UNIVERSITY OF PUNE
[4362]-204
S. E. (Polymer/Petroleum/Petrochemical)
MOMENTUM TRANSFER
(2008 Pattern)

Total No. of Questions : 12 **[Total No. of Printed Pages :5]**
[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

(1) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 OR Q.6,Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12
(2) Figures to the right indicate full marks
(3) Use of electronic calculator is allowed.
(4) Draw neat sketch where ever necessary

SECTION ONE

Q1.

a) Define the following fluid properties and state their units. [4]
(1) Specific weight (2) Dynamic Viscosity(3) Surface tension(4) Bulk Modulus of Elasticity

b) Define the following fluid properties with their significance in momentum transfer [6]
1) Capillarity 2) Vapor Pressure 3) Elasticity

c) State Newton's law of viscosity. Explain the variation of viscosity of liquids and gasses with temperature with justification [6]

OR

Q2.

a) A glass tube of internal diameter 2 mm is partially dipped in glycerin with its lower end 20 mm deep below surface. Air is blown in the tube so as to form an air bubble at its bottom end of the diameter of the tube. If specific weight and surface tension of glycerin are 12.356 kN/m^2 and 0.0637 N/m, find the pressure inside the bubble. [6]

b) If density of a liquid is 850 kg/m^3, find its specific weight, specific gravity and specific volume. If Kinematic viscosity of this liquid is 1.75 cm^2/sec, find its dynamic viscosity [5]

c) The bulk modulus of elasticity of water is given as K=2.2 X10^9 Pa. what pressure is required to reduce its volume by 0.5%? [5]

Q3.

a) With the help of a neat diagram define the terms: Absolute pressure, Gauge pressure and Vacuum pressure. [4]

b) Define the following: Path line, stream line, stream tube, streak line, velocity of a fluid and local acceleration of fluid particle [6]

c) In a three dimensional fluid flow, two velocity components u and v are u=2x^2 and v=2 xyz. Find the third component 'w' such that the continuity equation is satisfied. [6]

OR

Q4.

a) A 'U' tube mercury manometer is used to measure pressure of oil (sp.gr. 0.8) in a pipeline. The difference shown by manometer is 500 mm. the mercury oil interface is 1.5 m above the centre line of the pipe. Find the pressure of oil pipeline. [6]

b) State whether the flow of liquid given by u=3x and v=-3y is
1) Continuous 2) Rotational [4]

c) Distinguish between 'U' Tube Manometer and Differential Manometer with the help of neat diagram [6]

Q5.

a) The water is flowing through a pipe having diameters 20 cm and 10 cm at section 1 and 2 respectively. The rate of flow through pipe is 35 lit/sec. The section 1 is 6 m above Datum and a section 2 is 4m above datum, if the pressure at section 1 is 39.24N/cm^2, find intensity of pressure at section 2 [8]

b) Define the following hydraulics coefficients of an Orifice. [10]
1) Coefficient of contraction
2) Coefficient of Velocity
3) Coefficient of Discharge
4) Coefficient of Resistance

OR

Q6.

a) State and express Bernoulli Equation. With respect to Bernoulli equation explain the following [12]
1) Assumptions made in the derivation

2) Significance of the terms involved
3) Limitations of the equation
4) Modifications for head and energy
5) Kinetic energy correction factor

b) A fluid of density 1000 kg/m^3 is flowing through a pipe of diameter 40 cm is suddenly contracted to a diameter of 20 cm. the pressure in the larger pipe is 160 kN/m^2 and pressure in the smaller pipe is 150 kN/m^2. Head lost due to sudden contraction of pipe cross section is 0.34 m. determine the coefficient of contraction if the velocity of fluid in the larger pipe is 0.98 m/s [6]

SECTION TWO

Q7.

a) Explain the Hydrodynamics development of a fluid flow in a pipe. Explain the Laminar and turbulent flow velocity profiles with the help of neat sketch [8]

b) A fluid is flowing through a pipe of 60 cm diameter at the rate of 0.05 m^3/s. the length of the pipe is 600 m. density of fluid is 900 kg/m^3 and viscosity of fluid is 0.006 Ns/m^2. Determine the head lost due to friction. Friction factor is given by $f=0.046\ Re^{-0.2}$ [8]

OR

Q8.

a) What are major and minor losses in a flow through pipe? What is equivalent length of a pipe? Water flows through a Pipe of 100 mm diameter at the rate of 15.71 liters per sec. the straight length of pipe is 50 m and ne open globe valve, a 'T' through side outlet and an elbow is provided in it. If the loss co efficient of these fittings of these fittings are 10,1.8 and 0.9 respectively, what is the total length of the pipe and total head loss in it? Take friction factors as 0.022 [12]

b) Discuss the variation of friction factor with Reynolds number for different values of roughness for flow of fluid in pipe? [4]

Q9.

a) What are the characteristics of a turbulent flow? Explain the utility of turbulent flow characteristics in process industry. [8]

b) Explain with the help of neat sketch various multiphase flow regimes in Horizontal pipe. What is the flow regime map? [8]

OR

Q10.

a) Draw a neat sketch of a boundary layer. Define the following with respect to boundary layer: [10]
   1) Laminar Sublayer
   2) Hydrodynamic Smooth and rough boundaries
   3) Boundary layer thickness

b) Express the following and give its utility [6]
   1) Dracy's law 2) Ergun's Equation

Q11.

a) A centrifugal pump is used to deliver liquid at a rate of 0.003 m^3/s from a reservoir at atmospheric pressure. The gauge pressure at the end of delivery pipe is 300kN/ m^2 . The delivery is 3.5 m and the pump suction is 1.5 m above the level in the reservoir. The delivery pipe is 40 mm in diameter. The friction in the suction pipe is 3.5KN/ m^2 and the friction in the delivery pipe is 41 KN/ m^2. The overall efficiency of the pump is 60 percent. The vapor pressure of the liquid is 26 KN/ m^2. Density of liquid is 900 kg/ m^3. Calculate 1) Head Developed by the pump 2) Work done per second by the pump and 3) Net positive suction head of the pump [12]

b) Explain the following with respect to Dimensional Analysis: [6]
   1) Selection of repeating variables
   2) Utility of Dimensional analysis

OR

Q12.

a) Explain the classification of a Pump, blower, compressor and a Fan. Draw the operating characteristics of a centrifugal pump. [10]

b) A centrifugal pump is used to deliver a liquid at a rate of 0.3 m^3/s. the distance between liquid level in the reservoir and the suction pipe is 1.8 m. the vapor pressure of the liquid is 50 KN/m^2. The pressure on the liquid surface in the reservoir is 100 KN/ m^2. The diameter of the pipe is 30 cm and the length of pipe 50 m. Determine the NPSH. Density of liquid=900 kg/ m^3 and Viscosity of liquid = $0.5*10^{-3}$Ns/ m^2 [8]

[Total No. of Questions: *12*] **[Total No. of Printed Pages:** *5*]

UNIVERSITY OF PUNE

[4364]-207

S. E. (Petroleum/Petrochemical/Polymer Engineering) Examination - 2013

Heat transfer (2008 Course)

[Time: *3* **Hours]** **[Max. Marks: 100]**

Instructions:

1 *Answers to the two sections should be written in separate answer-books.*

2 *Draw neat diagram wherever necessary.*

3 *Numbers to the right indicate full marks.*

4 *Assume suitable data, if necessary*

5 *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

SECTION -I

Q.1 A An Aluminum (k = 200 W/m °C) 2.5cm in diameter and 10cm long protrudes from a wall which is maintained at 250°C. the rod is exposed to an environment at 15°C. The convective heat transfer coefficient is 15 W/m^2 °C. Assume rod end is insulated. Determine the heat loss by rod. Also find Fin efficiency and temperature at the end of fin. 8

B Hot air at a temperature of 70°C is flowing through a steel pipe of 15cm diameter. The pipe is covered with two layers of different insulating materials of thickness 5cm and 3cm and their corresponding thermal conductivity are 0.23 W/m °C and 0.37 W/m °C. The inside and outside heat transfer coefficients are 58 W/m^2 °C and 10 W/m^2 °C. The ambient temperature is 27°C. Find the rate of heat loss from 50m length of pipe also find temperature 8

at inner and outer surface. Neglect the resistance of steel plate.

	C	Define the terms Heat and Thermal Conductivity.	2

OR

Q.2	A	Derive the necessary expression for Critical Thickness of Insulation for Sphere.	6
	B	Derive the necessary expression for Heat flow rate, Fin Efficiency from an Infinitely long fin.	12
Q. 3	A	Define the terms Solid angle and intensity of Radiation and derive the necessary expression between Emissive power and Intensity of Radiation.	8
	B	Find out the heat transfer rate per unit area due to radiation between two infinitely long parallel planes. The first plane has emissivity = 0.4 and it is maintained at 200°C. The emissivity of second plane is 0.2 and is maintained at 30°C. A radiation shield having emissivity 0.5 is introduced between the given planes. Find the percentage reduction in heat transfer rate and the steady state temperature attained by the shield.	8

OR

Q. 4	A	Explain in detail Radiation Heat exchange between two Black Bodies.	8
	B	Explain the term Shape Factor and discuss the laws of Shape Factor.	6
	C	Explain Stefan Boltzman's Law.	2
Q. 5	A	Discuss in detail Reynold's Analogy and Colburn Analogy.	8
	B	Liquid metal flows at a rate of 4.5 kg/sec through a 5 cm diameter Stainless Steel tube. It enters at 415°C and leaves at 440°C as it passes through the tube. If a constant heat flux is maintained along the tube and the tube wall is at a temperature 20°C higher than liquid metal bulk temperatures. Calculate the length of tube required for effective heat transfer heat transfer. Fluid Properties are as below: C_p=149J/Kg °C, k= 15.6 W/m °C, μ=1.34×10^{-3}kg/m.sec, Npr=0.013,	8

Average Nusselt number is given by:

$(N_{Nu})_{Avg}=4.82+0.0185\ (Pe)^{0.827}$

OR

Q. 6 A Calculate the heat transfer coefficient by free convection and the maximum current intensity for a nichrome wire 0.5 mm in diameter, with the conditions that its temperature should not exceed 300°C. The wire is exposed to still air at 20°C and the resistance per meter length of the wire is 6 ohms/m. 8

The properties of air are as below:

ρ=0.8711 kg/m^3, C_p=1014 J/Kg °C,

k= 33.8×10^{-3} W/m °C, Kinematic viscosity $\upsilon = 26.41 \times 10^{-6}$ m^2/sec.

average Nusselt Number is given by:

$(N_{Nu})_D=1.18(N_{Gr}.N_{Pr})^{1/8}$

B Discuss any four different Dimensional Numbers applicable in convective heat transfer. 8

SECTION II

Q. 7 A Derive the expression for Logarithmic Mean Temperature Difference for Counter current type of Heat Exchanger. 12

B Define the following terms: 6

i) Logarithmic Mean Temperature Difference
ii) Number of Transfer Units
iii) Effective of heat Exchanger

OR

Q. 8 A Alcohol flowing in inner steel pipe of a double pipe exchanger is cooled with water flowing in the jacket. Inner diameter of inner steel pipe is 25mm and 2mm thick. Thermal conductivity of steel is 45 W/m°C. Film coefficient of alcohol is 1200 W/m^2 ^{0}C and that of water is 1800 W/m^2 ^{0}C. The inside and outside fouling factors are 5000 W/m^2 ^{0}C and 3000 W/m^2 ^{0}C respectively. Calculate the overall heat transfer coefficient depending on inside as well as outside area of the tube. 10

	B	Write a note on i) Classification of Heat Exchanger ii) Fouling Factor	8
Q. 9	A	Explain Film wise condensation and Explain the Effect of Non condensable gases on Condensation.	8
	B	Explain different characteristics of two phase convection systems.	8

OR

Q. 10	A	Find the rate of condensation per meter length of tube. Steam saturated at 49 °C is condensing on the outside of a bank of 25 horizontal tube of 1 cm diameter arranged in 5×5 square array at surface temperature of 40 °C. the properties of water film at mean temperature are: ρ=1218 kg/m^3, k= 0.069 W/m°C, Dynamic viscosity μ=250×10^{-6} Kg/m.sec. Latent heat of condensation = 128 KJ/Kg. Assume vapor density is small compared to that of the condensate.	10
	B	Explain different types of Boiling and explain the significance of critical Heat Flux.	6
Q. 11	A	Write a note on Multiple Effect Evaporation and explain any one method in detail of Multiple effects Evaporator.	10
	B	Discuss in detail Forced Circulation Evaporator.	6

OR

Q. 12	A	A single effect evaporator is used to concentrate 3000 kg/hr of 10% caustic soda liquor to 30% caustic soda thick liquor by weight basis. The liquor is pumped through vertical tubes of Calandria which are 32mm outer diameter and 28mm inner diameter and 1.5 m long. Steam is supplied at 120°C, latent heat of vaporization is 2270 kJ/kg Feed enters at 30°C. Boiling point elevation of 30% caustic soda thick liquor is 13°C. The saturated temperature of solution is evaporator is 82°C. The overall heat transfer coefficient is 1.75kW/m^2 ^{0}C. Estimate steam consumption and how many tubes will required in given evaporator.. Enthalpy of feed = 97.34 kJ/kg, Enthalpy of vapor=2686 kJ/kg,	10

Enthalpy of product = 298 kJ/kg.

B Explain effect of feed temperature on the economy of Evaporator. 6

PUNE UNIVERSITY
[4362]-205
S. E.(Polymer/Petroleum/Petrochem)
Examination-2013
Strength of Materials
(2008 Course)

[Total No. of Questions: 12] **[Total No. of Printed Pages: 5]**
[Time: 3 Hours] **[Max. Marks: 100]**

Instructions:

(1) Answer Q.1 or Q.2,Q.3 or Q.4,Q.5 or Q.6 questions from each section.
*(2) Answers to the **two sections** should be written in **separate answer-books**.*
(3) Black figures to the right indicate full marks.
(4) Neat diagrams must be drawn wherever necessary.
(5) Your answer will be valued as a whole.
(5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
(6) Assume suitable data, if necessary.
(7) All questions are compulsory.

SECTION-I

Q. 1. A) Derive the relationship between the stresses developed due to gradually & suddenly applied loads. (4)

B) Find the elongation of a bar under the action of its own weight having a uniform cross sectional area A and weighing wo per unit length. (6)

C) A vertical steel bar 15 mm diameter & 3000mm length is provided With a collar, at the lower end. find the maximum weight that can be Dropped through a height of 100mm on the collar if the maximum Permissible stress is 150MPa. Assume for steel is 200 GPa. (8)

OR

Q. 2. A) Define the following

i) Strain energy ii) Proof Renlience iii) Modules of Renlience iv) Thermal stress v) Thermal strain (5)

B) Define the constant of material & state the relationship between them. (5)

C) A square bar 25mm × 25mm is subjected to axial forces as show in Figure no. 2(c).Find the total elongation of the bar. (8)

Take E=200 GPa.

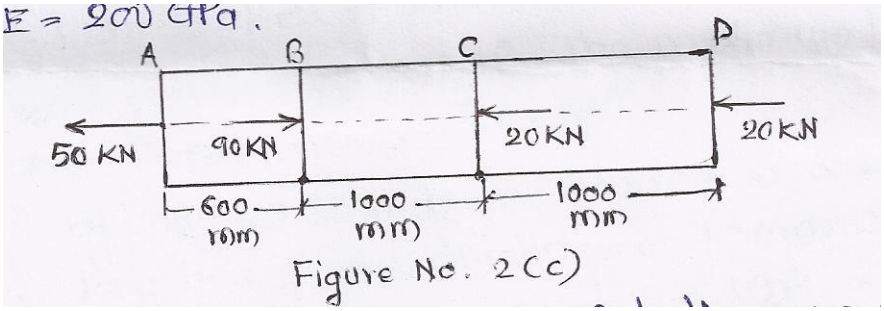


Figure No. 2(c)

Q. 3. A) At a point in a material there are normal stresses 30MPa & 60MPa, (8)
Both tenale together with a shearing stress od 22.5 MPa. Find the value Of principle stress & inclination of principle planes to the direction of 60MPa stress.

B) A steel shaft of solid circular section has to transmit 375KW at 210 (8)
r.p.m. the maximum shear stress is not to exceed 50 MPa & the angle of twist must be note more than 1º in a length at 3m. Design a suitable diameter of the shaft Take G=80GPa.

OR

Q. 4. A) At a point in a strained material under two dimensional stress (8)
Condition, the normal stress and certain plane is 80 MPa compressive & shear stress at 56 MPa. On a plane right angles to this plane, there is No normal stress. Find principle stress.

B) A solid shaft 54mm in diameter is to transmit a torque at 1100Nm. (8)
The maximum torque is 1.3 times the average torque. Twist allowed is 1.2º/meter length of the shaft. Calculate the maximum shear stress induced.

Q. 5. A) For a thin cylinder, derive the expression for increase in diameter (8)
increase in length & decrease in thickness due to fluid pressure.

B) A pipe of 200mm. internal diameter and 100mm. thickness contains a fluid at a pressure of 6 N/mm^2. Find the maximum & minimum hoop Stress across the section.

OR

Q. 6. A) Find the thickness of metal necessary for a steel cylindrical thick (8)
Shell of internal diameter 200mm to withstand an internal pressure of 50 MPa. The Maximum hoop stress in the section is not to exceed 150MPa.

B) A cylindrical thin drum 800mm in diameter and 3 meter long has a Shell thickness of 10mm If the drum is subjected to internal pressure at 2.5 MPa. Determine (8)

i. The change in diameter
ii. The change in length

Take $E=2\times10^5$ MPa & passon's Ratio=$^1/_4$

SECTION-II

Q. 7. A) A 10m long supported beam carries loads and a couple. (8)
Ref fig.Q.7 (A) Draw the shear force diagram and bending moment Diagram for the beam showing all important values.

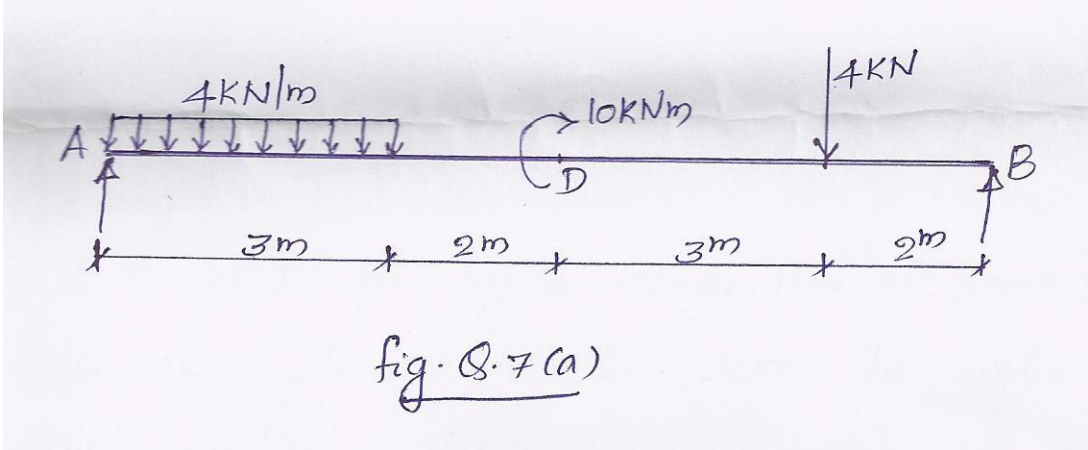


fig. Q.7 (a)

B) What is i) Moment of resistance ii) section modulus of a section of a beam. (8)
Derive expressions for the section module of any two standard section and in beams.

OR

Q. 8. A) Draw the shear force diagram and bending moment diagram for a Cantilever loaded as in fig Q.8 (A) show all important values. (4)

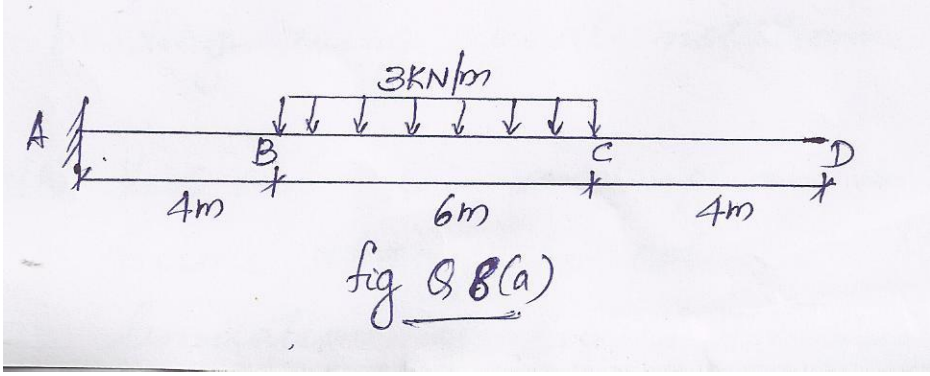


fig Q 8(a)

B) A simply supported cast iron square beam of 800mm span and 15mm×15mm in section faith or applying a load of 360N at the medspan. Find the maximum uniformly distributed load that can be applied safely to a 40mm wide,75mm deep and1.6 long cantilever made of the same material. (12)

Q. 9. A) A 320mm×160mm I section joint has 20mm thick flanges and a 15mm thick web. At a certain cross section it is acted upon by a shear Force of 200KN. Sketch the shear stress distribution across the section showing all important values. (8)

B) A 4m long follow alloy tube with inside and outside diameter Are 36mm and 48mm elongates by 3mm under a tensile force of 50KN Determine the buckling load for the tube when it is used as a column with Both ends fixed and a factor of safety of 5. (8)

OR

Q. 10 A) Derive the expression $z = \frac{SA\bar{y}}{bI}$ for a beam in bending using usual notations (8)

B) List out the orsamptions used in the Euler's theory for columns. Write the Limitations of Euler's formula. (8)

Q. 11.A) A short column of rectangular section 160mm×120mm carries a Load of 200KN the lad point is at a point 40mm from the longer side and 70mm from the shorter side. Determine the maximum tensile and Compression stresses in the section. (8)

B) A beam of length 'l' henged at ends carries a clockwise couple M at 'a' from the left end determine the slope at each and the defection at The point of application of the couple. (10)

OR

Q.12. A) A simply supported beam of 8m length catties two point loads of 64KN and 48KN at 1m and 4m respectively from the left end. Deduce the General expression to find the defecation at any section of the beam. (8)

B) Determine the maximum stress in the both for the bracket shown in Fig.Q.12 (B) Diameter of both=20mm. (10)

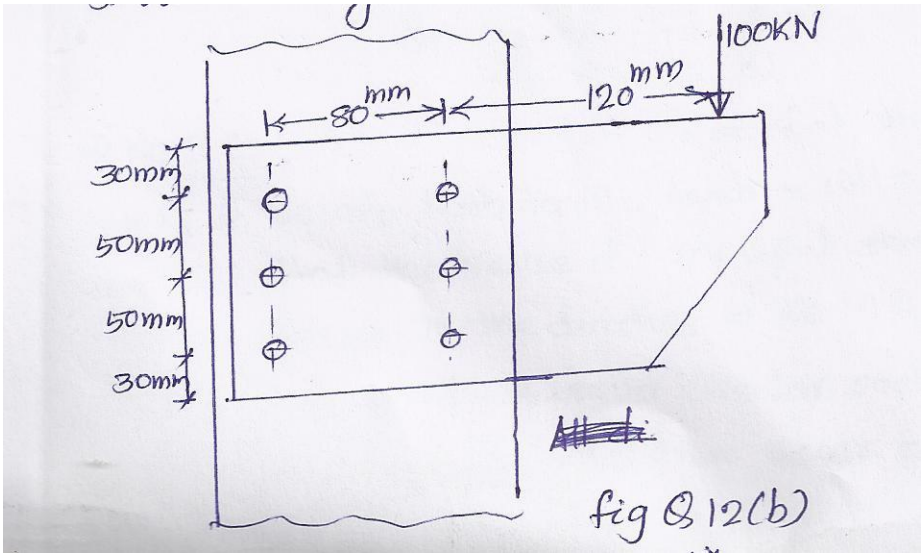


fig Q 12(b)

UNIVERSITY OF PUNE

[4362]-191

S.E Engineering Examinations 2013

MATHAEMATICS – III

(2008 COURSE)

[Total No. of Question=12] **[Total no. of printed pages= 7]**

[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

(i) Attempt q. No. 1 or q. no2, Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6 from Section I and Q No. 7 or Q. No. 8, Q. No. 9 or Q. No. 10. Q. No. 11 or Q No. 12 from section II.

ii) Answer to the two Sections should be written in separate answer-books.

iii) Figures to the right indicates full marks.

iv) Use of electronic pocket calculator is allowed.

v) Assume suitable data, if necessary.

Q.1 a) Solve any three [12]

1) $(D^2+3D+2)y = sine^x$

2) $(D^2+2D+1)y = 2cosx+3x+2+3e^x$

3) $(D^4 - 1)y = coshx$ Sinhx

4) $(1+x)^2 \frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = 4\cos[\log(1+x)]$

5) $(D^2 - 4D + 4)y = e^{2x}sec^2x$ (by method of variation of parameter.)

b) Solve

$$\frac{dx}{x^2-y^2-z^2} = \frac{dy}{2xy} = \frac{dz}{2xZ}$$ [5]

Q. 2 a) Solve any three [12]

1) $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 2y = 2logx + \frac{1}{x} + \frac{1}{x^2}$

2) $\frac{d^2y}{dx^2} - y = \frac{2}{1+e^x}$

3) $\frac{d^2y}{dx^2} + 4y = x \sin x$

4) $(D^2 - 4D + 4)y = e^x cos^2 x$

5) $x^2 \frac{d^2y}{dx^2} - 2x\frac{dy}{dx} - 4y = x^2 + 2\log x$

Q.2 b) Solve [5]

$\frac{dx}{dt} + y = e^t$

$-\frac{dy}{dt} + x = \bar{e}^t$

Q. 3 a) A body weighing 4.9 is hung from a spring. A pull of 10 N will stretch the spring to 5 cm. The body is pulled down 6 cm below the static equilibrium position and then released. Find the displacement of the body from its equilibrium position in time 't' seconds, the maximum velocity and period of oscillation [8]

b) A string is stretched and fastened to two points 'λ' apart. Motion is started by displacing the string in the from u= a sin $\frac{\pi x}{\lambda}$ from which it is released at time t=0^{λ}. Find the displacement u(x, t) from one end. [8]

OR

Q.4 a) In a heat exchange the temperatures x and y of two liquids satisfy the equations

$$\frac{dx}{dt} + 5x - 2y = t$$

$$\frac{dy}{dt} + 2x + y = 0$$

Find the temperatures x & y as a function of time, given that x=0 and y=0 at time t = 0

b) Solve the equation $\frac{\partial u}{\partial t} = a^2 \frac{\partial^2 u}{\partial x^2}$ [8]

Where u(x, t) satisfies the following conditions

i) u (0,t) = 0
ii) u (λ, t) = 0 $\forall\, t$
iii) u (x, 0) = x in $0 < x < \lambda$
iv) u(x, ∞) is finite

Q.5 a) Find the Fourier transform of [7]

$$f(x) = \begin{cases} 1 - x^2, & 1x1 \leq 1 \\ 0, & 1x1 > 1 \end{cases}$$

and hence evaluate

$$\int_0^\infty \left(\frac{xcosx - sinx}{x^3}\right) \frac{cos3x}{2}\, dx$$

b) Show that the Fourier transform of f(x) = $e^{-x^2/2}$ is $\bar{e}^{\lambda 2/2}$ [5]

c) Solve the integral equation [5]

$$\int_0^\infty f(x) sin\ \lambda\, x\, dx = \begin{cases} 1, & 0 \leq \lambda < 1 \\ 2, & 1 \leq \lambda < 2 \\ 0, & \lambda \geq 2 \end{cases}$$

OR

Q.6 a) Using Fourier integral equation show that [7]

$$\int_0^{\infty} \frac{cos\lambda x + \lambda sin\lambda x}{1+\lambda^2} d\lambda = \begin{cases} 0, & x < 0 \\ \pi/2\ , & x = 0 \\ \pi\bar{e}^{x}, & x > 0 \end{cases}$$

b) Find the Fourier sine transform of [5]

$$\frac{e^{-ax}}{x}$$

C) Find Fourier integral representation of [5]

$$f(x) = \begin{cases} \frac{\pi}{2} cosx\ , & |x| \leq \pi \\ 0, & |x| > \pi \end{cases}$$

Section-II

Q.7 a) Obtain Laplace transform of (any three): [12]

i) $\frac{\bar{e}^{at} - \bar{e}^{bt}}{t}$

ii) $e^{-4t} \int_0^t t \sin 3t \, dt$

iii) $(1+ 2t - 3t^2 + 4t^3)$ U (t-2)

iv) $\int_0^t erf\sqrt{u} \, du$

b) Using Laplace transform, evaluate: [4]

$$\int_0^\infty t^2 \, \bar{e}^t sint \, dt$$

OR

Q.8 a) Obtain inverse Laplace transform of (any three): [12]

i) $\frac{s}{(s^2+a^2)^2}$

ii) $\frac{1}{s}\log(\frac{s^2+a^2}{s^2+b^2})$

ii) $\frac{2s^2-6s+5}{s^3-6s^2+11s-6}$

iv) $\frac{\bar{e}^{3s}}{s^2+8s+25}$

Q.8 b) Find the Laplace transform of the periodic function: [4]

$$f(t) = \begin{cases} t, & 0 < t < \pi \\ \pi - t, & \pi < t < 2\pi \end{cases}$$

and $f(t+2\pi) = f(t)$

Q.9 a) Find the directional derivative of [5]

$\emptyset = 4 \text{ x } z^3 - 3x^2y^2z \; at \; (2,-1,2)$ along tangent to the curve $x=e^t \cos t$,

$y = e^t \sin t$, $z = e^t$ at $t = 0$

b) If the vector field [6]

$\bar{F} = (x + 2y + z)\,\bar{\imath} + (bx - 3y - z)\,\bar{\jmath} + (4x + cy + 2z)\,\bar{k}$ is irrotational, find a, b, c and determine $\emptyset$ such that $\bar{F} = \nabla\emptyset$.

c) Evaluate $\iint_S (\nabla \text{ X } \bar{F}).\overline{ds}$, where $\bar{F} = (x^3 - y^3)\,\bar{\imath} - xyz\,\bar{\jmath} + y^3\,\bar{k}$ and S is the [6] surface $x^2 + 4y^2 + z^2 - 2x = 4$ above the Y0z - plane.

OR

Q.10 a) Evaluate $\iint_S \frac{x\bar{\imath}+y\bar{\jmath}+z\bar{k}}{r^2} . \overline{ds}$ Where S is the surface of the sphere [6]

$x^2 + y^2 + z^2 = a^2$

b) With usual notations prove that (any two) **[6]**

i) $\nabla^4 (r^2 \log r) = \frac{6}{r^2}$

ii) $\nabla.\left[r \nabla \frac{1}{r^n}\right] = \frac{n(n-2)}{r^{n+1}}$

iii) $\nabla \text{ X } \left[\frac{\bar{a} \text{ X } \bar{r}}{r^3}\right] = \frac{3(\bar{a}.\bar{r})}{r^5}\bar{r} - \frac{\bar{a}}{r^3}$

C) Find the work done by the force

$\bar{F} = (x^2 - yz)\bar{\imath} + (y^2 - zx)\bar{\jmath} + (z^2 - xy)\,\bar{k}$ in taking a particle from

(1,1,1) to (3, -5,7) [5]

Q.11 a) Solve $\frac{dy}{dt} + 2y(t) + \int_0^t y(t)dt = sint$, given y(0) =1 using Laplace [5] transform.

Q.11 b) The transfer function of a second order system is given as [6]

G(s) = $\frac{6}{s^2+1.8s+1}$. Determine its properties such as overshoot, period of oscillation and $y(t)_{max.}$

C) Find the equations of stream line passing through the point (1,1,2) in case of steady motion of fluid defined by : $\bar{q} = -x\bar{\imath} + 2y\bar{\jmath} + (3 - z)\bar{k}$. [6]

OR

Q.12 a) Using the Laplace transform, solve the D.E. [5]

$y''+2y'+y = 6te^t$; y(0) =2, y′(0) =5.

b) Find the surface of equipressure in case of steady motion of a liquid which has velocity potential [6]

Ø = xy + yz + zx and is under the action of force

$\bar{F} = (mz + ny)\bar{\imath} + (nx + lz)\bar{\jmath} + (ly + mx)\bar{k}$

c) Is the motion represented by $(x^2-yz)\bar{\imath} + (y^2 - zx)\bar{\jmath} + (z^2 - xy)\bar{k}$ [6] irrotational? If so, find the corresponding velocity potential.

UNIVERSITY OF PUNE

[4362-201]

S.E.(Polymer/Petroleum/Petrochemical Engineering)

Examination-2013

Engineering Chemistry-I

(2008 pattern)

Time-Three hours **Maximum Marks-100**

[Total No. of Question=12] **[Total no. of printed pages= 4]**

Instructions:

(1)Answer three questions from Section-I and three questions from Section-II.

(2)Answers to the two sections should be written in separate answer books.

(3)Neat diagram must be drawn necessary.

(4)Figures to the right indicate full marks.

(5)Use of logarithmic tables,slide-rule,Molleir charts,calculator and steam tables is allowed.

(6)Assume suitable data wherever necessary.

SECTION-I

Q.1 (a)Explain structure of carbocation , carbanion and free radical. (6)

(b)Explain keto-enol tautomerism with suitable example. (6)

(c)Explain. (4)

(i)Trichloroacetic acid is stronger than acetic acid

(ii)Pyridine is weaker base

OR

Q.2 (a)Write a short note on mesomeric effect. (6)

(b)Explain inductive effect with suitable example. (6)

(c)Explain homolytic and heterolytic cleavage. (4)

Q.3 (a)Explain Beckmann rearrangement with suitable example. (6)

(b)Explain nitration of benzene and nitrobenzene. (6)

(c)Write a short note on Favoraskii rearrangement. (4)

OR

Q.4 (a)Explain aldol condensation shown by acetaldehyde. (6)

(b)Give mechanism of SN1 reaction with suitable example. (6)

(c)Write a short note on wurtz reaction. (4)

Q.5 (a)Explain chair and boat conformation of cyclo hexane. (6)

(b)Explain Skraup synthesis of quinoline. (6)

(c)Explain the following terms with proper example. (6)

(i)Distereoisomers (ii)Raceimic mixture

OR

Q.6 (a)Explain electrophilic substitution reactions shown by pyrrole. (6)

(b)Explain geometrical isomerism with suitable example. (6)

(c)Explain major conformations of ethane. Explain their stability. (6)

SECTION-II

Q.7 (a)Derive PV=nRT using Boyle's law and Charle's law. (6)

(b)Derive Van derWaal's equation of a state for real gases. (6)

(c)Normal B.P. of benzene is $80^0 C$ while ΔHv foe benzene is 30.8 KJ/mole. Find vapour pressure of benzene at $20^0 C$. (4)

OR

Q.8 (a)Define. (6)

(i)Boiling point of liquid

(ii)Melting point of solid

Also explain process of evaporation.

(b)Derive kinetic gas equation. (6)

(c)Calculate RMS velocity of Neon at $27^0 C$.(Given R =8.314 J/mole/K; Z=20 for Ne) (4)

Q.9 (a)What is a Galvonic cell?

Explain different types of cells giving one example of each type. (6)

(b)Represent $Zn-MnO_2$ battery cell. Give reactions and applications. (6)

(c)Give applications of batteries in modern era. (4)

OR

Q.10 (a)Explain working and construction of fuel cell. (6)

(b)Explain 'lead acid' battery. Give reactions at cathode and anode. (6)

(c)Compare primary and secondary batteries . (4)

Q.11 (a)Explain experimental method for determination of osmotic pressure of a liquid. (7)

(b)What is Ruoult's law? Explain with the help or graph? (7)

(c)Calculate vapour pressure of solution containing 3.42 g of canesugar in 180g of water of 100^0C .(M for sugar 342) (4)

OR

Q.12 (a)Explain how depression in freezing point is determined experimentally? (7)

(b)Give any two methods of preparation of colloids. Give chemical equations also. (7)

(c)Find mole fraction of ethanol in 60% solution of ethanol in water. (4)

[Total No. of Questions: 12] **[Total No. of Printed Pages:3]**

UNIVERSITY OF PUNE
[4362]-202
S. E. (Poly./Petro) Examination - 2013
ENGINEERING MATERIALS SCIENCE AND TECHNOLOY
(2008 Course)

[Time: 3 Hours] **[Max. Marks: 100]**

Instructions:

1. *Answers to the two sections should be written in separate answer-books.*
2. *Black figures to the right indicate full marks.*
3. *Neat diagrams must be drawn wherever necessary.*
4. *Assume suitable data, if necessary.*
5. *Answer three questions from Section I and three questions from Section II*

SECTION -I

Q.1 Differentiate between the following (any four). [16]

i) Ceramics and Polymers
ii) Metallic bond and Covalent bond
iii) Screw dislocation and Edge Dislocation
iv) Glass transition and Crystallization temperature
v) BCC structure and FCC structure of crystals

OR

Q.2 Write short notes on the following (any four) [16]

i) Biomaterials
ii) Smart materials
iii) Nano materials
iv) Liquid crystal polymers
v) Ionic bonds

Q. 3 A) Draw phase equilibrium diagram for water. Show "Invariant point" on it, also explain its significance. [6]

B) Draw Fe-Fe_3C phase equilibrium diagram. Explain significance of α phase and γ phase. [6]

C) Draw micro-structure of a Tin bronze. [4]

OR

Q. 4 A) Differentiate between Hardening and Annealing of steel, with their micro-structures. [8]

B) What are different types of strengthening mechanisms? Explain [8]

any one in detail with diagram.

Q. 5 Explain the following with the help of diagram (any three) [18]

i) Different types of magnetic materials
ii) Linear coefficient of thermal expansion
iii) The "MOSFET"
iv) Ruby Laser

OR

Q. 6 A) A cylindrical specimen of a titanium alloy is tested by applying 2040 N tensile load within the elastic limit. Its elastic modulus is 107 GPa. Its original diameter is 3.8 mm and observed 0.42 mm elongation at above load. Calculate original length of the specimen. [6]

B) The flow stress of copper alloy increases from 2MPa to 55MPa, when dislocation density increases from $10^7/cm^2$ to $10^{10}/cm^2$. Calculate the flow stress for a similar heavily deformed copper alloy with a dislocation density $10^{12}/cm^2$. [6]

C) What are the different methods to evaluate toughness of a material? Explain any one in detail. [6]

SECTION II

Q. 7 A) Why RCC is called as Multiple Composite? [6]

B) What are Cermets? What are their applications? [5]

C) Explain Aramid Fibre Reinforced Polymer Composites. [5]

OR

Q. 8 A) What are ceramic matrix composites? What are their applications? [6]

B) Explain carbon-carbon composites. [5]

C) What is the role of interfaces in determining the properties of composites? [5]

Q. 9 A) Explain the different methods for protection against electrochemical corrosion. [8]

B) Write short notes on (any two)- [8]

i) Chemical attack on polymers
ii) Electrode potential in electrochemical cells.
iii) Intergranular corrosion in stainless steel.

OR

Q. 10 A) In a corrosion cell composed of Copper and Zinc, the current density at the Copper Cathode is 0.05 A/cm^2. The area of both the Copper and Zinc electrodes is 100 cm^2. Calculate Corrosion current and the zinc loss per hour.(The atomic mass of Zn is 65.38 g/Mol). [6]

B) Why lightly stressed materials corrode faster? Illustrate with one [5]

example.

C) Explain Adhesive wear, when the two solid surfaces slide over one another. [5]

Q.11 A) Explain the following processing with the help of sketch(any three) [18]

i) Pre-stressed Cement Concrete Blocks
ii) Atomization for powder production
iii) Electrostatic Painting
iv) Welding of two metal parts

OR

Q. 12 A) What is Sintering process? Illustrate with the help of sketches. What are its applications? [6]

B) How is glass tubing or rods manufactured? [6]

C) Explain Hot rolling of metals and alloys. [6]

UNIVERSITY OF PUNE

[4362]-203

S. E. (Petroleum/ Petrochemical/ Polymer)

Examination - 2013

CHEMICAL PROCESS CALCULATIONS

(2008 Pattern)

[Time : 3 Hours] **[Max. Marks : 100]**

[Total No. of Questions : 12] **[Total No. of Printed Pages :5]**

Instructions :

(1) Answers three questions from ***Sections I*** *and three questions from* ***Section II****..*

(2) Answers to the ***two sections*** *should be written in* ***separate answer-books****.*

(3) Neat diagrams must be drawn wherever necessary.

(4) Black figures to the right indicate full marks.

(5) Use of electronic pocket calculator and steam tables is allowed.

(6) Assume suitable data, if necessary.

SECTION I

Q1) a) Explain fundamental and derived quantities. Enlist two quantities from each type with SI units. [08]

b) The volumetric flow rate of kerosene in a pipe is 75 Imperial gallons per minute. Calculate the mass flow of kerosene in kg/s having density of 0.8 kg/dm^2. [08]

OR

Q2) a) Find the equivalent weights of: [08]

i) CO_3 radical ii) Na_2 CO_3

b) Glycerin, weighing 600mg is dissolved in pure water to make a final solution of one litre. Find the TOC and ThOD of the solution. [08]

Q3) a) Explain the classification of general material balance problems. Discuss the three general methods of solving material balance problems for non-reacting systems. [08]

b) In a polymer processing plant, a double effect evaporator system concentrates [08]

weak liquor containing 4% (by weight) caustic soda to produce a lye containing 25% solids (by weight). Calculate the evaporation of water per 100 kg feed in the evaporator.

OR

Q4) A 100 kg mixture of 27.8% of Acetone (A) and 72.2% of Chloroform (B) by weight is to be batch-extracted with a mixed solvent at 298 K. The mixed solvent of an unknown composition is known to contain water (S_1) and acetic acid (S_2). The mixture of the original mixture and the mixed solvent is shaken well, allowed to attain equilibrium and separated into two layers. [16]

The compositions of the two layers are as below:

	Composition, weight %			
Layer	A	B	S_1	S_2
Upper Layer	7.5	3.5	57.4	31.6
Lower Layer	20.3	67.3	2.8	9.6

Find: i) the quantities of the two layers
ii) the weight ratio of the mixed solvent to the original mixture
iii) the composition of the mixed solvent (weight basis)

Q5) a) Explain the terms: [08]
i) Limiting reactant ii) Excess reactant iii) Conversion iv)Yield

b) The analysis of a gas entering the secondary converter in a contact sulphuric acid plant is 4% SO_2, 13% O_2, and 83% N_2 (on volume basis). The gas leaving the converter contains 0.45% SO_2 on SO_3 free basis (by volume). Calculate the percentage of SO_2 entering the converter getting converted to SO_3. [10]

OR

Q6) Monochloroacetic acid (MCA) is manufactured in a semibatch reactor by the action of glacial acetic acid with chlorine gas at 373 K in the presence of PCI_3 catalyst. MCA thus formed will further react with chlorine to form dichloroacetic acid (DCA). To prevent the formation of DCA, excess acetic acid is used. A small-scale unit which produces 5000 kg/d MCA, requires 4536 kg/d of chlorine gas. Also 263 kg/d of DCA is separated in the crystallizer to get almost pure MCA product. Find the % conversion, % yiels of MCA and selectivity. [18]

SECTION II

Q7) a) Neatly draw the vapor-liquid equilibrium diagram and explain bubble and dew Point. Calculate procedure in details. [16]

OR

Q8) a) Assuming the validity of Raoult's Law, perform the following calculations for Benzene (1) and Toluene (2). [16]

i) x_1 = 0.33, t = 100^0 C, find y_1 and P

ii) y_1 = 0.33, t = 100^0 C, find x_1 and P

iii) x_1 = 0.33, P = 120 kPa , find y_1 and T

Given:

Component	A	B	C
Benzene	13.8594	2773.78	220.07
Toluene	14.0098	3103.01	219.79

Q9) Toluene is heated form 290K to 350K at the rate of 0.25 kg/s. Calculate the heat required to be added to toluene using constants provided and generate the % difference. [18]

Set	a	b × 10^3	c × 10^6	d × 10^9
I	1.8083	812.223	-1512.67	1630.01
II	-56.3627	1768.423	-5192.623	5497.39

OR

Q10) a) Write the Watson and Riedel Equations for heat of vaporization. [18]

For O-xylene, Calculate:

i) Latent heat of vaporization at 298 K using Watson eq.

ii) Latent heat of vaporization at T_B using Riedel eq.

Given : P_C = 3730 kPa , T_C = 630.3 K , T_B = 417.5 K

Q11) a) The heat absorbed when $Na_2\ CO_3$. 10 H_2 O. is dissolved isothermally at 291 K in a large quantity of water is 67.91 KJ per mole solute. Calculate the heat of crystallization of 1 Kg $Na_2\ CO_3$. 10 H_2 O. [16]

OR

Q12) Calculate the heat of hydration of $Na_2\ SO_4$. 10 H_2 O using the given data of heat of formation: [16]

Compound	Standard heat of formation, KJ/mol
$Na_2\ SO_4$	-1387.08
H_2 O	-285.82
$Na_2\ SO_4$. 10 H_2 O	-4327.26

[Total No. of Questions: 12] **[Total No. of Printed Pages: 4]**

UNIVERSITY OF PUNE

[4362]-206
S. E. (Poly/Petro/Petrochem.) Examination - 2013
ENGINEERING CHEMISTRY-II (2008 Course)

[Time: 3 Hours] **[Max. Marks: 100]**

SECTION -I

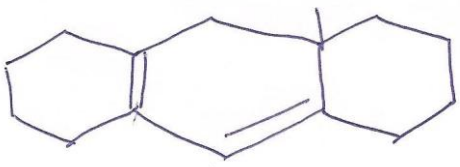
Q.1	A	Draw Haworth's projection formula for following carbohydrates. i) Amylopectine ii) Cellulose iii) Amylose.	6
	B	Explain primary and secondary structural of Protein.	6
	C	Give classification of carbohydrates.	4
		OR	
Q.2	A	Explain oxidation of glucose by- i) Bromine water ii) Nitric acid iii) Fehling solution	6
	B	Explain three characteristic reactions each of amino group and carboxyl group amino acids.	6
	C	Give classification of enzymes.	4
Q. 3	A	Explain three oxidative methods for synthesis of carboxylic acids.	6
	B	Give synthesis of esters form i) Acid chloride ii) Acid anhydride iii) diazomethane	6
	C	Explain the use of Lindler's catalyst in reduction of alkynes.	4
		OR	
Q. 4	A	Explain use of clemmenson reduction and Woltt Kishner reduction in synthesis of alkanes.	6
	B	Explain synthesis of amines from- i) alkyl halide ii) ketones iii) aldehydes	6
	C	Explain Friedel- Craft acylation for synthesis of ketones.	4

Q. 5 A Explain following terms with suitable examples 6

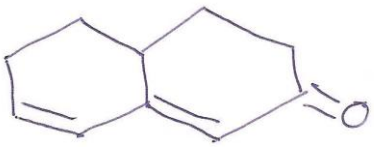
i) Chromophore
ii) Auxochrome
iii) Bathochromic shift

B Calculate U.V. absorption maxima for following clearly show your calculations. 6

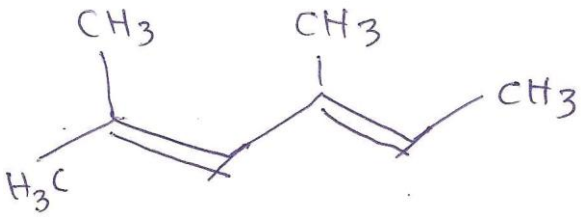
i)



ii)



iii)



C Explain following aspects of the NMR spectrum with simple example 6

i) The number of signals
ii) Position of the signals

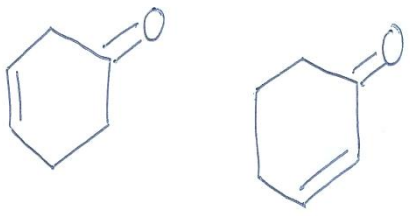
OR

Q. 6 A The molecular formula and I.R. data is given below. Suggest porbable structure for them. 6

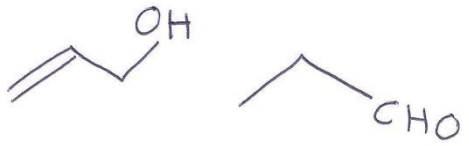
Molecular formula: C_3H_6O $\upsilon_{max} = 2720 , 1730\ cm^{-1}$

B How you distingwish following pairs by I.R spectroscopy 6

i)

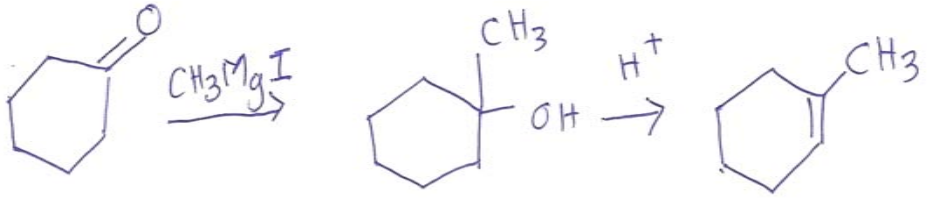


ii)



C How following sequence of reaction is followed by I.R. spectroscopy 6

i)



A B C

SECTION II

Q. 7 A Give valance-bond representation of ammonia molecule. Why bond angle is 107.5^0? 6

B Draw molecular orbital diagram for nitrogen molecule. Explain triple bonding of nitrogen molecule 6

C Write electronic configuration of iron atom. Find all four quantum numbers for last electron of iron 4

OR

Q. 8 A What is meant by quantum numbers ? Explain all in detail. Also find quantum numbers for last electron of cobalt. 6

B Draw and explain molecular orbital diagram for Oxygen molecule. 6

C Draw 'd' obitals of electron. 4

Q. 9 A What is meant by transition elements? explain why they show variable oxidation states- (for 1^{st} transition series.) 6

B With the help of VBT explain why [cu $(NH_3)_4$] SO_4H_2O is square planar instead of tetrahedral. 6

C Give drawbacks of valance bond theory 4

OR

Q. 10 A Explain magnetic properties of following complex irons on the basis of CFT. 6
$[Fe\ (H_2O)_6]^{2+}$ and $[Fe(CN)_6]^{4-}$

B What is meant by CFSE? Calculate it for following complex ions. 6
$[CO(CN)_6]^{3-}$ and $[COF_6]^{3-}$ which ion is stable?

C Find EAN ,O.S and C.N for central metal ion in the following complexes. 4

$Ni(CO)_4]$; $K_4[Fe(CN)_6]$

Q. 11	A	What is chromatography? Explain column chromatography.	6
	B	What is thermal analysis? Explain TGA curve for $CuSO_4.5H_2O$	7
	C	Give two principle of chromatography	5
		OR	
Q. 12	A	Explain gas liquid chromatography. (GLS)	7
	B	Explain how metal ions can be identified by using paper chromatography	6
	C	Explain principles of atomic absorption spectroscopy (AAS)	5

GIVEN-

Symboly →	Sc	Ti	Cr	Fe	Co	Ni	Cu
At Wts →	21	22	24	26	27	28	29

UNIVERSITY OF PUNE
[4362]-208
S. E.(Petroleum/Polymer/Petrochemical)Examination - 2013
PARTICULATE TECHNOLOGY
(2008 Pattern)

[Total No. of Questions:12] **[Total No. of Printed Pages 5]**
[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

*(1) Answer **Q1 or Q2, Q3 or Q4, Q5 or Q6** from section I and **Q7 or Q8, Q9 or Q10, Q11 or Q12** from section II.*
*(2) Answers to the **two sections** should be written in **separate answer-books**.*
(3) Black figures to the right indicate full marks.
(4) Neat diagrams must be drawn wherever necessary.
(5) Use of logarithmic tables, slide rule, electronics pocket calculator is allowed.
(6) Assume suitable data, if necessary.

SECTION-I

Q1 a) Explain in detail general characteristics of particulate solids in bulk. [8]

b) Discuss agglomeration of solids. [8]

OR

Q2 a) Discuss various types of conveyors used in transportation of solids. [8]

b) Describe in detail flow of solids through hoppers. [8]

Q3 a) A certain crusher takes rock whose average particle diameter is 0.025m [8] and crushes it to a product whose average particle diameter is 0.018 m, at the rate of 20 tons/hour. At this rate, the mill takes 9 HP of power and 0.46 HP power is required to run it empty.

i) What would be the power consumption for same capacity, if average particle diameter in the product is 0.008 m?

ii) How much power would be required under conditions by kick's law?

b) Derive the relationship between critical speed of ball mill with radius of ball mill and radius of ball. [6]

c) A certain set of crushing has rolls of 100cm diameter by 38 cm width face. They are set so that crushing surfaces are 1.25cm apart at the narrowest point. The manufacture recommends that they may be run at 50 to 100 rpm. They are to crush a rock having a specific gravity of 2.35 and angle of nip 30°. What are the maximum permissible size of feed and maximum actual capacity in tons per hour, if the actual capacity is 12% of the theoretical. [6]

OR

Q4 a) State and explain various size reduction laws by giving mathematical expressions. [6]

b) A material is crushed in Blake Jaw crusher and the average particle size is reduced from 5cm to 1.3cm with consumption of 37 Watts-hr/ton. Calculate the energy required to crush the same material with average particle size from 8cm to 3cm by using Rittinger's and kick's laws. Assume mechanical efficiency remains constant. [6]

c) Discuss energy utilization in size reduction equipments. [6]

Q5 a) Discuss principles involved in sedimentation process with a neat [8]

sketch.

b) Write a note on flocculation. [8]

OR

Q6 a) A slurry containing 5 kg of water/kg of solids is to be thickened to a sludge containing 1.5kg of water/kg of solids in a continuous operation. Laboratory tests using five different concentrations of the slurry yielded the following data: [8]

Concentration(kg water/kg solids)	**Rate** (mm/s)
5.0	0.2
4.2	0.12
3.7	0.094
3.1	0.070
2.5	0.050

Calculate the minimum area of a thickener required to effect the separation of a flow of 1.33kg/s of solids.

b) Explain with neat sketch construction and working of continuous thickener. [8]

SECTION-II

Q7 a) Obtain the relation for minimum fluidization velocity in terms of terminal settling velocity for free flowing particles. Define the range of operation. [6]

b) Describe in detail any two following applications of fluidization: [6]

i) Petroleum Refining

ii) Biochemical reactions

iii) Physical operations

c) Explain in brief what is mean by fluidization with its advantages and disadvantages. [4]

OR

Q8 a) Calculate the minimum fluidization velocity for the bed of sharp sand particles of ε_{mf} =0.54 particles of diameter 180 μm and density 2.6 gm/cc is fluidized by means of gas of density 0.0012 gm/cc and dynamic viscocity 0.00018 g/cm.s. Also calculate the minimum fluidization velocity by (i) Wen & Yu and (ii) Chitester co-relations and determine the percentage error. [8]

b) Discuss in brief different types of fluidization with neat diagram. [4]

c) Explain the Geldart classification of particles with graphical representation. [4]

Q9 a) A sample of slurry had previously been tested with a leaf filter of 0.05m^2 filtering surface giving a pressure difference of 71.3 kN/m^2. The volume of filtrate collected in first 300 seconds was 250 cm^3 and after further 300 seconds an additional 150 cm^3 was collected. Determine the time required to filter out 900 cm^3 of liquid through same filter surface area. [10]

b) A plate and frame press gave a total of 10 m^3 of filtrate in 2000 seconds and 15 m^3 of filtrate in 4200 seconds when the filtration was stopped. Estimate the washing time if 5m^3 of wash water is used. The [8]

resistance of cloth may be neglected and a constant pressure is used throughout.

OR

Q10 a) Derive the relation for constant rate and constant pressure filtration for the flow of filtrate through cloth & cake resistance combined. [10]

b) Explain in brief i) Plate and Frame Filter Press [8]

ii) The tube press filter

Q11 a) Estimate the terminal settling velocity for 150 to 230 mesh particles of a limestone whose density is 2800 kg/m^3 falling in water at 30°C. [8]

Data: 150 mesh = 0.104 mm, 230 mesh = 0.063mm, viscocity=0.801 cp, density of water=995.7 kg/m^3

b) Describe in detail with neat diagram the principle, construction and working of cyclone separator with advantages, disadvantages and applications. [8]

OR

Q12 Write short note on (any two) [16]

i) Hydraulic Jig ii) Liquid washing equipments iii) Capacity and effectiveness of screens iv) Froth flotation

[Total No. of Questions: 6] **[Total No. of Printed Pages: 2]**

UNIVERSITY OF PUNE
[4362]-209
S. E. (Poly/Petro/Petrochemical Engg) Sem II Examination - 2013
ELEMENTS OF SOCIAL SCIENCES (2008 Course)
[Time: 3 Hours] **[Max. Marks: 100]**

Instructions:

1 *Answer three question from each section*
2 *Answer any three questions from Section I and any three questions from Section II*
3 *Answers to the two sections should be written in separate answer-books.*
4 *Neat diagrams must be drawn wherever necessary.*
5 *Black figures to the right indicate full marks.*

SECTION -I

Q.1	A	Explain the merits and demerits of Mixed Economies.	8
	B	Explain the problems of Economic Organizations.	8
		OR	
Q.1	A	State and Explain different types of Markets.	8
	B	Explain Law of Demand.	8
Q. 2	A	Government plays a vital role in Economic Development. Explain.	8
	B	Explain merits and demerits of specialization and division of labour.	8
		OR	
Q. 2	A	Explain the functions of Money.	8
	B	Explain the different factors of production.	8
Q. 3	A	Write short notes on. i) Law of Diminishing Return ii) Perfect and Imperfect Competition iii) Vision of India 2020	18
		OR	
Q. 3	A	Explain the following in brief. i) Concept of Capital and Private Property ii) 5 years Plans of Economic Development	18

iii) LPG model for Economic Development

SECTION II

Q. 4	A	Explain in brief i) Cultural Diversity of India ii) Modern families in India	8 8
		OR	
Q. 4	A	Explain the importance of Study of Civilizations in details.	6
	B	Discuss the Socio Economic impact of Globalization on India Society.	10
Q. 5	A	Sustainable Consumption and Sustainable Development go hand in hand. Explain.	8
	B	The entire world is in grief of Religious Fundamentalism. Discuss	8
		OR	
Q. 5	A	Explain the importance of "Census of India"	8
	B	Technology leads to Social Change. Explain.	8
Q. 6	A	Write short notes on the following. i) Secular policy of India ii) Features of Modern Urbanism iii) Indian Philosophy	18
		OR	
Q. 6	A	Explain the following in brief. i) Environment and Ecology ii) Social Reformers and Reforms iii) IT Revolution in India.	18