Total No. of Questions : 12]

SEAT No. :

P3852

[Total No. of Pages : 5

[5057] - 105

S.E. (Chemical Engineering)

PROCESS CALCULATIONS

(2008 Pattern) (Semester - I)

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

Instructions to the candidates :-

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer Q1or2, Q3or4, Q5or6 from section I and Q7or8, Q9or10, Q11or12 from section II.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of Calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) The nitrogen content of NH_2CONH_2 sample is 40% by weight. Find the actual urea in the sample. **[6]**

b) The partial pressure of CO_2 and H_2 in a mixture of gases is 42 kPa and 58 kPa respectively, at 298 K. Calculate the mass fraction of the two.**[6]**

c) A gaseous mixture has the following composition by volume: SO_2 = 8%, SO_3 = 20%, O_2 = 10%, H_2O = 5% and N_2 = 57%. Calculate the average molecular weight of the gas mixture, the density of the gas at 315 K and 101.325 kPa. **[6]**

OR

Q2) a) 2.51 solution of strength 1 N H_2SO_4 is to be prepared by adding 98% H_2SO_4 (sp. Gr. 1.84) to water. Calculate the volume of 98% $H_2SO_4$to be added. **[6]**

b) A producer gas has the following by volume: CO = 25%. CO_2 = 5%, O_2 = 5% and rest N_2. Calculate the volume of gas in m^3 at 298 K and 99.325 kPa per kg carbon present. **[8]**

c) Define molality. molarity and normality. **[4]**

P.T.O.

Q3) a) A mixture of $CuSO_4.5H_2O$ and $FeSO_4.7H_2O$ weighs 100g. After removing the water of hydration by heating the dehydrated mass weights 60g. Calculate the weight ratio of $CuSO_4.5H_2O$ to $FeSO_4.7H_2O$ in the original salt mixture. (Atomic weights: Cu = 63, S = 32, Fe = 56). **[8]**

b) Groundnut seeds containing 48% oil and 32% solids are fed to an extractor. The cake leaving the extractor is found to contain 80% solids and 5% oil. Find the percentage recovery of oil. **[8]**

OR

Q4) a) An effluent sample from a plant contains formaldehyde (HCHO) and methanol (CH_3OH). Analysis of the sample shows that for the sample total organic carbon (TOC) = 258.3 mg/l and theoretical oxygen demand (ThOD) is 956.5 mg/l. Find the concentration of each in mg/l. **[8]**

b) A dilute acid containing 25% H_2SO_4 is concentrated by commercial grade sulphuric acid containing 98% H_2SO_4 to obtain an acid containing 65% H_2SO_4, Find the quantity of the acids to prepare 500 kg of desired acid. **[8]**

Q5) a) The Shift reaction is takes place as follows: **[8]**

$CO + H_2O = CO_2 + H_2$

If a and b are the percent CO in the dry inlet and dry outlet gas mixtures to and from shift converter respectively, prove that Moles of CO converted (x) per 100 moles of inlet gas mixture can be calculated by using the formula, $x = \frac{100(a-b)}{100+b}$

b) Define limiting component, conversion, yield and selectivity. **[8]**

OR

Q6) a) Formaldehyde is produced by dehydrogenation of methanol. $CH_3OH \rightarrow HCHO + H_2$. Per pass conversion is 57%. Product leaving the reactor is fed to a separation unit where formaldehyde is separated from methanol and hydrogen. The separated methanol is recycled to the reactor. If the production rate of formaldehyde is 1500 kg/h, calculate the combined feed ratio and fresh feed rate. **[8]**

b) How is recycle useful? **[4]**

c) Where is bypass operation used? Explain the advantages of using bypass. **[4]**

SECTION - II

Q7) a) Define heat of dissolution, heat of crystallization, relation between heat of solution and heat of crystallization, heat of reaction, heat of dissolution, heat of fusion, sensible heat and latent heat. **[9]**

b) A gas is heated from 220 K to 345 K. Calculate the amount of heat added per kmol of ethylene if its specific heat is given by the equation:

$C_p^0 = 4.1261 + 155.0213 \times 10^{-3} T - 81.5455 \times 10^{-6} T^2 + 16.9755 \times 10^{-9} T^3$ kJ/kmol K T is in K. **[9]**

OR

Q8) a) A stream of nitrogen flowing at the rate of 1200 kmol/h is heated from 200 K to 315 K. Calculate the heat that must be transferred if specific heat of gas is given by $C_p^0 = 29.5909 - 5.141 \times 10^{-3} T + 11.1829 \times 10^{-6} T^2 - 4.968 \times 10^{-9} T^3$ kJ/kmol K. **[6]**

b) Calculate the heat of formation of benzoic acid crystals ($C_7H_6O_2$) at 298.15 K using the following data: Standard heat of formation of CO_2 (g) = –393.51 kJ/mol. Standard heat of formation of H_2O (1) = –285.83 kJ/mol, Standard heat of combustion of benzoic acid crystals = –3226.95 kJ/mol. **[4]**

c) Methane is oxidized with air to produce formaldehyde: **[8]**

CH_4 (g) + O_2 (g) → HCHO (g) + H_2O(g). ΔH^0_R = –283.094 kJ/mol. 150 mol of methane are fed to the reactor at 311 K, air is used in 30% excess and supplied at 373 K. If conversion is 60% calculate the heat that must be removed from the product stream to emerge at 478K. Data : C^0_{pm} for air (373 – 298 K) = 29.2908 kJ/kmol K.

Component	C^0_{pm}(311 – 298 K)kJ/kmol K	C^0_{pm} (478 – 298 K) kJ/kmol K
CH_4	36.044	40.193
N_2	-	29.2866
O_2	-	30.0821
HCHO	-	41.2902
H_2O	-	34.2396

Q9) a) 500 kg of $AgNO_3$ at 373 K is cooled to 293 K and the crystals are filtered out. The wet filter cake which contains 75% solid crystals and 25% saturated solution by weight passes through the dryer in which remaining water is evaporated. Calculate the fraction of $AgNO_3$ removed as dry crystals and The amount of water that must be removed in the drying stage. Solubility of $AgNO_3$ at 373 K is 900 kg $AgNO_3$/ 100 kg water and at 293 K is 222 kg $AgNO_3$/ 100 kg water. **[8]**

b) Define dew point, wet bulb and dry bulb temperature. What is the relation between relative humidity and percentage humidity? At what condition is DBT = WBT? **[8]**

OR

Q10) a) Wet solids containing 20% water is sent through a dryer in which 80% of the water is removed. Based on 100 kg of feed calculate the mass fraction of dry solids in the dried product leaving the dryer. Also calculate the weight ratio of water removed to the total product leaving the dryer. **[4]**

b) A gas mixture containing 15 mol% A and 85 mol% inerts is fed to an absorption column where it is contacted with a solvent B. The mole ratio of solvent to gas entering the tower is 2:1. Gas leaving the tower contains 3% A, 2% B and the rest inerts. Calculate the percentage recovery of A and fraction of B fed to the tower which is lost in the gas leaving the tower. **[8]**

c) Define tie humid heat and adiabatic saturation temperature. **[4]**

Q11) a) The orsat analysis of the flue gases shows CO_2:l2.4%.CO_2:3.l%O_2:5.4% & N_2:79.1% (by volume).All the hydrogen but only 85 % of the carbon in the flue appears in the flue gases. Calculate the percentage excess air used. Assume that negligible oxygen and nitrogen are present in the fuel. **[10]**

b) Define % calorific value and the two types of calorific values. What is the relation between them? **[6]**

OR

Q12) a) Explain proximate analysis in detail. **[8]**

b) Crude oil is found to contained 87.1% carbon. 12.5% Hydrogen and 0.4% sulfur (by weight). Its Gross Calorific Value at 298.15 K is measured to be 45070 KJ/Kg Oil. Calculate its net calorific value at 298. 1 5 K.

Data:

Latent heat of water vapor at 298.15 K =2442.5 KJ/Kg **[8]**

Total No. of Questions : 7] **SEAT No. :**

P3406 **[Total No. of Pages : 3**

[5057] - 115
S.E. (Printing)
TECHNOLOGY OF PRINTING MATERIALS
(2008 Pattern)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Suggest a suitable metal as a material for inking roller with justification. **[8]**

b) What is Polymerization? Explain the use of polymers in the printing industry. **[8]**

OR

a) Differentiate between thermoset and thermoplastic type of polymer.

b) What is Photoploymer? Explain the use of the same in printing.

Q2) a) Draw a diagram of layers in Photographic film and explain the importance of each layer. **[8]**

b) Explain the procedure of processing of the photographic films to obtain negative or positive. **[8]**

OR

a) Explain the procedure of manufacturing the Silver Halaide film.

b) Explain various types of adhesives used in printing industry.

P.T.O.

Q3) a) Explain the basic printing principles with diagrams. **[9]**

b) Differentiate between Paste ink and Liquid ink. **[9]**

OR

a) Explain the basic properties of the printing inks.

b) Explain the major components of printing ink with suitable examples.

SECTION - II

Q4) a) Explain the Light fastness and Rub resistance properties of ink with suitable examples. **[8]**

b) Describe the procedure of determining moisture content in the paper. **[8]**

OR

a) Differentiate between Process inks and Spot / Special inks.

b) Write the importance of thickness of the paper with reference to the procedure of thickness gauge.

Q5) a) Draw a neat diagram of Fourdrinier machine and name the parts. **[8]**

b) State the importance of the fillers in the paper. **[8]**

OR

a) Comment on any two
   i) Beater
   ii) Conical refiner
   iii) Hydrapulper

b) Describe in detail the theory of internal sizing in the paper.

Q6) a) Describe in short any two : **[9]**
   i) Bursting strength
   ii) Acidity and pH
   iii) Brightness

b) Write in detail the procedure of determining the grammage of paper. **[9]**

OR

Q7) a) Comment on any two : **[9]**

i) Tensile strength

ii) Dimensional stability

iii) Opacity

b) Describe in detail the procedure of determining the ash content in the paper and state the importance of ash content in paper with respect to printing. **[9]**

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Total No. of Questions : 12]

SEAT No. : ____

P3407

[Total No. of Pages : 4

[5057] - 124

S.E. (Polymer/Petroleum/Petrochemical)

MOMENTUM TRANSFER

(2008 Pattern)

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

Instructions to the candidates:

1) ***Attempt Q1 or 2, Q3or 4, Q5or 6, Q7 or 8, Q9 or 10, Q11 or 12.***
2) ***Figures to the right indicate full marks.***
3) ***Use of electronic calculators is allowed.***
4) ***Draw neat sketch where ever necessary.***

SECTION - I

Q1) a) Explain applications of fluid mechanics in process equipment design and operation. **[6]**

b) Explain with neat figure different types of Non-Newtonian Fluids. **[6]**

c) For water at 30°C, convert a kinematic viscosity of 0.01 cm^2/sec to Centi-stoke, Pa-sec, poise and centipoise **[4]**

OR

Q2) a) Explain Newton's law of viscosity. Give its applications with all details. **[8]**

b) Draw the rheological diagram and show various types of fluids in it. Give at least two examples of each. **[8]**

Q3) a) State Pascal's Law. Starting from basic principles derive the hydrostatic equation. **[6]**

b) Explain the velocity potential function and stream function. Derive the Laplace equation for both functions. **[6]**

c) For a given velocity vector, $V = 3\,xyi + 4\,yzj + 6\,(zx\text{-}t^2)k$, determine the velocity at (1,1,1) at time 2 seconds, acceleration at (1,1,1) at time 1 second and Rotation at (1,1,1) at time 3 seconds. **[6]**

OR

P.T.O.

Q4) a) In a two dimensional incompressible flow, the velocity components are u = 2x ; v = (l-2y) find the stream function and the velocity potential function. **[9]**

b) With a neat diagram show absolute pressure, positive and negative gauge pressures, standard atmospheric pressure with the gauge pressure. Convert pressure of 2000 Pa into GPa absolute. **[9]**

Q5) a) Define the following types of flows with suitable examples. **[8]**

i) Steady and Unsteady flow

ii) Laminar and turbulent flow

iii) Rotational and Irrotational flow

iv) Uniform and Non - Uniform flow

b) A 30 cm throat diameter and 50 cm inlet diameter venturimeter is installed in vertical pipe carrying water. The flow is in upward direction. The difference between the levels of throat and inlet is 80 cm. The water - mercury differential manometer gives deflection of 17.5 cm of mercury. Find the discharge of water. Take coefficient of discharge of meter as 0.98. **[8]**

OR

Q6) a) Explain principle and construction of Venturimeter. Derive the expression for flow rate through venturimeter. **[8]**

b) A Pipeline carrying oil of specific gravity 0.87 changes in diameter from 200 mm at position 1 to 500 mm diameter at position 2 which is 4 meters at higher level. If the pressures at 1 and 2 are 100 KN/m^2 and 60 KN/m^2 respectively and the discharge is 0.2 m^3/sec, determine the loss of energy in terms of head and justify the direction of flow. **[8]**

SECTION - II

Q7) a) Draw Moody's diagram and explain variation of friction factor f in laminar, transition and turbulent flow regimes. Explain the use of Moody's chart in Flow through pipe calculations. **[8]**

b) Explain the following: **[8]**

i) Hydraulic diameter

ii) Equivalent length

iii) No slip condition

iv) Hydrodynamic rough boundary

OR

Q8) a) Derive the expression for shear stress distribution in steady laminar flow through a circular pipe. **[8]**

b) Oil having specific gravity 0.8 is pumped through a horizontal pipe 150 mm diameter and 2000 m long at the rate 20 lit/sec. The pump requires 7 KW at 70% efficiency. Taking friction factor = 64/Re, determine the viscosity of oil. **[8]**

Q9) a) Explain with neat sketch : **[8]**

i) Momentum thickness

ii) Energy Thickness

iii) Displacement Thickness

b) Derive the expression relating pressure drop and flow rate for a flow through packed bed column. **[8]**

OR

Q10)a) What is boundary layer? Give the importance of boundary layer theory in heat and mass transfer operations. **[8]**

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

Q11)a) Explain the following with significance **[9]**

i) Euler No.

ii) Mach No.

iii) Weber No.

iv) Froude No.

b) Draw a neat labeled sketch of a centrifugal pump and explain the function of each part. Also show the basic pump heads on the sketch.**[9]**

OR

Q12)a) Give the utility of Dimensional Analysis. What are repeating variables? Explain the detail procedure of dimensional analysis using Buckingham's π Method. **[9]**

b) A centrifugal pump delivers 0.3 kg/s of water through a pipe of 30 mm diameter and 50 m long in horizontal direction and up through vertical height of 9 m. The control valve and the pipe fittings equivalent to 50 pipe diameters. The frictional loss of head in the suction pipe is 0.5 m. Determine the power required by the pump. The efficiency of the pump is 60 percent. Density of water = 1000 kg/m^3, Viscosity of water = 10^{-3} Ns/m^2 . The friction factor is given by $f = 0.046 (Re)^{-0.2}$. **[9]**

Total No. of Questions : 12]

SEAT No. : ____

P3408

[Total No. of Pages : 4

[5057] - 125

S.E. (Polymer/Petroleum/Petrochemical)

STRENGTH OF MATERIALS

(2008 Pattern)

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

Instructions to the candidates:

1) ***Answer Q1 or 2, Q3 or 4, Q5 or 6, questions from Section - I and Q7 or 8, Q9 or 10, Q11 or 12 Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of electronic pocket calculator is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw and explain the stress strain curve for a ductile material. **[4]**

b) What are thermal stresses? How is it developed? Explain with illustrations. **[5]**

c) What are the various elastic constants? Define each one of them. **[8]**

OR

Q2) a) A flat steel plate (modulus of elasticity, E) of trapezoidal shape and uniform thickness 't', tapers uniformly from width 'b_1' to width 'b_2' at the other end, over a length 'l'. Derive the expression for the elongation of the plate when subjected to an axial load 'p'. **[9]**

b) Derive the expression for maximum instantaneous stress developed in a longitudinal bar due to impact loading. **[8]**

Q3) a) Write the assuptions made in the derivation of the 'torsion formula'. Also derive the torsion formula. **[9]**

P.T.O.

b) Find the principal stresses, maximum shear stress and location of principal planes for the stress system shown in fig. Q.3 (b). **[8]**

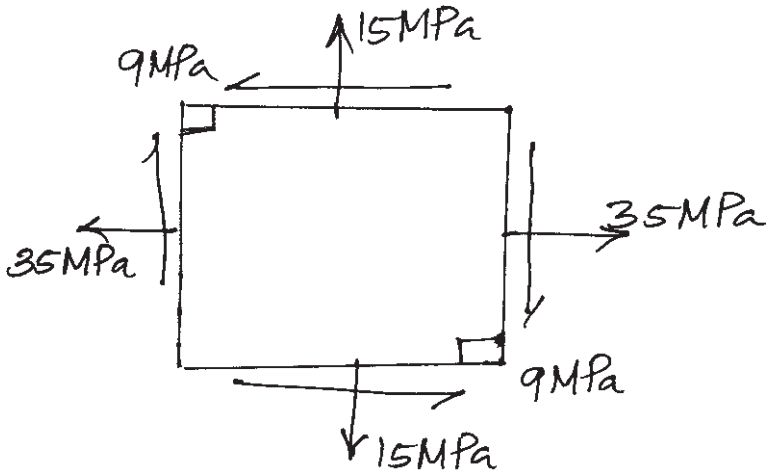

fig. Q.3(a)

OR

Q4) a) A solid steel shaft is subjected to a torque of 45kNm. If the permissible angle of twist for the shaft is 0.5° per metre length and the permissible shear stress for the material of the shaft is 90MPa, find a suitable diameter of the shaft, if G = 80GPa. **[9]**

b) Derive the expression for normal and shear stress developed on an inclined plane of an element subjected to an unidirectional normal stress. **[8]**

Q5) a) Differentiate between thin and thick pressure vessels. Write the assumptions made in Lames' theory for thick walled pressure vessels.**[8]**

b) An aluminium thickwalled cylindrical pressure vessel is subjected to an internal fluid pressure of 150MPa. The cylinder has an inside diameter of 200 mm and outside diameter of 800 mm. Find the stresses developed in the thickness of the cylinder and sketch them. Use Lame's equation. **[8]**

OR

Q6) a) Derive the formula for the circumferential and longitudinal stresses developed in a thin cylindrical shell when subjected to an internal pressure. **[8]**

b) Find the increase in volume of a thin spherical shell of 1m diameter and 10mm thickness when subjected to an internal fluid pressure of 1.6MPa if E = 200 GPa and ν = 0.3. **[8]**

SECTION - II

Q7) a) Define shear force and Bending moment at a section of a beam. Hence derive the relation between shear force, bending moment and rate of loading at a section of the beam. **[8]**

b) A timber beam of depth 300mm is simply supported over a span of 10m. What udl per metre (including self weight) can it carry if the maximum permissible bending stress allowed is 7.5N/mm^2. Take MI of the section about NA is 4.5×10^8mm^4. **[9]**

OR

Q8) a) Explain the following : **[8]**

i) Theory of bending equation.

ii) Section modulus.

iii) Pure bending.

b) A beam is supported and loaded as in fig. Q8(b) Draw the SFD and BMD for the beam showing the important values. **[9]**

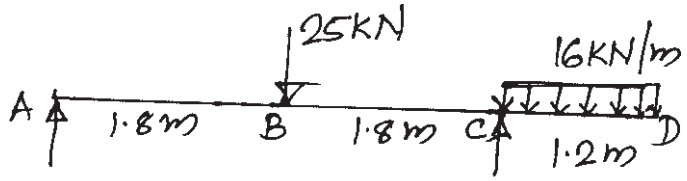

fig. Q 8(b)

Q9) a) Derive the expression for shear stress distribution over a rectangular section, when subjected to a shear force F. Hence sketch the shear stress distribution over the cross section. **[8]**

b) What is meant by effective length of columns. Draw a table showing the effective length of columns with standard end conditions and the corresponding buckling load. **[9]**

OR

Q10)a) The cross section of a beam is a T section 120 mm × 200mm × 12mm with the 120mm side horizontal and overall depth as 200mm. Sketch the shear stress distribution showing all important values. SF on the section = 200KN. **[8]**

b) A hollow CI column with fixed ends, supports an axial load of 800kN. If the column is 3m long and has an external diameter of 200mm, find the thickness of metal required. Use Rankinis formula Take a constant of $\frac{1}{1600}$ (including end effects) and assume a working stress of 90N/mm^2. **[9]**

Q11)a) From basic principles derive the expression for slope and deflection at any section of a cantilever beam carrying a udl throughout its span. What will be slope and deflection at the free end. **[8]**

b) What is the core or kernel of a section. With the help of proper sketches, derive the expression for the extreme fibre stresses for a short member subjected to an eccentric compressive loading W. Eccentricity is about one axis only. **[8]**

OR

Q12)a) A simply supported beam of span L is subjected to a uniformly distributed load w. Derive the expression for the central deflection of the beam. **[8]**

b) At a certain section of a shaft of 80mm external diameter, there is a BM of 35kNm and a twisting moment of 50kNm. Determine the principal stresses developed. **[8]**

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Total No. of Questions : 12]

SEAT No. :

P4935

[Total No. of Pages : 2

[5057]-32

S.E. (Production Sandwich)

HEAT AND FLUID ENGINEERING

(2008 Pattern)

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

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answer to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) a) Define and explain; Compressibility, Surface tension, Ideal fluid and Dynamic viscosity. **[8]**

b) Expression is to be derived for total pressure and center of pressure for vertical plane immersed in liquid. **[8]**

OR

Q2) a) Write applications of Pascal's law and write its statement. **[8]**

b) Explain any suitable pressure measuring device for positive and negative pressure. **[8]**

Q3) a) Derive an expression for discharge through orifice meter. **[8]**

b) Derive an expression for discharge through venture meter. **[8]**

OR

Q4) a) Define; Stream lines, Streak lines, Velocity potential, Flow net. **[8]**

b) Derive Bernoulli's equation and write its assumptions. **[8]**

Q5) a) Write equations for losses of energy in pipes with neat sketch. **[9]**

b) Explain with neat sketch constructional details and working of Pump. **[9]**

P.T.O.

OR

Q6) a) Explain; Froude number, Euler number, Mack number, Dimensional homegeneity. Reynolds number **[10]**

b) Explain with neat sketch construction details and working of turbine. **[8]**

SECTION - II

Q7) a) Describe mountings and accessories of boiler. **[8]**

b) Draw and explain any water tube boiler with neat diagram. **[8]**

OR

Q8) a) Explain complete and incomplete combustion process in detail. **[8]**

b) Explain the working principle of fire tube boiler with neat sketch. **[8]**

Q9) a) Describe the working of VCC with neat sketch. Draw it on P-h and T-s diagrams. **[8]**

b) Describe and explain; DBT, DPT, WBT and RH. **[8]**

OR

Q10) a) Draw and explain Unitary Air Conditioning system **[8]**

b) Draw and explain air refrigeration in detail. **[8]**

Q11) a) Explain various efficiencies related to Reciprocating Air Compressor. **[9]**

b) Draw and explain the intercooler used in multistage compressor. **[9]**

OR

Q12) a) Compare Otto, Diesel and Dual cycles. **[9]**

b) Explain; Ignition and Lubrication systems of an IC Engine. **[9]**

Total No. of Questions : 12]

SEAT No. :

P3851

[Total No. of Pages : 3

[5057] - 93

S.E. (Instrumentation)

PRINCIPLES OF SENSORS AND TRANSDUCERS

(2008 Pattern)

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

Instructions to the candidates :-

1) ***All questions are compulsory.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is measurement? Why it is necessary? **[8]**

b) Write specification of temperature sensor. **[8]**

OR

Q2) a) What is Calibration? Give calibration standards for temperature sensor. **[8]**

b) Explain types of error? How error is represented in transducers. **[8]**

Q3) a) Explain bimetallic temperature? Explain application of same. **[9]**

b) Explain working principle of manometer. Explain how range and sensitivity can be increase. **[9]**

OR

Q4) a) Explain cantilever beam to measure force. **[9]**

b) Explain rate gyroscope. **[9]**

P.T.O.

Q5) a) Explain viscosity to torque conversion with proper figure and working principle. **[8]**

b) Explain static vane element for flow measurement with neat figure, working principle, advantages and disadvantages. **[8]**

OR

Q6) a) Explain measurement of density using **[8]**

i) Bubbler method.

ii) U-tube weighing system

b) Explain level to force and level to pressure converter. **[8]**

SECTION - II

Q7) a) Explain RTD with working principle, materials and ranges, contraction diagram. **[9]**

b) Explain LVDT with suitable example. **[9]**

OR

Q8) a) Explain disappearing filament type optical pyrometer. **[9]**

b) Explain how thickness can be measure with capacitive sensor with suitable diagram, supporting equations. **[9]**

Q9) a) What will happen if reference junction is not kept at constant temperature? Explain cold junction temperature compensation. **[8]**

b) Explain Hall effect sensor and its application. **[8]**

OR

Q10) a) Explain piezoelectric principle? Which different parameters can be measured? Explain any one. **[8]**

b) Explain Electromagnetic flow meter. **[8]**

Q11) a) Explain self balancing system. **[8]**

b) Explain data logger. **[8]**

OR

Q12) a) Explain magnetic tape recorder. **[8]**

b) Explain feedback transducer. **[8]**