

OM

Shri Vile Parle Kelavani Mandal's  
**SHRI BHAGUBHAI MAFATLAL POLYTECHNIC**  
**AUTONOMOUS SEMESTER EXAMINATION APRIL/MAY, 2018**

TIME ALLOWED: 03 HOURS  
MAXIMUM MARKS: 100  
COURSE: APPLIED MECHANICS

SEAT NO. \_\_\_\_\_  
SEMESTER: 1st  
PROGRAMME: Civil Engg.  
CODE: 160001

ALL

**INSTRUCTIONS:**

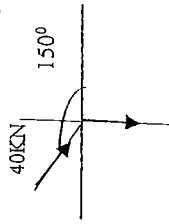
- (1) Answer to the two sections must be written in separate answer books.
- (2) Attempt all questions.
- (3) Illustrate your answer with neat sketches, wherever necessary.
- (4) Use of Mathematical and Steam tables and pocket calculator (non-prog.) is permissible.
- (5) Figures to the right indicate full marks.
- (6) Assume suitable additional data, if necessary.
- (7) Student should read the name and code of the subject and confirm that the question paper received is as per subject registered.

**SECTION-I**

Q.1

Attempt ANY SIX of the following.

- (1) Define. Rigid body, statics.
- (2) State parallelogram law of forces.
- (3) State Lami's theorem
- (4) Differentiate between Resultant & Equilibrant.
- (5) Resolve a force of 80 KN along two directions making angles  $30^\circ$  &  $20^\circ$  with it on opposite sides.
- (6) What is varignon's theorem of moment?
- (7) Resolve a force of 40KN inclined at  $150^\circ$  with axis as shown in fig.

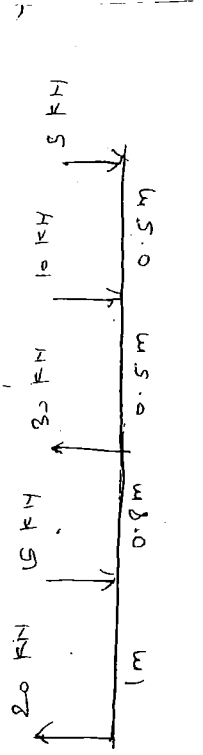


(8) Differentiate between Mass and Weight.

Q.2

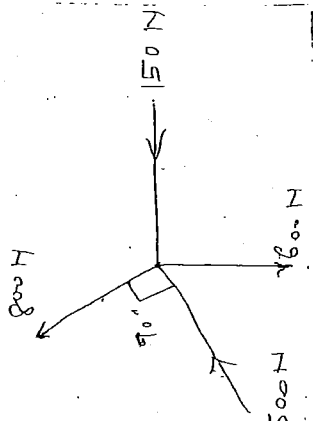
Attempt ANY FOUR of the following.

(a) Find the resultant & point of application of resultant for force system as shown in fig.



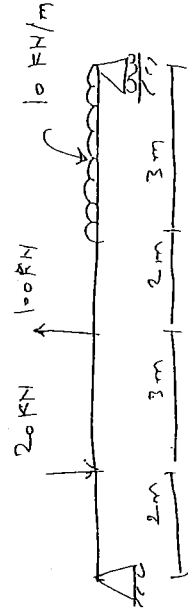
- (b) State properties of couple.
- (c) What are the different types of loads & end support of beam?
- (d) The sum of two forces is 9N. Their resultant which is perpendicular to the smaller force is of 6N. Find magnitude of the force.
- (e) Find the angle between two equal forces P, if their resultant is also equal to P.

(f) Find the resultant of all the forces as shown in fig.

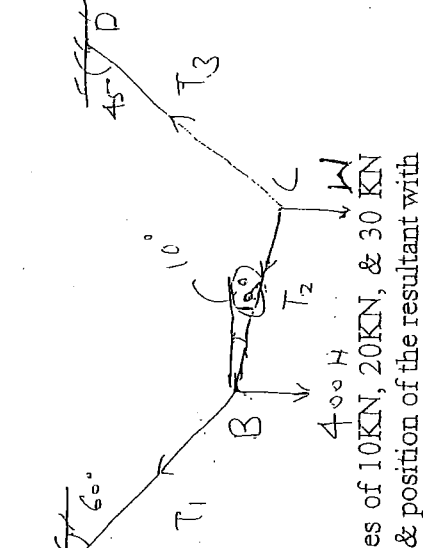


Q.3 Attempt ANY TWO of the following. (16)

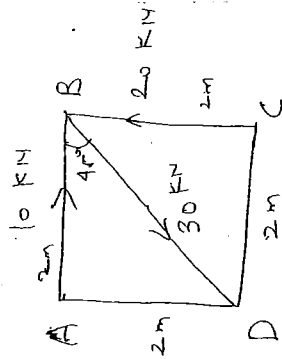
(a) For the beam shown in fig. calculate support reactions using analytical method.



(b) Find the weight 'W' & tension in the strings.



(c) A square ABCD of 2m side is subjected to forces of 10 kN, 20 kN, & 30 kN along AB, CB, & BD. Find magnitude, direction & position of the resultant with respect to A.



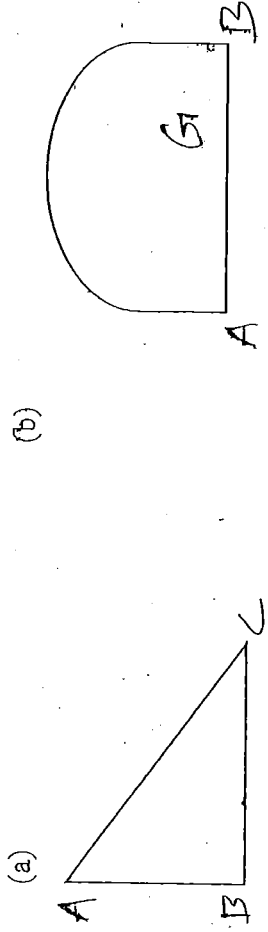
SECTION-II

Q.4 Attempt ANY SIX of the following.

(18)

- (1) State law of polygon of forces.
- (2) Define angle of repose.
- (3) Define centre of gravity.
- (4) Define - Mechanical Advantage & Efficiency of Machine.

- (5) Find formula for centroid of following fig. with usual notations.

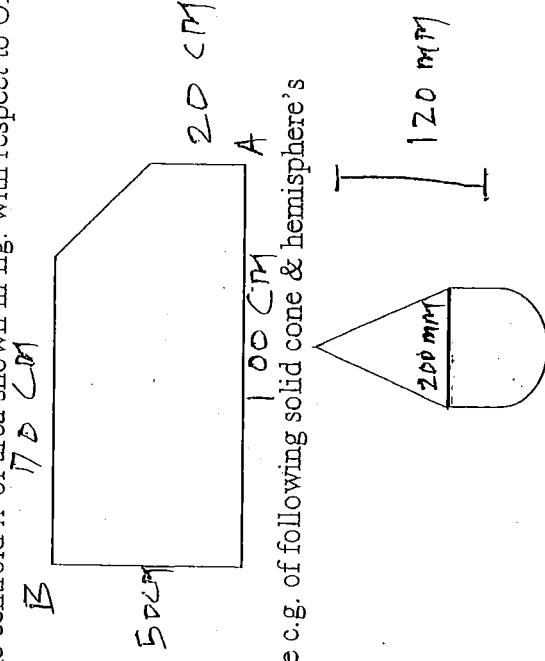


- (6) What is law of machine?  
 (7) A body of weight 2000N rests in a horizontal plane. If the coefficient of friction is 0.4, find the horizontal force required to be applied parallel to the plane to move the body.  
 (8) The velocity ratio of certain machine is 50. Determine the effort required to lift a load of 1500N if the efficiency of machine is 40%.

**Q.5**

**Attempt ANY FOUR of the following.**

- (a) A body weighing 150N is resting on a rough horizontal plane & can be just moved by a force of 50N applied horizontally. Find the coefficient of friction. Also find magnitude & direction of the resultant reaction.  
 (b) In a machine an effort of 15N can lift a load of 300N & an effort of 25N can lift a load of 500N. Find law of machine.  
 (c) Find the centroid  $\bar{X}$  of area shown in fig. with respect to OB line.



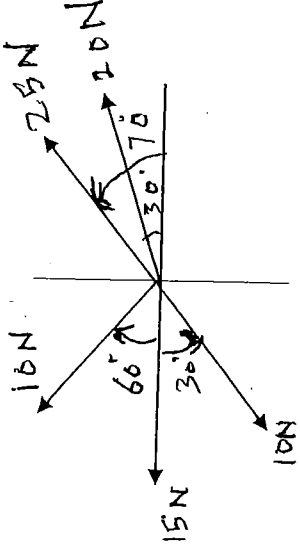
- (d) Find the c.g. of following solid cone & hemisphere's  
 (e) What are the advantages & disadvantages of friction?  
 (f) In differential axle & wheel the diameter of wheel is 400mm & the dia of axis are 100mm & 80mm. If an effort of 50N can lift a load of 1500N. Find V.R. & efficiency of machine.

Q.6

Attempt ANY TWO of the following.

(16)

- (1) Find graphically the resultant of concurrent force system shown in fig.



- (2) Following observations were made in an experiment as simple machine with V.R. = 60 Find law of machine & efficiency at load of 300N. Draw a graph.

Load	Effort
100N	10N
200N	14N

- (3) A ladder of weight 400N & length 10m is supported on smooth wall with its lower end 4m from the wall. The coefficient of friction between the floor & the ladder is 0.3. Show the forces acting on the ladder & find frictional force at floor.

\*\*\*\*\*

219 n/ly 160001

**TIME ALLOWED: 03 HOURS**  
**MAXIMUM MARKS: 100**  
**COURSE: COMMUNICATION SKILL**  
**SEAT NO. \_\_\_\_\_**  
**SEMESTER: I/II**  
**PROGRAMME: ALL**  
**CODE: 160003**

**INSTRUCTIONS:**

- (1) Answer to the two sections must be written in separate answer books.
- (2) Attempt ALL questions from Section-I and Section-II.
- (3) Use of Mathematical and Steam tables and pocket calculator (non-programmable) is permissible.
- (4) Illustrate your answers with neat sketches, wherever necessary.
- (5) Figures to the right indicate full marks.
- (6) Assume suitable additional data, if necessary.
- (7) The student should read the name and code of the subject and confirm that the question paper received is as per subject registered.

**SECTION-I**

**Q.1. Answer the following (Any Six)**

(18)

- (a) How does the selection of media plays an important role in the process of communication?
- (b) State two characteristics of communication.
- (c) "Grapevine is closely related to the morale of the employees working in an organisation." Justify this statement with suitable examples.
- (d) "Communication is life-blood of any organisation" Justify the statement with the help of suitable examples.
- (e) Which type of communication is happening in the following situation? Explain its advantages  
'The production manager of a company is communicating to the purchase manager of the same company.'
- (f) What is sympathetic listening? Give an example.
- (g) "Positive feedback motivates the sender." How far do you agree with the given statement? Explain with an example.
- (h) How can the speaking skill be improved? (write any two techniques)

**Q.2. Attempt (any Four) of the following.**

(16)

- (a) Do as directed  
(i) \_\_\_\_\_ he is not eligible, he got the position (insert suitable conjunction)  
(ii) The river is \_\_\_\_\_ the bridge (Insert suitable preposition)  
(iii) Ganga is a holy river. ( Under line noun & state its type)  
(iv) Bombay is the most crowded city of India ( change the degree)
- (b) Fill in the blanks with correct form of (tense) of the verb given in bracket.  
(i) We \_\_\_\_\_ (work) on the project since 2011.  
(ii) I \_\_\_\_\_ to her yesterday (speak)  
(iii) I \_\_\_\_\_ (wait) for you at the station.  
(iv) Where there \_\_\_\_\_ (be) a will, there \_\_\_\_\_ (be) away.
- (c) (i) Write antonyms of :-  
(a) Transparent (b) Confident  
(ii) Write synonyms of :-  
(a) Guidance (b) Fragrance
- (d) Give two examples of each:-  
(a) Clipping (b) Compounding
- (e) Insert suitable heteronym-  
(i) (a) He gave her a beautiful \_\_\_\_\_  
(b) \_\_\_\_\_ me later, I will be at home.  
(ii) (a) It's hot , so let's sit in the \_\_\_\_\_  
(b) That \_\_\_\_\_ of red does not suit her.

- (f) Give examples of:-  
i) Capitonyms  
ii) Homophons

**Q.3. Answer the following:- (any Two)**

(16)

- (a) What are the underlying causes that results in similarities or differences between systems of human and animal communication?
- (b) Write in detail any four types of reading.
- (c) Differentiate between listening & hearing.



TIME ALLOWED: 03 HOURS  
 MAXIMUM MARKS: 100  
 COURSE: BASIC MATHEMATICS

SEAT NO. \_\_\_\_\_  
 SEMESTER: I  
 PROGRAMME: ALL  
 CODE: 160002

**INSTRUCTIONS:**

- (1) Answer to the two sections must be written in separate answer books.
- (2) Attempt **ALL** questions from Section-I and Section-II.
- (3) All questions are compulsory.
- (4) Illustrate your answers with neat sketches, wherever necessary.
- (5) Use of Mathematical and Steam tables and pocket calculator (non-programmable) is permissible.
- (6) Figures to the right indicate full marks.
- (7) Assume suitable additional data, if necessary.

**SECTION-I****Q.1 Attempt Any Six****(18)**

- (a) Evaluate :  $\frac{1}{\log_3 6} + \frac{1}{\log_6 6} + \frac{1}{\log_9 6}$
- (b) Find k if  $\begin{vmatrix} 2 & -k & 7 \\ 3 & -4 & 13 \\ 8 & -11 & 33 \end{vmatrix} = 0$
- (c) Find x and y satisfying the matrix equation  $\begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix} \begin{bmatrix} x & y \\ 3 & -1 \end{bmatrix} = \begin{bmatrix} 7 & 0 \\ 9 & 4 \end{bmatrix}$
- (d) Use binomial theorem. Find approximate value of  $\sqrt{30}$
- (e) Resolve into partial fractions  $\frac{5x+1}{x^2+x-2}$
- (f) Find the 5<sup>th</sup> term of  $(x+2y)^8$
- (g) If  $A = \begin{bmatrix} 2 & 5 \\ 6 & 7 \end{bmatrix}$  find  $A^2 + 4A + 2I$  where I is unit matrix
- (h) Find x if  $\log_2(x^2 - 6x + 40) = 5$

**Q.2 Attempt Any Four****(16)**

- (a) Resolve into partial fractions  $\frac{2x+3}{x^2(x-1)}$
- (b) Find the middle terms in the expansion of  $\left[ 3x - \frac{x^3}{6} \right]^9$
- (c) Solve the equation by using determinant method  $x + y + z = 3$ ;  $x - y + z = 1$ ,  $x + y - 2z = 0$
- (d) If  $A = \begin{bmatrix} 2 & -1 & 1 \\ 3 & -4 & 0 \end{bmatrix}$  and  $B = \begin{bmatrix} 0 & 2 \\ -3 & 1 \\ 4 & -1 \end{bmatrix}$  Is the matrix AB non-singular?
- (e) Using properties of determinant show that  $\begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix} = 0$
- (f) Find K if  $(1 + \sqrt{3})^4 + (1 - \sqrt{3})^4 = K$

- Q.3** **Attempt Any Two** (16)
- (a) Solve by matrix method  
 $2x + 3y - z = -3$ ,  $5x + y + 3z = 10$ ,  $4x + 3y - 2z = -3$
- (b) The term independent of  $x$  in the expansion of  $\left(x^3 + \frac{m}{x^8}\right)^{11}$  is 1320. Find  $m$
- (c) Resolve into partial fractions  $\frac{x^2+23x}{(x+3)(x^2+1)}$

**SECTION-II**

- Q.4** **Attempt Any Six of the following** (18)
- (a) Prove that  $\tan^{-1}\left(\frac{3}{4}\right) + \tan^{-1}\left(\frac{3}{5}\right) - \tan^{-1}\left(\frac{8}{19}\right) = \frac{\pi}{4}$
- (b) Find the slope of the line  $\frac{x}{6} + \frac{y}{4} = \frac{1}{3}$
- (c) Find the equation of the circle having radius 2 and touching the  $y$ -axis at  $(0, -3)$
- (d) Find the equations of the tangent to the circle  $x^2 + y^2 + 6x + 7 = 0$  at  $(-2, 1)$
- (e) Find the centre and radius of the circle  $2x^2 + 2y^2 - 6x + 4y - 3 = 0$
- (f) Find the value of  $K$  so that the lines  $3x - y - 2 = 0$ ,  $5x + ky - 3 = 0$  and  $2x + y - 3 = 0$  are concurrent.
- (g) Find the acute angle between the line  $2x + y - 1 = 0$  and  $3x + y + 4 = 0$
- (h) Prove that  $1 + \tan \theta \cdot \tan 2\theta = \sec 2\theta$

- Q.5** **Attempt Any Four of the following** (16)
- (a) Find the distance between the lines  $5x - 12y + 1 = 0$  and  $10x = 24y + 1$
- (b) Find the equations of the circle which passes through the points  $(1, -2)$  and  $(4, 3)$  and which has its centre on the line  $3x + 4y = 7$
- (c) Find the equations of the tangent at the point  $(4, 5)$  on the circle  $x^2 + y^2 - 4x + 2y - 35 = 0$
- (d) In  $\Delta ABC$ , if  $a = 25$  cm,  $b = 52$  cm and  $c = 63$  cm. Find  $\sin A$ .
- (e) In triangle  $ABC$ , if  $A + B + C = \pi$ , then prove that  $\sin 2A + \sin 2B + \sin 2C = 4 \sin A \cdot \sin B \cdot \sin C$
- (f) Find the equations of the line passing through  $(-1, 1)$  and making an angle  $45^\circ$  with the line  $2x + 3y = 6$

- Q.6** **Attempt Any Two of the following** (16)
- (a) Prove that  $\cos^2 A + \cos^2 B - \cos^2 C = 1 - 2 \sin A \cdot \sin B \cdot \cos C +$
- (b) Find the equation of the perpendicular bisector of the line segment  $AB$ , where  $A = (3, -4)$  and  $B = (-4, 3)$
- (c) Find the equations of the tangents to the circle  $x^2 + y^2 - 6x - 4y + 5 = 0$ , which makes an angle of  $45^\circ$  with the  $x$ -axis.

\*\*\*\*\*



Shri Vile Parle Kelavani Mandal's  
SHRI BHAGUBHAI MAFATLAL POLYTECHNIC  
AUTONOMOUS SEMESTER EXAMINATION APRIL/MAY, 2018

TIME ALLOWED: 03 HOURS  
MAXIMUM MARKS: 100  
COURSE: ENGINEERING MATHEMATICS

SEAT NO. \_\_\_\_\_  
SEMESTER: II  
PROGRAMME: ALL  
CODE: 160008

**INSTRUCTIONS:**

- (1) Answer to the two sections must be written in separate answer books.
- (2) Attempt all questions each from Section I & Section II.
- (3) Illustrate your answer with neat sketches, wherever necessary.
- (4) Use of Mathematical and Steam tables and pocket calculator (non-programmable) is permissible.
- (5) Figures to the right indicate full marks.
- (6) Assume suitable additional data, if necessary.
- (7) Student should read the name and code of the subject and confirm that the question paper received is as per subject registered.

**SECTION-I**

**Q.1**

**Attempt Any Six out of Eight**

(16)

- (a) If  $f(x) = x^2 - 3x + 2$ , find  $f(1) + f(3)$
- (b) If  $f(x) = 2x + 5$ ,  $g(x) = x^2 - x$  find fog
- (c) Evaluate  $\lim_{x \rightarrow 2} \frac{x^{10} - 1024}{x^5 - 32}$
- (d) If  $f(x) = 4x^4 + 3 \cos x + x \cdot \sin x + 1$
- (e) Evaluate :  $\lim_{x \rightarrow 2} \frac{x-2}{\sqrt{x}-\sqrt{2}}$
- (f) Evaluate:  $\lim_{x \rightarrow a} \frac{x^{10} - a^{10}}{x - a}$
- (g) Evaluate :  $\lim_{\theta \rightarrow \pi/2} \frac{1 - \sin^3 \theta}{\cos^2 \theta}$
- (h) Evaluate :  $\lim_{x \rightarrow 0} \frac{e^{7x} - 1}{e^{3x} - 1}$

**Q.2**

**Attempt Any Four out of Six**

(16)

- (a) If  $Y = e^x - \frac{1}{x} + \log_e x$  find  $\frac{dy}{dx}$
- (b) If  $f(x) = \frac{x+2}{4x-3}$  and  $t = \frac{2+3x}{4x-1}$  show that  $f(x) = x$
- (c) Determine  $\frac{dy}{dx}$  if  $Y = \frac{x^2+3}{x^2-2}$
- (d) Differentiate w.r.to  $x$  :  $x \cdot \sin^{-1} x + \sqrt{1-x^2}$
- (e) Differentiate w.r.to  $x$  :  $\log_e(\sec x + \tan x)$
- (f) Differentiate w.r.to  $x$  :  $\sin^{-1}(2x \cdot \sqrt{1-x^2})$

**Q.3**

**Attempt Any Two out of Three**

(16)

- (a) If  $Y = 2 \cos(\log x) + 3 \sin(\log x)$ , prove that  $x^2 \cdot \frac{d^2 y}{dx^2} + x \cdot \frac{dy}{dx} + y = 0$
- (b) Differentiate  $\tan^{-1} \left[ \frac{2x}{1-x^2} \right]$  w. r. to  $\cos^{-1} \left[ \frac{1-x^2}{1+x^2} \right]$
- (c) If  $x = \tan^{-1} \left[ \frac{2t}{1-t^2} \right]$   $y = \tan^{-1} \left( \frac{3t-t^3}{1-3t^2} \right)$  find  $\frac{dy}{dx}$

## SECTION-II

Q.4

(18)

**Attempt Any Six out of the following**

- (a) If  $z = 1 + 2i$  find the value of  $z^2 - 2z + 6$
- (b) Find modulus and amplitude of  $1 - i\sqrt{3}$
- (c) Find the gradient of the curve  $y = \sqrt{x^3}$  at  $x = 4$
- (d) Find the radius of curvature of the curve  $y = x^3$  at  $(2, 8)$
- (e) Convert exponential form into Cartesian form 6.e  $\frac{5\pi}{6}$
- (f) If  $\vec{a} = 2\hat{i} + \hat{j} + \hat{k}$ ,  $\vec{b} = \hat{i} - \hat{j} - \hat{k}$ ,  $\vec{c} = 2\hat{i} - 2\hat{j} - \hat{k}$  Find  $\vec{a} \cdot (\vec{b} \times \vec{c})$
- (g) Find the angle between the vectors  $\hat{i} + 2\hat{j} + 2\hat{k}$  and  $\hat{i} - 2\hat{j} + 2\hat{k}$
- (h) Determine the area of the parallelogram formed by the two vectors  $3\hat{i} + 2\hat{j}$  and  $2\hat{j} + 4\hat{k}$

Q.5

(16)

**Attempt Any Four of the following**

- (a) Find all value of  $(1 + i\sqrt{3})^{1/3}$
- (b) Using Euler's formula prove that  $\cosh^2 x - \sinh^2 x = 1$
- (c) If magnitude of force 3 units acts in the direction  $2\hat{i} + 3\hat{j} + 6\hat{k}$  at the point  $(1, 1, 1)$ . Find moment of force about the point  $(-1, 2, 3)$
- (d) Find volume of the parallelepiped of having edges vectors  $\hat{i} - \hat{j} + \hat{k}$ ,  $2\hat{j} + 3\hat{k}$ ,  $4\hat{i} + 8\hat{k}$
- (e) Find the equation of the tangent to the curve  $Y = 9x^2 - 12x + 7$  which is parallel to the x axis.
- (f) A bullet fired into block of wood penetrates according to the lane  $S = 18t - t^3/6$ . How far does it penetrate?

Q.6

(16)

**Attempt Any Two out of Three**

- (a) If  $x + iy = \sin(A + iB)$  prove that
- (i)  $\frac{x^2}{\cosh^2 B} + \frac{y^2}{\sinh^2 B} = 1$       (ii)  $\frac{x^2}{\sin^2 A} + \frac{y^2}{\cos^2 A} = 1$
- (b) Find the maximum and minimum values of the function  $Y = 2x^3 - 3x^2 - 36x + 10$
- (c) The slope of the curve  $2y^3 = ax^2 + b$  at  $(1, -1)$  is same as the slope of  $x + y = 0$ . Find a, b.

TIME ALLOWED: 03 HOURS  
MAXIMUM MARKS: 100  
COURSE: ORGANIC AND  
PHYSICAL CHEMISTRY

SEAT NO. \_\_\_\_\_  
SEMESTER: II  
PROGRAMME: Plastic/Chem.  
CODE: 160604

**INSTRUCTIONS:**

- (1) Answer to the two sections must be written in separate answer books.
- (2) All questions are compulsory.
- (3) Illustrate your answer with neat sketches, wherever necessary.
- (4) Use of Mathematical and steam tables and pocket calculator (non-programmable) is permissible.
- (5) Figures to the right indicate full marks.
- (6) Assume suitable additional data, if necessary.
- (7) Student should read the name and code of the subject and confirm that the question paper received is as per subject registered.

**SECTION-I**

**Q.1 Answer ANY SIX questions.**

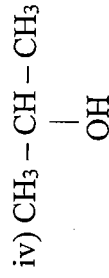
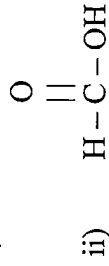
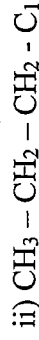
(18)

- Identify the functional unit in the following compounds.  
$$\begin{array}{c} \text{O} \\ || \\ \text{CH}_3 - \text{C} - \text{CH}_3 \end{array}$$
- Write the structural formula of the following.  
i. Aniline    ii. Acetylene    iii. Benzoic Acid
- Explain  $sp^2$  hybridisation.
- Distinguish between electrophile and neutrophile.
- Write any two example of substitution reaction?
- Give the names of formulae for first 3 numbers of homologous series of alkenes.
- Write the chemical equation for wurtz reaction?
- Distinguish between alcohols and phenols.

**Q.2 Attempt ANY FOUR**

(16)

- Give the IUPAC names of the following.



- Explain Carbylamine Reaction.
- Write any two methods for preparation of ethane.
- Distinguish between aldehydes & ketones.
- Write any two substitution reactions of Benzene.
- Explain esterification.

**Q.3**

**Attempt ANY TWO**

**(16)**

- a) i) Define bond fission. Explain homolytic fission and heterolytic fission.  
ii) Give any two methods of preparation of toluene
- b) i) Explain oxidation of ethanol.  
ii) Give any two methods of preparation of Aniline.
- c) i) Write a note on Friedel Craft's Reaction.  
ii) Explain clemmenson's reduction.

**Q.4**

**SECTION-II**

**Answer the following.(ANY SIX)**

**(18)**

- a. What is hydrolysis and degree of hydrolysis?  
State the phase rule.
- b. What are colligative properties? Give examples.
- c. State which of the following is a colloidal solution and which is true solution.  
(i) Ink (ii) Milk (iii) Sugar solution in H<sub>2</sub>O
- e. Define acids and bases.
- f. Explain the importance of PH in different industries.
- g. Define electrophoresis.
- h. Define mole fraction and molality.

**Q.5**

**Answer the following (ANY FOUR)**

**(16)**

- a. Draw a neat and labelled phase diagram of water system.
- b. What is the nature of the following salt solutions?
  - i) Copper sulphate solution
  - ii) Ammonium chloride solution
  - iii) Sodium carbonate solution
  - iv) Zinc nitrate solution
- c. Explain the Bredig's arc method for the preparation of gold sols.
- d. State and explain Raoult's Law of ideal solutions.
- e. Explain the phenomenon of tyndall effect.
- f. State and explain Nernst distribution law.

**Q.6**

**Answer the following (ANY TWO)**

**(16)**

- a) i) Define buffer solutions. Give two examples of buffer solutions.  
ii) Give four points of difference between lyophobic and lyophilic sols.
- b) i) Define phase, component and degree of freedom.  
ii) Name the processes of purification of colloidal sols. Explain one of them.
- c) i) Explain why there is depression in freezing point when a solute is added to non-volatile solvent.  
ii) State Henry's law. Give its application.

\*\*\*\*\*

Shri Vile Parle Kelavani Mandal's  
**SHRI BHAGUBHAI MAFATLAL POLYTECHNIC**  
**AUTONOMOUS SEMESTER EXAMINATION APRIL/MAY -2018**

TIME ALLOWED: 03 HOURS  
MAXIMUM MARKS: 100

SEAT NO. \_\_\_\_\_  
SEMESTER: III  
PROGRAMME: ME/PL/CH

COURSE: BASICS OF ELECTRICAL & ELECTRONICS CODE: 160015

**INSTRUCTIONS:**

- (1) Answer to the two sections must be written in separate answer books.
- (2) All questions are compulsory.
- (3) Illustrate your answer with neat sketches, wherever necessary.
- (4) Use of pocket calculator (non-programmable) is permissible.
- (5) Figures to the right indicate full marks.
- (6) Assume suitable additional data, if necessary.
- (7) Student should read the name and code of the subject and confirm that the question paper received is as per subject registered.

**SECTION-I**

**Q.1 Write ANY SIX out of EIGHT (18)**

- a) Define the following:
  - i) Electric potential
  - iii) Fleming's Right Hand Rule
  - ii) Electric Energy
- b) A circuit draws current of 10A at voltage of 200V & it's p.f. is 0.8 lagging.  
Calculate : i) Apparent Power ii) True Power iii) Reactive Power
- c) Write down applications for DC series motor, DC shunt motor & DC compound motor (2 applications for each)
- d) Draw the characteristics of DC series motor.
- e) Explain in brief construction of core type transformer.
- f) Enlist the applications of 3 phase induction motors.
- g) Compare between rope drive and belt drive.
- h) State the advantages of electrical heating

**Q.2 Write ANY FOUR out of SIX. (16)**

- a) Write down voltage & current equations for the star connection circuit & delta connection circuit, with the help of diagram.
- b) Explain the working principle of DC motor.
- c) Derive the EMF equation for 1 Phase transformer.
- d) A 3300/250V, 50 Hz, 1 -  $\phi$  transformer is built on a core having an effective cross sectional area of 125 cm<sup>2</sup> and 70 turns on the Low Voltage Winding.  
Calculate: i) No. of turns on High Voltage winding.  
ii) Value of Maximum Flux Density.
- e) Why does a 1 - Phase Induction Motor requires starting torque to run? Explain
- f) State the differences between an Individual drive & Group drive.

- Q.3** Write **ANY TWO** out of **THREE** (16)
- Write down the speed control methods of 3 Phase Induction motor. Explain any 2 methods in brief.
  - With the help of block diagram. Explain electrical drive system. Also write down the advantages of electrical drives.
  - Explain in brief types of electrical heating system.

### SECTION – II

- Q.4** Attempt **ANY SIX** of the following. (18)
- Draw symbols of SCR, DIAC & TRIAC.
  - Name the different photo devices used in Electronic circuits & give their functions.
  - State necessity of filter circuit.
  - Draw the neat diagram of bridge type rectifier circuit.
  - Define transducer and give its classification.
  - With the help of diagram, explain process of measurement of pressure using Bourdon Tube.
  - Describe in brief working of LVDT for displacement measurement.
  - Enlist various applications of microprocessor & microcontroller in mechanical & chemical industries.

- Q.5** Attempt **ANY FOUR** of the following. (16)
- Draw neat diagram of 4:1 multiplexer & explain how it selects a data line with the help of truth table.
  - Describe working of R-C phase shift oscillator with the help of suitable diagram.
  - Compare full wave centre trapped rectifier with half wave rectifier. (Any Four Points)
  - Draw the symbol & connection diagram to explain working of seven segment display.
  - Explain construction & V-I characteristic of DIAC.
  - What do you understand by colour coding of resistors? State the meaning of first, second, third and fourth colour band.

- Q.6** Attempt **ANY TWO** of the following. (16)
- Define conductor, semiconductor & insulator giving example of each.
    - Draw the input and output characteristics of BJT in C-E configuration.
  - State the necessity of amplifier. Draw the circuit diagram of single stage transistor amplifier stating its working. Also obtain the input & output waveforms along with its frequency response.
  - Draw the symbol & truth table as well as write the Boolean expression for following logic gates.
    - OR
    - NOR
    - AND
    - NAND

Shri Vile Parle Kelavani Mandal's  
SHRI BHAGUBHAI MAFATLAL POLYTECHNIC  
AUTONOMOUS SEMESTER EXAMINATION APRIL/MAY, 2018

TIME ALLOWED: 03 HOURS  
MAXIMUM MARKS: 100

SEAT NO. \_\_\_\_\_  
SEMESTER: II  
PROGRAMME: CHEMICAL ENGG.

COURSE: Technology of Inorganic Chemicals      CODE: 160601

**INSTRUCTIONS:**

- (1) Answer to the two sections must be written in separate answer books.
- (2) Attempt ALL questions from Section I & Section II.
- (3) Illustrate your answer with neat sketches, wherever necessary.
- (4) Use of Mathematical and Steam tables and pocket calculator (non-programmable) is permissible.
- (5) Figures to the right indicate full marks.
- (6) Assume suitable additional data, if necessary.
- (7) Student should read the name and code of the subject and confirm that the question paper received is as per subject registered.

**SECTION-I**

- Q.1** Answer **ANY SIX** of the following. (18)
- (a) Explain Block Flow Diagram.
  - (b) Draw symbols for (i) Belt conveyor (ii) Rotary Filter.
  - (c) Write raw materials, reactions for manufacturing Ammonium Nitrate.
  - (d) Explain chemical equilibrium.
  - (e) Write raw materials, reactions for production of Nitric acid.
  - (f) What are the advantage of  $V_2O_5$  catalyst in sulphuric acid manufacturing process.
  - (g) Write properties and uses of sulphuric acid.
  - (h) Write reaction for the production of phosphoric acid by strong  $H_2SO_4$  acid process.

- Q.2** Answer **ANY FOUR** of the following (16)
- (a) Explain effect of the temperature and pressure on  $NH_3$  production.
  - (b) Draw flow sheet for the manufacture of  $NH_3$ .
  - (c) Explain the manufacturing process of Ammonium Sulphate.
  - (d) Describe the manufacture of Sulphuric Acid.
  - (e) Draw flow sheet for the production of Triple Superphosphate.
  - (f) How is  $PCl_5$  manufactured?

- Q.3** Answer **ANY TWO** of the following. (16)
- (a) Explain with a flowsheet the manufacturing process of urea.
  - (b) Describe the manufacturing process of Ammonium Nitrate by prilling process with Flowsheet.
  - (c) Explain the electric furnace method for the production of elemental phosphorus with Flowsheet.

.....  
.....2.....

## SECTION-II

(18)

**Q.4** Answer ANY SIX

- a) Write raw materials, reactions for the production of soda ash.
- b) Write cell reactions for mercury cell.
- c) Explain the significance of annealing in glass manufacturing process.
- d) Write two uses of (i)  $\text{CO}_2$  (ii)  $\text{Cl}_2$
- e) Write raw materials, reactions for the production of Acetylene from hydrocarbons.
- f) What is producer gas?
- g) Differentiate between soda lime glass and borosilicate glass.
- h) What is plaster of paris? How is it prepared?

(16)

**Q.5** Answer ANY FOUR

- a) Explain the manufacturing process of hydrochloric acid.
- b) Explain the construction and working of diaphragm cell.
- c) Draw flow sheet for the production of Acetylene.
- d) Draw flow sheet for manufacturing producer gas.
- e) What are the raw materials required for the manufacture of glass? Write reactions.
- f) Explain the manufacturing process of Refractories.

(16)

**Q.6** Answer ANY TWO

- a) Describe the manufacturing process of sodium hydroxide chlorine with a flow sheet.
- b) Explain with a flow sheet the manufacturing process of Hydrogen by steam hydrocarbon process.
- c) What are the constituents of Portland cement?  
Explain with a flow sheet the production process of Portland cement.

\*\*\*\*\*



Shri Vile Parle Kelavani Mandal's  
SHRI BHAGUBHAI MAFATLAL POLYTECHNIC  
AUTONOMOUS SEMESTER EXAMINATION APRIL/MAY 2018

SEAT NO. \_\_\_\_\_

TIME ALLOWED: 03 HOURS

SEMESTER: II

MAXIMUM MARKS: 100

PROGRAMME: CHEMICAL ENGINEERING  
CODE: 160602

COURSE: MECHANICAL OPERATION

**INSTRUCTIONS:**

- (1) Answer to the two sections must be written in separate answer books.
- (2) All Questions are compulsory.
- (3) Illustrate your answer with neat sketches, wherever necessary.
- (4) Use of Mathematical and Steam tables and pocket calculator (non-programmable) is permissible.
- (5) Figures to the right indicate full marks.
- (6) Assume suitable additional data, if necessary.
- (7) Student should read the name and code of the subject and confirm that the question paper received is as per subject registered.

**SECTION-I**

**Q.1.**

**Solve any Six**

- (a) State Amoyat's law.
- (b) State Dalton's law.
- (c) What is crushing efficiency?
- (d) Write deference between primary unit & derived unit.
- (e) What is actual screen?
- (f) Name any three equipment for separating of solids based on size.
- (g) Name different flow pattern in agitated vessel.
- (h) State Rittinger's law.

(18)

**Q.2.**

**Solve any four.**

- (a) Describe gyratory crusher with diagram.
- (b) Write difference between crushing & grinding.
- (c) Write difference between Blake & Dodge Jaw crusher.
- (d) Derive the equation for effectiveness of screen
- (e) Draw neat sketches of any two motions of screens
- (f) State the various types of impellers and draw a sketch of any one of them.

(16)

**Q.3.**

**Solve Any two**

- (a) Derive the equation of Tower consumption of mixer.
- (b) Calculate the operating speed of the boll mill from the following data.  
(i) Diameter of ball mill = 500 mm.  
(ii) Diameter of ball = 40mm.  
(iii) Operating speed is 50% of the critical speed of the mill.
- (c) Draw construction & working of Vibrating screen with neat diagram.

(16)

## SECTION-II

Q.4.

**Attempt any Six questions.**

(18)

- (a) Explain hydro cyclone in brief.
- (b) Write classification of classifier.
- (c) What is filter aid? Write its function in filtration.
- (d) Distinguish between hydrophobic & hydrophilic compound.
- (e) Distinguish between filtration & sedimentation.
- (f) Mention the different zones form during sedimentation with neat diagram.
- (g) What are different type of conveyors?
- (h) Explain the different method of waging solid material in process plant.

Q.5.

**Attempt any four question**

(16)

- (a) Explain in detail about double cone classifier.
- (b) What is jigging? Write its use.
- (c) Describe free setting & hindered setting.
- (d) Describe in brief constant rate filtration & constant pressure filtration.
- (e) Explain Kyach theory of sedimentation.
- (f) Explain in brief belt conveyor with neat diagram.

Q.6.

**Attempt any two question**

(16)

- (a) Explain in detail drum separation for magnetic separation
- (b) Write working principle of electrostatic separation. Also explain its construction & working with neat & clean diagram.
- (c) Draw neat sketch & explain construction & working of centrifugal filtration.

\*\*\*\*\*

**Shri Vile Parle Kelavani Mandal's**  
**SHRI BHAGUBHAI MAFATLAL POLYTECHNIC**  
**AUTONOMOUS SEMESTER EXAMINATION APRIL/MAY-2018**

TIME ALLOWED: 03 HOURS

MAXIMUM MARKS: 100

COURSE: TECHNOLOGY OF ORGANIC

CHEMICALS AND PRODUCTS

SEAT NO. \_\_\_\_\_

SEMESTER: III

PROGRAMME: CHEMICAL ENGG.

CODE: 160605

**INSTRUCTIONS:**

- (1) Answer to the two sections must be written in separate answer books.
- (2) All Questions are compulsory.
- (3) Illustrate your answer with neat sketches, wherever necessary.
- (4) Use of Mathematical and Steam tables and pocket calculator (non-programmable) is permissible.
- (5) Figures to the right indicate full marks.
- (6) Assume suitable additional data, if necessary.
- (7) Student should read the name and code of the subject and confirm that the question paper received is as per subject registered.

**SECTION-I**

**Q.1. Answer any Six of the following (18)**

- (a) Why is alcohol denatured and how?
- (b) Write raw materials and reactance for acetone manufacture.
- (c) What are the drawbacks of food processing?
- (d) What are the products of fractional distillation of crude?
- (e) Explain friended crafts reaction with example.
- (f) Write reactions for the production of methanol.
- (g) What are the raw materials for varnish?
- (h) What two uses each of –  
(i) Ethyl (ii) Acetic acid

**Q.2. Answer any Four of the following. (16)**

- (a) Draw flow sheet for the manufacture of acetic acid.
- (b) Explain any four food preservation methods.
- (c) Draw a neat flow sheet for the production of methanol.
- (d) What are the constituents of petroleum?
- (e) Distinguish between paint and varnish.
- (f) Describe the paint manufacturing process.

**Q.3. Answer any Two of the following. (16)**

- (a) What is fermentation? Explain with a flow sheet the manufacture of Ethanol from molasses.

- (b) Describe the manufacturing process of Ethyl acetate with a flow sheet.
- (c) Write draw materials reactions for the manufacture of phenol. Explain the manufacturing process with a flow sheet.

### SECTION-II

**Q.4.**

**Answer any Six of the following.**

**(18)**

- (a) What is DMT? Explain with reactions.
- (b) Explain the basic chemistry of Viscose process for Rayon.
- (c) Define Iodine value and explain its significance.
- (d) Write raw materials and reactions for production of detergent powder.
- (e) What are the various methods of production of polyethylene?
- (g) What are the raw materials required for paper manufacture?
- (h) Write two uses each : (i) Polystyrene (ii) Phenol formaldehyde

**Q.5.**

**Answer any Four of the following.**

**(16)**

- (a) Compare sulphate and sulphite pulping processes.
- (b) Explain Mechanical expeller for extracting vegetable oil.
- (c) Draw flow sheet for Rayon manufacture.
- (d) What is hydrogenation in vegetable oil?
- (e) Draw flow sheet for the production of HDPPF.
- (f) Explain the paper manufacturing process.

**Q.6.**

**Answer any Two of following.**

**(16)**

- (a) Explain the production process of polyvinyl chloride (PVC) with a flow sheet.
- (b) Write draw materials, reactions for soap manufacture. Explain with a flow sheet, the manufacture of soap by continuous process.
- (c) Explain with a flow sheet the preparation of wood pulp by Kraft process.

\*\*\*\*\*

SEAT NO. \_\_\_\_\_

TIME ALLOWED: 03 HOURS

SEMESTER: III

MAXIMUM MARKS: 100

PROGRAMME: CHEMICAL ENGG

COURSE: FLUID FLOW OPERATION

CODE: 160607

**INSTRUCTIONS:**

- (1) Answer to the two sections must be written in separate answer books.
- (2) ALL questions are compulsory.
- (3) Use of Mathematical and Steam tables and pocket calculator (non-programmable) is permissible.
- (4) Illustrate your answers with neat sketches, wherever necessary.
- (5) Figures to the right indicate full marks.
- (6) Assume suitable additional data, if necessary.
- (7) The student should read the name and code of the subject and confirm that the question paper received is as per subject registered.

**SECTION-I**

**Q.1**

**Attempt ANY SIX of the following.**

**(18)**

- a) Classify the fluids based on variation of density with temperature & pressure.
- b) State & explain the equation of continuity.
- c) Name & define the types of friction.
- d) Suggest the correction in Bernoulli's equation for pump work.
- e) Calculate the friction factor when Reynolds number is 2000 for the flow of fluid through the pipe.
- f) The pressure difference over a manometer is  $2452 \text{ N/m}^2$ . If the manometric fluid is carbon tetra-chloride (specific gravity 1.6) and water is flowing through the pipeline and fills the manometer leads, what will be manometer reading?
- g) Define Reynolds number and name the different types of flows.
- h) A 75mm diameter pipe discharges liquid at the rate of 30 l/s. Determine the type of flow if the viscosity of the liquid is  $1.2 \times 10^{-3} \text{ kg/m.sec}$ , take density of liquid =  $1012 \text{ kg/m}^3$

**Q.2**

**Attempt ANY FOUR of the following**

**(16)**

- a) Draw a neat diagram for Reynold's experimental set up.
- b) Define friction factor and state its mathematical equation.
- c) A 300mm pipe carries water at a velocity of 24 m/s. At stations A and B measurements of pressures and elevation were  $361 \text{ kN/m}^2$  and  $288 \text{ kN/m}^2$ , 30.5m and 33.5m respectively. For steady flow, find the loss of head between stations A and B.
- d) Derive the expression to calculate the pressure drop by using an inclined manometer.
- e) Explain the frictional losses in pipe due to sudden enlargement, sudden contraction.
- f) Draw a neat sketch of U-tube manometer & explain in brief.

**Q.3**

**Attempt ANY TWO of the following.**

**(16)**

- a) State the Newton's law of viscosity. Explain in brief the types of non-Newtonian fluids with suitable examples along with its graphical representation.
- b) Derive the expression of average velocity for Laminar Flow of incompressible fluid.
- c) Derive the Bernoulli's equation for incompressible fluid without fluid friction.

**SECTION - II**

**Q.4**

**Attempt ANY SIX questions**

**(18)**

- a) Differentiate between variable area meter & various read meter.
- b) Defined cavitation. Its effect on working of centrifugal pump.
- c) What are the different types of fan & blowers?
- d) State the different types of impeller with their application.
- e) Why priming is necessary in centrifugal pump.
- f) Explain working of pitot tube with the help of neat diagram
- g) Give the classification of flow measuring meter.
- h) Explain in brief working of rotameter.

**Q.5**

**Attempt ANY FOUR questions.**

**(16)**

- a) Differentiate between venturimeter & orifice meter.
- b) Write the procedure for calibration of rotameter.
- c) State NPSH & Priming in centrifugal pump.
- d) Explain construction & working of gear pump.
- e) Mention the factor to be consider while selecting the pump.
- f) Why pressure recovery in orifice meters is lower than venturimeter.

**Q.6**

**Attempt ANY TWO questions.**

**(16)**

- a) Discuss construction & working of orifice meter with neat & clean diagram.
- b) Describe the construction & working of a centrifugal pump with neat & clean diagram.
- c) Explain in detail Reciprocating compressor

\*\*\*\*\*

Shri Vile Parle Kelavani Mandal's  
**SHRI BHAGUBHAI MAFATLAL POLYTECHNIC**  
**AUTONOMOUS SEMESTER EXAMINATION APRIL/MAY- 2018**

TIME ALLOWED: 03 HOURS

MAXIMUM MARKS: 100

COURSE: INDUSTRIAL MANAGEMENT

SEAT NO. \_\_\_\_\_

SEMESTER: III/IV

PROGRAMME: CH/ME

CODE: 160012

**INSTRUCTIONS:**

- (1) Answer to the two sections must be written in separate answer books.
- (2) All Questions are compulsory.
- (3) Illustrate your answer with neat sketches, wherever necessary.
- (4) Use of Mathematical and Steam tables and pocket calculator (non-programmable) is permissible.
- (5) Figures to the right indicate full marks.
- (6) Assume suitable additional data, if necessary.
- (7) Student should read the name and code of the subject and confirm that the question paper received is as per subject registered.

**SECTION-I**

- Q.1 Attempt ANY SIX of Following. (18)**
- a) State importance of Management.
  - b) List out content of partnership deed.
  - c) What is the role of industry in Indian Economy?
  - d) What are functions of H.R. Department?
  - e) What are function of Supervisor?
  - f) State advantages of co-operatives enterprises.
  - g) Give classification of industry.
  - h) State importance of H.R. Department to industry.
- Q.2 Attempt ANY FOUR of following. (16)**
- a) What are factors to be consider while selecting locations of industry.
  - b) State advantages & disadvantages of public sector enterprises.
  - c) Explain role and responsibilities of Supervisor.
  - d) State relevance of Management to Engineers.
  - e) What are various employee welfare measures in industry?
  - f) Explain about industrial training.
- Q.3 Attempt ANY TWO of following. (16)**
- a) Explain in detail various principles of Management.
  - b) Differentiate between Private Ltd Company & Public Limited Company.
  - c) Explain in detail Recruitment selection & placement of Man Power in Industry.





Shri Vile Parle Kelavani Mandal's  
SHRI BHAGUBHAI MAFATLAL POLYTECHNIC  
AUTONOMOUS SEMESTER EXAMINATION APRIL / MAY 2018

SEAT NO. \_\_\_\_\_  
SEMESTER: IV  
PROGRAMME: CHEMICAL ENGG.  
CODE: 160606

TIME ALLOWED: 03 HOURS  
MAXIMUM MARKS: 100  
COURSE: HEAT TRANSFER OPERATIONS

**INSTRUCTIONS:**

- (1) Answer to the two sections must be written in separate answer books.
- (2) All questions are compulsory.
- (3) Illustrate your answer with neat sketches, wherever necessary.
- (4) Use of Mathematical and steam tables and pocket calculator (non-programmable) is permissible.
- (5) Figures to the right indicate full marks.
- (6) Assume suitable additional data, if necessary.
- (7) Student should read the name and code of the subject and confirm that the question paper received is as per subject registered.

**SECTION-I**

**Q.1 Answer any six**

(18)

- (a) Distinguish between conduction and convection.
- (b) Write steady state equation of Fourier law for conduction.
- (c) Explain in brief critical radius of insulation with its mathematical equation.
- (d) Define the Newton's law of convection with suitable example.
- (e) Discuss co-current flow and counter current flow with the help of flow profile.
- (f) Explain the significance of LMTD.
- (g) Define Kirchoff's law of radiation with mathematical equation.
- (h) Write Stefan Boltzmann's law of radiation with mathematical equation.

**Q.2 Attempt any four**

(16)

- (a) Derive the expression for rate of heat transfer by conduction through a solid wall.
- (b) Derive the expression for rate of heat transfer by conduction through a cylindrical pipe.
- (c) What is dimensionless number? Mention any four dimensionless number in heat transfer.
- (d) Discuss the difference between natural and forced convection.
- (e) Calculate the loss of heat per unit area from a steam pipe to the surrounding air by radiation mode using the following data,  
Emissivity = 0.9  
Temperature of steam pipe = 398 k  
Temperature of air = 303 k
- (f) Define
  - i) Emissivity
  - ii) Emissive power
  - iii) Black body
  - iv) Monochromatic emissivity.

1/3  
160606

Q.3

Attempt any two

(16)

- (a) A furnace wall consists of 200mm of refractory brick 100 mm, kaolin brick and 6mm of steel pipe.  
Inner temperature is  $1100^{\circ}\text{C}$  and outside temperature of steel plate is  $30^{\circ}\text{C}$ .  
Calculate heat loss per unit area.

**Given data**

Thermal conductivity of refractory brick,  $K_r = 1.5 \text{ W/m}^2\text{ }^{\circ}\text{C}$ .

Thermal conductivity of kaolin brick,  $K_k = 0.085 \text{ W/m}^2\text{ }^{\circ}\text{C}$ .

Thermal conductivity of steel,  $K_s = 45 \text{ W/m}^2\text{ }^{\circ}\text{C}$ .

- (b) i) A steam pipe line, 150/160 mm in diameter is covered with layer of insulating material of thickness 50mm. The temperature inside the pipe line is 393K and outside surface of insulation is 313K. Calculate the rate of heat loss per meter length of pipe.  $K(\text{pipe}) = 5 \text{ W/m.k}$  and for insulating material is  $= 0.08 \text{ W/m.k}$   
ii) Methyl alcohol is flowing through the inner pipe of 25mm diameter of a double pipe heat exchanger. The outer pipe is 32mm diameter and water is flowing through it. The alcohol heat transfer coefficient is  $1020 \text{ W/m}^2\text{ }^{\circ}\text{C}$  and water coefficient is  $1700 \text{ W/m}^2\text{ }^{\circ}\text{C}$ . If the fouling factors are negligible, find the overall heat transfer coefficient.

(c) What are film coefficients and fouling factors with respect to heat transfer?

$$\text{Prove that } \frac{1}{U_i} = \frac{1}{h_i} + \frac{L A_i}{K A_m} + \frac{A_i}{h_o A_o}$$

Where the terms have their usual meaning.

## SECTION -II

Q.4

Attempt any six

(18)

- (a) Name the heat transfer equipments based on their function.  
(b) Define the terms  
i) Boiling point elevation  
ii) Evaporation  
iii) Capacity of evaporator  
(c) Explain the importance of crystal habit.  
(d) Classify shell, Tube heat exchangers.  
(e) State the advantages of floating head heat exchanger.  
(f) State the method of increasing the economy of an evaporator.  
(g) State the advantages of forced circulation evaporation.  
(h) Explain the effect of temperature on solubility.

Q.5

Attempt any four

(16)

- (a) Describe the construction of Swenson walker crystallizer.  
(b) Write in detail on nucleation growth of crystals.  
(c) Calculate the heat transfer area of 1-2 heat exchanger from the following data: Inlet, outlet temperatures of hot fluid are 423k, 353k respectively. Inlet, outlet temperatures of cold fluid are 303k, 318k respectively.  
Overall heat transfer coefficient =  $4100 \text{ W/m}^2\text{ }^{\circ}\text{C}$   
Heat loss = 407 KW  
LMTD correction factor = 0.84

PTO..

- (d) An oil is cooled from 353k to 313k in an oil cooler. The inlet temperature of water is 303k calculate the temperature of cooling water leaving the cooler, LMTD assuming flow to be counter current, if the mass flow rate of oil, water are  $1.4 \text{ kg/s}$ ,  $2.5 \text{ kg/s}$ , respectively  
 $C_p$  for oil =  $2.135 \text{ KJ/KgK}$   
 $C_p$  for water =  $4.187 \text{ KJ/KgK}$
- (e) Explain the construction of fixed tube sheet 1-2 heat exchanger with the help of suitable diagram.
- (f) In a double pipe counter – current flow heat exchanger  $10000 \text{ kg/h}$  of an oil having a specific heat of  $2095 \text{ J/Kg.K}$  is cooled from 353k to 323k by  $8000 \text{ kg/h}$  of water entering at 298k. Calculate the heat transfer area for an overall heat transfer coefficient of  $300 \text{ W/m}^2 \cdot \text{k}$ . Take  $C_p$  of water as  $4180 \text{ J/Kg.K}$

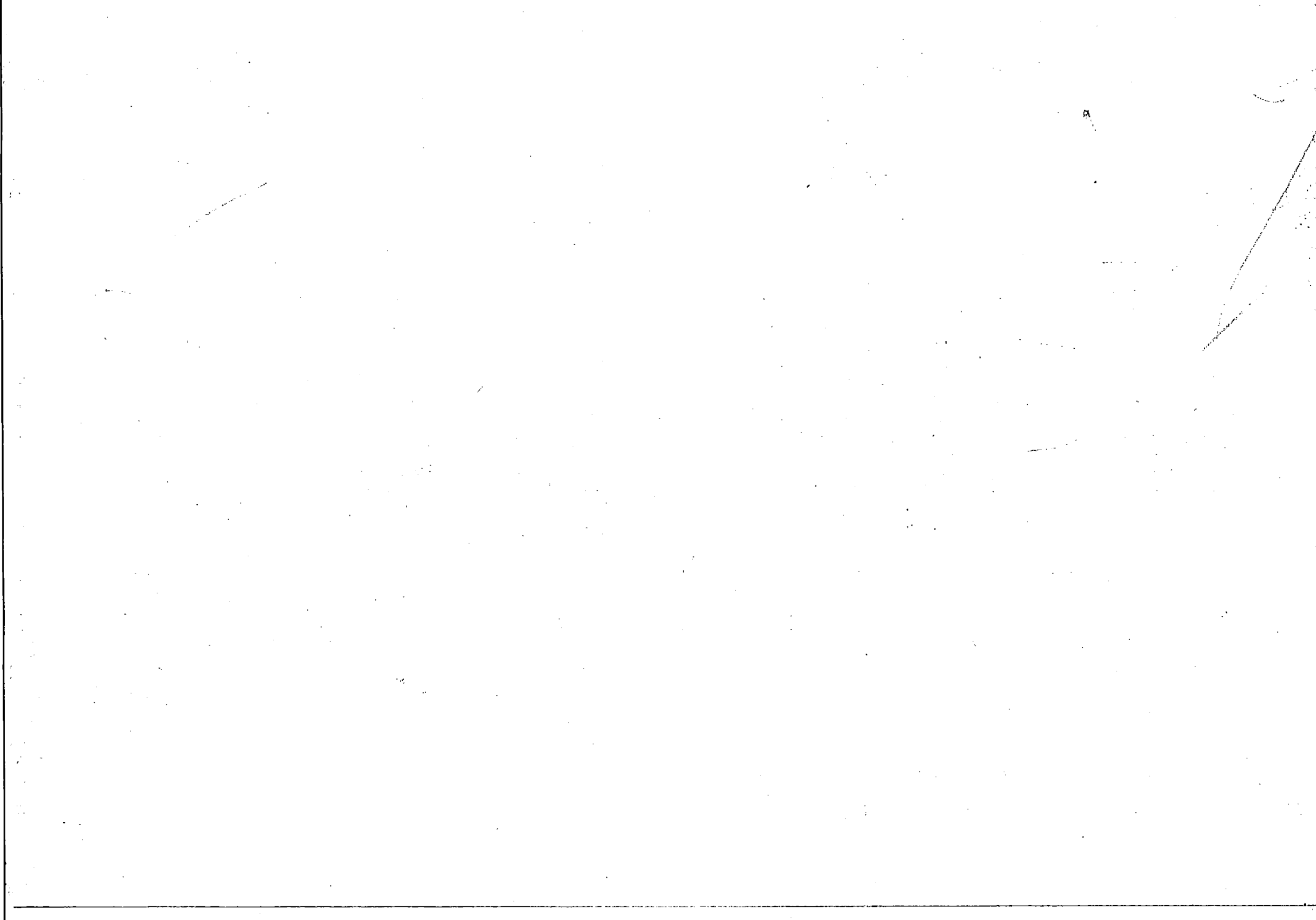
#### Q.6

Attempt any two

(16)

- (a) Explain the construction, working of calendar type evaporator.
- (b) With the neat diagram explain the construction & working of forward feed evaporator.
- (c) Write the step by step procedure for designing the shell & tube heat exchanger.

\*\*\*\*\*





## SECTION-II

- Q.4** **Answer Any Six of the following** (18)
- Define Dryness fraction and Equivalent evaporation from and at 100°C performance of boiler.
- (a) Define (i) Absolute humidity (ii) % relative humidity(iii) Saturated humidity
- (b) Explain use of non-steam heating media.
- (c) Draw diagram of steam pressure gauge.
- (d) Discuss use of steam trap.
- (e) Explain use of compressed air and process air.
- (f) Reason why boiler efficiency is not 100% ?
- (g) Define :
- (h)

- (i) Wet bulb temperature
- (ii) Dew point temperature
- (iii) Humid volume

- Q.5** **Answer Any Four of the following** (16)
- Steam is generated at 10 bar absolute pressure from water at 30oC. Determine the heat required to produce 1 kg of steam
- (a) (i) When dryness fraction is 0.9 and steam is wet.
- (b) (ii) When steam is dry saturated.
- (c) Compare fire tube boiler and water tube boiler.
- (d) Describe working of induced draft cooling tower and what are their merits and demerits?
- (e) Describe about different boiler mountings.
- (f) Write uses of instrument air in process plant.
- (g) How inspection of boiler is carried out by boiler inspector?

- Q.6** **Answer Any Two of the following** (16)
- (a) Find the efficiency of boiler and the grade if A boiler plant supplies 2000 kg of steam per hour at a pressure of 8 bar and 0.94 dry from feed water at 40°C when 200 kg/ hr. Coal is burnt with calorific value 31000 KJ/kg . The coal burnt is 90%/  
(b) Atmospheric air at 760 mm hg has dry bulb temperature 25°C and relative humidity 40% with help of psychometric chart find
- (c) Describe following:
- (i) Wet bulb temperature
  - (ii) Dew point temperature
  - (iii) Specific humidity
- (d) Describe following:
- (i) Non Steam heating in process plant
  - (ii) The process to get instrument air

\*\*\*\*\*

Shri Vile Parle Kelavani Mandal's  
**SHRI BHAGUBHAI MAFATLAL POLYTECHNIC**  
**AUTONOMOUS SEMESTER EXAMINATION APRIL/MAY-2018**

TIME ALLOWED: 03 HOURS

MAXIMUM MARKS: 100

COURSE: PRINCIPLES OF STOICHIOMETRY

SEAT NO. \_\_\_\_\_

SEMESTER: IV

PROGRAMME: CHEMICAL ENGG.

CODE: 160610

**INSTRUCTIONS:**

- (1) Answer to the two sections must be written in separate answer books.
- (2) Attempt **ALL** questions from Section-I and Section-II.
- (3) All questions are compulsory.
- (4) Illustrate your answers with neat sketches, wherever necessary.
- (5) Use of Mathematical and Steam tables and pocket calculator (non-programmable) is permissible.
- (6) Figures to the right indicate full marks.
- (7) Assume suitable additional data, if necessary.

**SECTION-I**

**Q.1 Attempt any six**

(18)

- (a) How many kilogram of ethane are there in 210 kmol?
- (b) The concentration of an aqueous solution acetic acid is specified as 30% by weight. Find the molding of the solution.
- (c) 5 kg of Oxygen contained in closed container of volume 1 m<sup>3</sup> is heated without exceeding a pressure of 709.28kpa. Calculate the maximum temperature of gas attained.
- (d) A sample of gas having volume of 1m<sup>3</sup> is compressed in such a manner so that its pressure is increased by 85%. The operation is done for a fixed mass of gas at constant temperature. Calculate the final volume of gas.
- (e) A single effect evaporator is fed with 1000 kg/hr of weak liquor containing 15% caustics by weight and is concentrated to get thick liquor containing 40% by weight caustic (NaOH) calculate  
i) kg/hr of water evaporated ii) kg/hr of thick liquor obtained.
- (f) A sample of caustic soda (NaOH) Flakes contains 74.6% Na<sub>2</sub>O by weight. Find the purity of the flakes.
- (g) A wet solid contains 20% moisture and is dried to a moisture content of 1% by hot air If 75 kg water is evaporated, what is the feed rate?
- (h) A dilute acid containing 25% H<sub>2</sub>SO<sub>4</sub> is concentrated by commercial grade sulphuric acid containing 98% H<sub>2</sub>SO<sub>4</sub> to obtain desired acid containing 65% H<sub>2</sub>SO<sub>4</sub> Find the quantities of the acids required to make 1000Kg of desired acid.

**Q.2 Attempt any four**

(16)

- (a) Convert.  
i) Kcal/hr.m<sup>2</sup>.°C to Btu/hr.Ft<sup>2</sup>. °F    ii) 9/cm<sup>3</sup> to lb/ft<sup>3</sup>.
- (b) An aqueous solution of sodium chloride PS prepared by dissolving 25Kg of sodium chloride in 100Kg of water find.  
i) Weight % ii) Mole % composition of sot ?
- (c) Find the molarity of 0.5N-KOH solution

1/3

160610

- (d) For ideal gases, prove that, Volume % = Pressure %
- (e) For carrying out nitration reaction, it is desired to have a mixed acid containing 39%  $\text{HNO}_3$ , 42%  $\text{H}_2\text{SO}_4$  and 19%  $\text{H}_2\text{O}$ . Nitric acid of 68.3% is readily available. Calculate
- Required strength of  $\text{H}_2\text{SO}_4$  to obtain the above mixed acid.
  - The weight ratio of  $\text{HNO}_3$  to  $\text{H}_2\text{SO}_4$  to be mixed.
- (f) A waste acid from nitrating process contains 23%  $\text{HNO}_3$ , 57%  $\text{H}_2\text{SO}_4$  and 20% water by weight. This acid is to be concentrated to contain 27%  $\text{HNO}_3$ , 60%  $\text{H}_2\text{SO}_4$  by addition of concentrated  $\text{H}_2\text{SO}_4$  containing 93%  $\text{H}_2\text{SO}_4$  and conc.  $\text{HNO}_3$  containing 90%  $\text{HNO}_3$ . Calculate the weights of waste and concentrated acid that must be combined obtain 1000Kg of desired mixture.

### Q.3

#### Attempt any two

- (a) The analysis of the gas sample is given below (on volume basis)  $\text{CH}_4 = 66\%$ ,

$\text{CO}_2 = 30\%$ ,  $\text{NH}_4 = 4\%$ ,

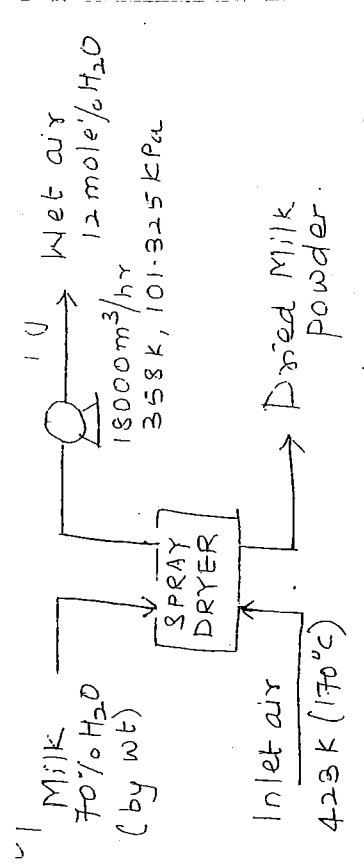
Find

- The average molecular weight of the gas.
- Density of the gas at 303.975kpa and 303k.

(16)

- (b) Milk powder is produced in spray dryer which evaporated all of liquid ( $\text{H}_2\text{O}$ ). Operation is shown in fig. Assuming inlet air contains no water, calculate:-

- Production rate of powdered milk.
- Molal flow rate of the inlet air.



- (c) A mixed fertilizer, having the NPK composition 10:26:26 as %N, % $\text{P}_2\text{O}_5$  & %  $\text{K}_2\text{O}$  BY weight respectively is to be formulated by mixing ammonia, phosphoric acid & potassium chloride. If anhydrous ammonia, Phosphoric acid & 100% potassium chloride are used for mixing calculate the amount of each of them required for formulating 100kg mixed fertilizer. It may be assumed that filler will be make up the balance.



SECTION-II

Q.4

**Attempt any six**

(18)

- (a) With example, explain stoichiometric equation and stoichiometric ratio.
- (b) Define i) % yield ii) % conversion
- (c) What is excess component in a chemical reaction? What is % excess?
- (d) For the reaction  $\text{CO} + 2\text{H}_2 \rightarrow \text{CH}_3\text{OH}$  calculate:
  - i) Stoichiometric ratio of  $\text{CO}:\text{H}_2$
  - ii) If 4Kmoles CO are reacted Kmoles of  $\text{CH}_3\text{OH}$  formed.
- (e) Explain Hess's law of constant heat summation.
- (f) Define adiabatic reaction and adiabatic reaction temperature.
- (g) Calculate the heat required to heat 5Kg water from  $30^\circ\text{C}$  to  $70^\circ\text{C}$ .
- (h) Define i) Standard heat of combustion ii) standard heat of reaction.

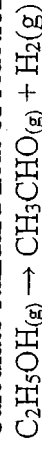
Q.5

**Attempt any four**

(16)

- (a) In production of  $\text{SO}_3$  and 200km of  $\text{O}_2$  are fed to a reactor. The product stream is found to contain 80 Kmof  $\text{SO}_3$ . Find % conversion of  $\text{SO}_2$ .
- (b) For manufacture of  $\text{NH}_3$ , 4Kmoles of  $\text{N}_2$  and 10 Kmofes of  $\text{H}_2$  are fed. Identify excess component and calculate % excess.
- (c) For the oxidation of ethane, 10 kmofes of ethane and 200 Kmofes air are fed. Calculate % excess air.
- (d) Calculate the heat that must be added at 3kmof air to heat is from 298 K of 473k using the mean mofal heat capacity data.  
CPM (between 473 k and 298k) for air =  $29.39 \frac{\text{KJ}}{\text{K mof K}}$
- (e) 100 Kg /hr of water at  $25^\circ\text{C}$  is to be completely converted to saturated steam at  $100^\circ\text{C}$ . Calculate the amount of heat required. CP= 4.187 KJ/Kg K.  
latent heat of vaporization = 2240 KJ/ kg.

- (f) Calculate standard heat of reaction of the following reaction



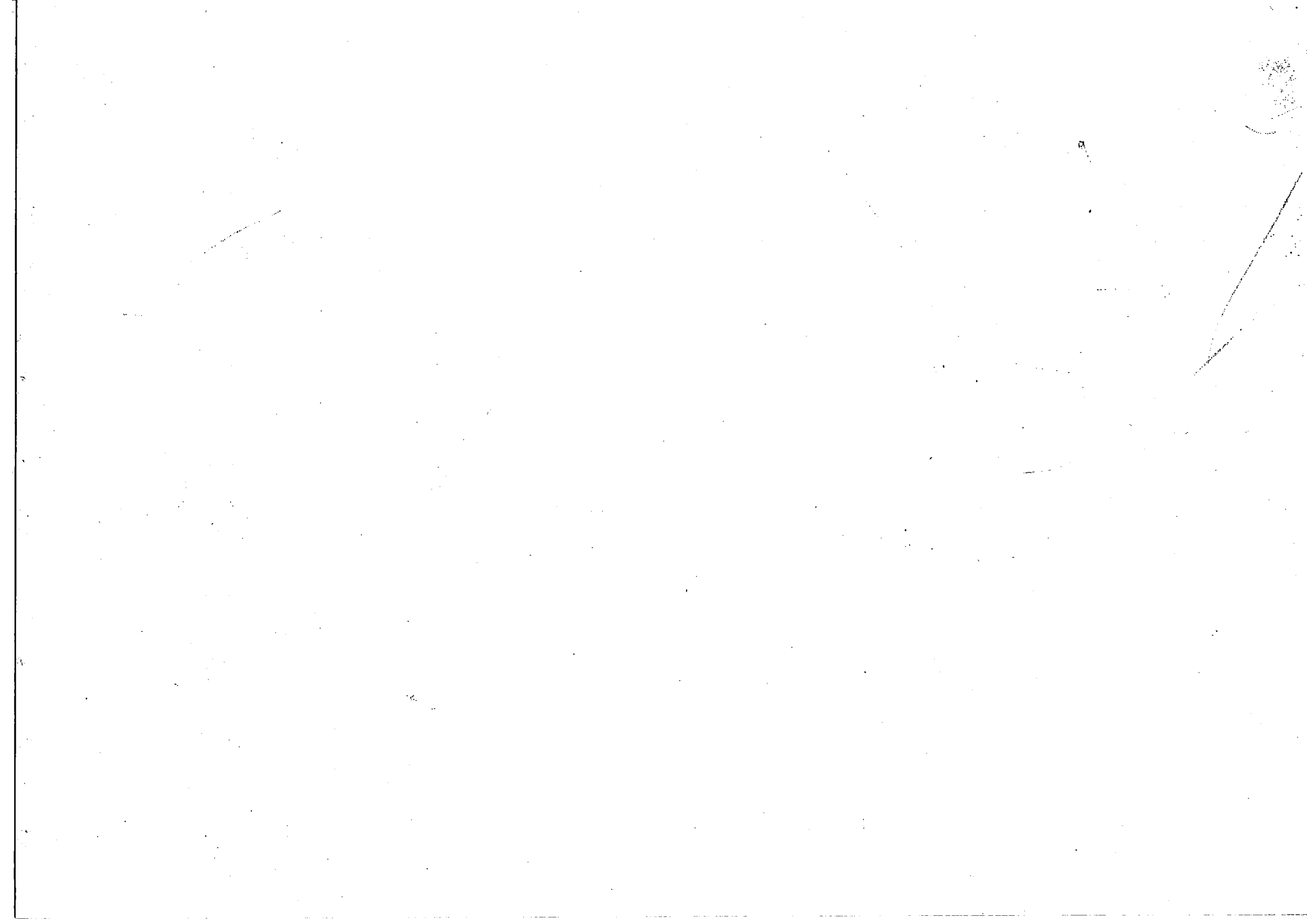
Component	$\Delta H^\circ\text{C KJ/mof}$
$\text{C}_2\text{H}_5\text{OH}_{(g)}$	- 1410.09
$\text{CH}_3\text{CHO}_{(g)}$	- 1192.65
$\text{H}_2_{(g)}$	- 285.83

Q.6

**Attempt any two**

(16)

- (a) A gas containing 25%  $\text{CO}$ , 5%  $\text{CO}_2$ , 2%  $\text{O}_2$  and rest  $\text{N}_2$  (by volume) is burnt with 20% excess air. If the combustion is 80% complete calculate the composition of flue gases leaving the combustion chamber by volume.
- (b) In the Deacon process for manufacturing chlorine, hydrochloric acid is oxidised with air.  $4\text{HCl} + \text{O}_2 \rightarrow 2\text{Cl}_2 + 2\text{H}_2\text{O}$  Air used is 30% in excess of that theoretically required and the oxidation is 80% Complete. Calculate the composition by volume of gases leaving the reaction chamber.
- (c) Calculate heat of formation of liquid 1-3 butadiene at 298.15k using following data.  
Std. Heat of formation of  $\text{CO}_2$  (g) = -393.51 KJ/mf.  
Std. heat of formation of  $\text{H}_2\text{O}$  (l) = -285.83 KJ/mf.  
Heat of combustion of  $\text{C}_4\text{H}_6$  at 298.15 k = -2520.11 KJ/mof.



**Shri Vile Parle Kelavani Mandal's**  
**SHRI BHAGUBHAI MAFATLAL POLYTECHNIC**  
**AUTONOMOUS SEMESTER EXAMINATION APRIL/MAY- 2018**

TIME ALLOWED: 03 HOURS  
MAXIMUM MARKS: 100  
COURSE: PLANT SAFETY & LOSS PREVENTION. CODE: 160611

SEAT NO. \_\_\_\_\_  
SEMESTER: IV  
PROGRAMME: CHEMICAL ENGG.

**INSTRUCTIONS:**

- (1) Answer to the two sections must be written in separate answer books.
- (2) Attempt All questions.
- (3) All Questions are compulsory.
- (4) Use of Mathematical and Steam tables and pocket calculator (non-programmable) is permissible.
- (5) Illustrate your answers with neat sketches, wherever necessary.
- (6) Figures to the right indicate full marks.
- (7) Assume suitable additional data, if necessary.
- (8) The student should read the name and code of the subject and confirm that the question paper received is as per subject registered.

**SECTION - I**

- Q.1 Answer any Six of the following (18)**
- (a) Discuss various types of PPE's used for foot protection.
  - (b) With examples, discuss various classes of fire.
  - (c) Discuss selection criteria of respiratory apparatus.
  - (d) Explain concept of fire triangle in detail.
  - (e) Explain various factors governing storage of chemicals.
  - (f) What is work permit and explain its significance.
  - (g) Explain emergency information pond with neat sketch.
  - (h) Explain in detail about Trencard used in transportation of hazardous chemical.
- Q.2 Answer any Four of following (16)**
- (a) What is MSDS & List important points that are necessary in MSDS?
  - (b) Describe construction & working of self- contained compressed air breathing apparatus.
  - (c) Explain construction & working of canister type respiratory device & its limitations.
  - (d) Explain in detail various important features of vessel entry work permit.
  - (e) Discuss various hazards associated with momentum transfer.
  - (f) Discuss various colour codes used in plant safety.
- Q.3 Answer any Two of following (16)**
- (a) With neat sketch, explain construction and working of foam type fire extinguisher.
  - (b) With neat sketch, explain various types of class labels used for hazardous chemicals.
  - (c) Discuss various general safety precautions for transportation of hazardous chemicals.

SECTION-II

Q.4

**Attempt any Six**

(18)

- (a) State the importance, objectives of plant safety.
- (b) What are the causes of industrial accidents?
- (c) Name the different types of hazards.
- (d) Give examples of unsafe Act, unsafe condition.
- (e) What are the medical benefits under the ESL.
- (f) What are the effect of Noise on human being?
- (g) Explain the principles of total loss control.
- (h) How the hazards in industry can be controlled?

Q.5

**Attempt any Four**

(16)

- (a) Discuss in detail the role of management in implementing safety in industry.
- (b) Discuss general safety precautions in case of welding.
- (c) Explain HAZOP in detail with suitable example.
- (d) Explain the role of various personnel in case of emergency during normal working hour.
- (e) Explain the process of investigation and reporting of industrial accidents.
- (f) Explain any two case studies of industrial accidents & their remedial measures.

Q.6

**Attempt any Two**

(16)

- (a) Explain in detail event tree analysis.
- (b) Give examples of static electricity generation in process industry. How to prevent static electricity generation in process industry?
- (c) Explain in detail about various sections of factory Act 1948.

\*\*\*\*\*

Shri Vile Parle Kelavani Mandal's  
SHRI BHAGUBHAI MAFATLAL POLYTECHNIC  
AUTONOMOUS SEMESTER EXAMINATION APRIL / MAY 2018

TIME ALLOWED: 03 HOURS  
MAXIMUM MARKS: 100  
COURSE: POLLUTION CONTROL AND WASTE DISPOSAL

SEAT NO. \_\_\_\_\_  
SEMESTER: IV  
PROGRAMME: CHEMICAL ENGG.  
CODE: 160614

**INSTRUCTIONS:**

- (1) Answer to the two sections must be written in separate answer books.
- (2) All questions are compulsory.
- (3) Illustrate your answer with neat sketches, wherever necessary.
- (4) Use of Mathematical and steam tables and pocket calculator (non-programmable) is permissible.
- (5) Figures to the right indicate full marks.
- (6) Assume suitable additional data, if necessary.
- (7) Student should read the name and code of the subject and confirm that the question paper received is as per subject registered.

**SECTION-I**

- Q.1 Attempt any Six (18)**
- (a) Define "Air Pollution" Discuss the sources, classification of air pollution.
  - (b) Describe the effect of Air pollution on plants and animals.
  - (c) Draw a neat labelled diagram of the scrubber used for sampling gaseous air pollutants.
  - (d) Describe in short how the pollutants in atmosphere are determined.
    - i) Suspended impurities.
    - ii) SO<sub>2</sub>
  - (e) Name the absorbents used for NO<sub>x</sub>, HF, H<sub>2</sub>S, and SO<sub>2</sub>.
  - (f) Write a short note on "Bhopal gas tragedy."
  - (g) Explain the phenomenon of "Green House Effect".
  - (h) State the principle of "Incineration"
- Q.2 Attempt any Four (16)**
- (a) What do you mean by Automobile Pollution? Describe its control methods with respect to catalytic converter.
  - (b) What are the causes responsible for ozone hole? Explain the remedial measures for mitigation.
  - (c) Define and explain the term sampling. Explain the sampling methods of air pollution.
  - (d) What are the advantages of "Web scrubbers" over "Fabric filters"
  - (e) Describe the case study on "Air Pollution in Delhi". Its magnitude effects on health".
  - (f) Write down the applications of 'Gravity setting chamber' in detail.
- Q.3 Attempt any Two (16)**
- (a) With the help of a neat sketch explain the principle, construction, working of "Cyclone Separator."
  - (b) Describe the construction and working of an "electrostatic precipitator".
  - (c) Explain the various techniques available for collection of gaseous pollutants.

## SECTION-II

**Q.4**

**Attempt any Six**

**(18)**

- (a) Define water pollution. Classify the sources of water pollution.
- (b) Explain, why industrial waste water is to be treated before leaving it to the water bodies.
- (c) Define i) BOD ii) COD iii) DO
- (d) Define flotation. Explain its working principle.
- (e) Explain Ion exchange process for waste water with suitable example.
- (f) State the importance of tertiary waste water treatment. List the process used for it.
- (g) Classify the solid waste.
- (h) Explain why it is necessary to treat solid waste.

**Q.5**

**Attempt any Four**

**(16)**

- (a) Explain the effect of inorganic chemicals and oil on water.
- (b) Describe the analytical methods for Dissolved Oxygen (DO).
- (c) With the help of neat sketch, explain principle, construction and working of Trickling filter.
- (d) List various chemical and physical treatment methods for wastewater and explain any one.
- (e) Explain Reverse Osmosis method for waste water with suitable example.
- (f) Explain facultative pond with neat diagram.

**Q.6**

**Attempt any Two**

**(16)**

- (a) Explain solid waste handling process by sanitary land filling.
- (b) Explain the basic principle and treatment of waste by activated sludge process.
- (c) Explain the characteristics of waste water.

\*\*\*\*\*