marks)

(b) Name important routes available for the production of glycerin. Describe any one method using a typical flow chart. (10 Marks)

18. How are ceramics classified? Give examples and applications of ceramics. Explain the manufacture of porcelain or window glass using suitable schematic flow diagrams.

(20 Marks)

THIRD SEMESTER BTECH DEGREE EXAMINATION 2014

(SCHEME: 2013)

Branch: Chemical Engineering

13.305 CHEMICAL TECHNOLOGY I (H)

MODEL QUESTION PAPER 2

Time: 3 hours   Maximum marks: 100

PART-A

*Answer **all** questions. **Each** question carries 2 marks*

1. What are the processes and raw materials available for the production of hydrogen?

2. Give any four industrial uses of phosphoric acid.

3. Explain the major engineering problems faced in the manufacture of sulfuric acid by Contact Process?

4. What are mixed and complex fertilizers?

5. Ammonium sulfate, Ammonium nitrate, Ammonium chloride and Urea are used as fertilizers. Briefly discuss about the available nitrogen in each.

6. Give the methods for production of soda ash.

7. What are marine chemicals? List a few of them.

8. List various types of Portland cement. Distinguish between each.

9. What are fats and oils? How do you distinguish between them?

10. Briefly explain about detergents and surfactants.

(10 x 2 Marks = 20 Marks)

PART-B

*Answer **one full** question from **each** module. **Each** question carries **20** marks.*

MODULE - I

11. (a)   What are the industrial uses of acetylene gas?   (3 Marks)

    (b) Give the reactions involved in manufacturing process of acetylene. With the help of a neat flow diagram explain the process.   (14 Marks)

    (c) Explain the term "tonnage of oxygen".   (3 Marks)

12. (a) List out the main sources of sulfur.   (4 Marks)

    (b) Using a neat flow sheet explain the DCDA process for manufacture of sulfuric acid giving the reactions involved.   (16 Marks)

MODULE - II

13. (a) Give the reactions involved in the manufacture of urea. Draw a process flow diagram and explain commercial manufacture of urea. (10 Marks)

(b) What are mixed and complex fertilizers? With the help of a schematic flow diagram explain the commercial production of mixed or complex fertilizer. (10 Marks)

14. (a) Explain the manufacture of diammonium phosphate with the help of a neat flow sheet. (10 Marks)

(b) How is ammonium nitrate manufactured commercially? Discuss in detail about its uses. (10 Marks)

MODULE - III

15. (a) Compare mercury cell, diaphragm cell, and membrane cell methods of production of caustic soda. (10 Marks)

(b) How do you compare Solvay process with Dual process for the manufacture of soda ash? (5 Marks)

(c) Explain bromine manufacture and state its uses. (5 Marks)

16. Describe with the help of a neat flow diagram, the manufacture of soda ash by the Solvay process indicating the reactions involved. (20 Marks)

MODULE - IV

17. (a) What are the different processing methods for ceramic products? (5 Marks)

(b) Write a note on testing of refractories. (5 Marks)

(c) Describe the manufacture of different kinds of silicate glasses and discuss their properties and uses. (10 Marks)

18. (a) Describe the solvent extraction process for the production of vegetable oils. (12 Marks)

(b) What is the basic difference between fatty oil based soap and detergent. Explain in detail. (8 Marks)