AGRICULTURAL UNIVERSITIES OF GUJARAT
COLLEGE OF AGRICULTURAL ENGINEERING AND TECHNOLOGY
JUNAGADH / GODHRA / DEDIYAPADA

Semester : 1st , B.Tech.(Agril.Engg.) (5th Deans' Syllabus)

<u>Semester End Examination – DEC – 2019(REGULAR)</u>

Subject : Engineering Mathematics – I
Date : 09/12/2019
Day : Monday

Course No. : Math(E) – 1.1.1
Time : 10:00 to 12:00
Marks : 50.00

Q-1 <u>Attempt the following multiple choice questions.</u> (05)

(1) $\lim\limits_{x \to 0} \dfrac{\log (tanx)}{logx} =$ ___
    (a) 1   (b) 2   (c) -1 (d) None

(2) If $x = rcos\emptyset$, $y = rsin\emptyset$ then $\dfrac{\partial(x,y)}{\partial(r,\emptyset)} =$ ___
    (a) $\emptyset$ (b) r (c) $r/\emptyset$ (d) None

(3) The radius of curvature of the curve $y = x^2$ at the point $x = 0$ is ___
    (a) 1   (b) 1 / 2 (c) 2   (d) None

(4) Asymptote of the curve $y(6 - x) = x^2$ is ___
    (a) $y = x$ (b) $y = 6$ (c) $x = 6$ (d) None

(5) The value of $\beta(4,6) =$ ___
    (a) 1 / 504 (b) 1 / 405 (c) 1/505 (d) None

Q-2 <u>Attempt the followings (Any FIVE)</u> (15)

(1) Test whether $A = \begin{bmatrix} 1 & 1 & 3 \\ 5 & 2 & 6 \\ -2 & -1 & -3 \end{bmatrix}$ is nilpotent or not.

(2) Evaluate $\lim\limits_{x \to 1} \dfrac{x^5-2x^3-4x^2+9x-4}{x^4-2x^3+2x-1}$

(3) Expand $f(x) = cosx$ in Maclaurin's series.

(4) Evaluate $\lim\limits_{(x,y) \to (0,0)} \dfrac{y^2-x^2}{y^2+x^2}$

(5) If $x = u(1 - v)$, $y = uv$ then find the value of $\dfrac{\partial(u,v)}{\partial(x,y)}$

(6) Determine the normal vector to the surface $x^2yz^3 + xy^2z^2 = 2$ at the point $P(1, 2, -1)$

(7) Trace the curve $y^2(2 - x) = x^3$.

Q-3 <u>Attempt the followings (Any FIVE)</u> (15)

(1) If $u = cos^{-1}\left\{\dfrac{x+y}{\sqrt{x}+\sqrt{y}}\right\}$ then prove that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} + \dfrac{1}{2}cotu = 0$

(2) Evaluate: $\int_0^1 \int_0^2 \int_1^2 x^2yz \, dxdydz$

(3) Determine the surface area of the solid obtained by rotating $y = \sqrt{9 - x^2}$, $-2 \le x \le 2$ about the x – axis .

(PTO)

(4) If $\bar{r} = \left(t^3, 2t^3 - \frac{1}{5t^2}, 0\right)$ then prove that $\bar{r} \times \frac{d\bar{r}}{dt} = (0,0,1)$

(5) Express $\int_0^1 \frac{x^2}{\sqrt{1-x^5}} dx$ in terms of beta function.

(6) Find the directional derivative of $\emptyset = x^2z + 2xy^2 + yz^2$ at the point P(1,2,--1) in the direction of $\bar{a} = (2,3,-4)$.

Q-4 **Attempt the followings (Any THREE)**   (15)

(1) Find the value of $\int \int y \, dxdy$ over the region bounded by the parabolas $y^2 = 4x$, $x^2 = 4y$

(2) Solve the system of linear equations
$$x + y + z = 3, x + 2y + 3z = 4, x + 4y + 9z = 6$$

(3) Find the eigen values of $= \begin{bmatrix} 11 & -4 & -7 \\ 7 & -2 & -5 \\ 10 & -4 & -6 \end{bmatrix}$. Find the eigen vectors
corresponding to the largest eigen value.

(4) A rectangular box open at the top is to have a volume of 32 CC. Find the dimensions of the box requiring least material for its construction.

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Q.1 (A) Answer the following in very short, each of 1.0 mark. (Any five)   **(05)**

(1) Write full form of LASER.

(2) Define valance band (VB).

(3) What is magnetism?

(4) Define photometry.

(5) What is particle?

(6) Define ferromagnetism.

(7) Write the statement of De-Broglie hypothesis.

Q.1 (B) Answer the following multiple choice questions, each of 1.0 mark. (Any five)   **(05)**

(1) Unit of Luminous Flux is.............

     (a) Coherent   (b) non-coherent   (c) Lumen   (d) Candella

(2) He-Ne laser is a type of........

     (a) gas laser   (b) glass laser   (c) gain medium   (d) not any

(3) Quantum theory of light states that light consist of.............

     (a) Moisture   (b) Seven color   (c) Photons   (d) Rays

(4) In ferromagnetic material as the temperature increases the value of susceptibility...

     (a) decreases   (b) increases   (c) crystalline   (d) die-magnet

(5) The extrinsic semiconductors are .... at any given temperature.

     (a) Electrically $^{+ve}$ (b) electrically $^{-ve}$ (c) electrically neutral (d) magnetic

(6) In Meissner effect, the magnetic susceptibility of the material, χ = ...

     (a) 0   (b) -1   (c) 1   (d) 2

(7) The wavelength λ associated with a particle of mass m moving with velocity v is given by

     (a) $\lambda = h / mv$ (b) $\lambda = m / hv$ (c) $\lambda = v / hm$ (d) $\lambda = mhv$

(PTO)

Q.2 (A) Answer the following short questions, each of 2.0 marks. (Any Five) **(10)**

    (1) Explain Inverse square law of Illumination **OR** Lambert's Cosine law of Illumination.

    (2) Derive Time Dependent Schrodinger wave equation.

    (3) Enlist the type of MASER.

    (4) Draw the band diagram of conductors and from that write features of conductors.

    (5) Explain properties of diamagnetism.

    (6) Explain Critical magnetic field.

    (7) Explain N-type **OR** P-type of semiconductor.

Q.2 (B) Answer the following numerical, each of 2.0 marks. (Any Five) **(10)**

    (1) For certain metal the critical magnetic field is 8×10^3 A/m at 8 K and 8×10^4 A/m at 0K. Determine its transition temperature.

    (2) The transition temperature for Pb is 7.2 K. However, at 8 K it loses the superconducting properties if subjected to magnetic field of 5×10^4 A/m. Find the maximum value of H, which will allow the metal to retain its superconductivity at 0K.

    (3) Compute the de-Broglie wavelength of neutron having energy of 10 keV. Mass of neutron may be taken as 1.67×10^{-27} kg.

    (4) Find the energy of the neutron in units of electron volt whose de-Broglie wavelength is $1\mathring{A}$.

    (5) Calculate de-Broglie wavelength associated with a proton moving with a velocity equal to $\frac{1}{20}$ th of the velocity of light. (Plank's constant = 6.62×10^{-34} J.sec)

    (6) If the uncertainty in position of an electron is 25×10^{-10} m. Calculate the uncertainty in its momentum. (Plank's constant = 6.625×10^{-34} J.sec)

    (7) A sample of cast iron exhibits a magnetic field of B = 0.5 T. When the magnetic intensity is H = 10 A/m. (a) Find the permeability of cast iron at this value of H. (b) What would the field be in air at this value of H ?

Q.3 Answer the following long questions, each of 4.0 marks. (Any five) **(20)**

    (1) Derive the Time Independent Schrodinger wave equation in one dimension.

    (2) Describe paramagnetic substance and properties of paramagnetic substance.

    (3) Explain Type-I and II superconductor.

    (4) Derive Langevin's expression for diamagnetic susceptibility.

    (5) Explain: (i) Absorption (ii) Spontaneous Emission (iii) Stimulated Emission with energy diagram.

    (6) Write short note on Raman Effect **OR** Stark Effect.

    (7) Discuss the Curie-Weiss Law of paramagnetism.

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Semester: 1st B.Tech,5th Deans (Agri.Engg.)   Date: 11.12.2019 (Wednesday)

Subject: Engineering Chemistry   Time: 10.00 to 12.00

Course No.: Chem(E)-1.1.3   Marks: 50.00

Q.1 Match the followings.   05

1. Fructose	Fruit Sugar
2. Sucrose	Grain Sugar
3. Glucose	Milk Sugar
4. Lactose	Blood Sugar
5. Maltose	Table Sugar

Q.2 Define any five following with example: 05

1 Enzyme
2 Combustion
3 Lipids
4 Protein
5 Vitamins
6 Corrosion

Q.3 Write answers to any five of the following questions.   10

1. Define Calorific Value and explain why gaseous fuel have high Calorific Value.
2. Application of Colloids.
3. Draw the cyclic structure of Sucrose.
4. Explain classification of proteins.
5. Difference between Temporary hardness and Permanent hardness.
6. How vitamins are differing from other organic food stuffs?

Q.4 Write answer to any five of the following questions.   15

1. Mention uses of Plastic/Polymer.
2. Explain factors affecting the rate of enzymatic reaction.
3. Draw the structures of Peptide Bond, Glucose and Fructose.
4. Explain with equation why Hard water does not produce lather with soap.
5. Give classification of Carbohydrates with examples.
6. Functions of Lubricants.
7. Write advantages of gaseous fuel in detail.

Q.5 Write answer to any five of the following questions.   15

1. Explain preparation method of (A) Teflon (B) Nylon-6,6 (C) Buna N
2. Write short notes on Octane number.
3. Write importance of Cellulose.
4. Explain chemical properties of proteins.
5. Write shortnote on Polysachharides.
6. List the fat soluble Vitamins and its deficiency diseases.

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Semester: 1st(Regular / ~~Supplementary~~) B.Tech (Agril. Engg.)

Semester End Examination – 2019

Subject: Principles of Soil Science	Course No: Ag(E)-1.1.4
Date: 12/12 /2019	Time: 10.00 to 12.00 hrs
Day: Thursday	Marks: 50.0

Q. 1   Define soil and explain the different components of soil with diagram.   (5.0)

OR

Q. 1   What is rocks ? classify it and give detail classification of igneous rock on the basis of percentage silica content.

Q.2   Define / Explain the following term. (any four)   (4.0)
1.Aminization.4.Edaphology.
2.Nitrification.5. Bulk density.
3. Humus.

Q.3   Differentiate the following. (any four)   (6.0)
1. Sandy and Clay soil.
2. Physical and chemical weathering.
3. Land and soil.
4. Soil texture and soil structure.
  5. Saline soil and Alkali soil.

Q.4   Write about role of organic matter in soil fertility.   (5.0)

OR

Q.4   Enlist the different soils of Gujarat and discuss any one of them detail.

Q.5   Write short not.(any two)   (6.0)
1. C: N ratio.
2. Types of soil structure.
3.Soil profile.
4. Specific soil forming process.

Q.5   Answer the following in brief. (any four)   (6.0)
1. Classify the mineral on the basis of mode of formation with example.
2. Enlist the different physical properties of soil.
3. Enlist the soil forming factors.
4. Enlist the general recognized criteria for judging the quality of irrigation water.
5. Enlist the factors affecting soil porosity.

Q.6   A soil having bulk density 1.39 g / cc and particle density 2.68 g / cc calculate   (3.0)
space (%) and weight (Kg / ha) of hectare soil up to 15 cm. depth .

OR

Q.6   What do you mean by alkali soil? What are the management practices for alkali soil reclamation?

Q.7   Fill in the blanks with appropriate word into given bracket of the following.   (5.0)

1.   Particles less than _____ mm. diameters is called soil colloids.
      (0.002 , 0.001, 0.003)

2.   _____ is the basic property of soil and cannot be changed by management.
      (Texture , Structure , Porocity)

3.   The cation exchange capacity is expressed in _____.
      (mg /100 g, me / 100g, ml /100 g)

4.   Which of the following soil particles are chemically most active? _____.
      (sand , silt , clay)

5.   The incomplete covering of water forming seas and ocean is the _____.
      (Atmosphere, Lithosphere, Hydrosphere)

6.   The removal of excess water from the field is called _____.
      (leaching , drainage, seepage)

7.   _____ criteria is not used to decid the quality of irrigation water.
      (EC , SAR, CEC)

8.   _____ is the main cause of sait affected soils .
      (Topography , Climate , soiltexture)

9.   The process of accumulation of salts is known as _____.
      (alkalization, salinization , calcification)

10.   _____ an amendment which are used to reclaim sodic soils.
       (Fertilizer , Minerals , Gypsum)

Q.8   Match the following groups   (5.0)

Groups -A		Groups -B	
1.	Zone of washout	A.	Saline soil
2.	Heavy mineral	B.	High salinity
3.	Regolith	C.	*Illuvial horizons*
4.	Oldest rocks	D.	Sodic soil
5.	Clay minerals	E.	*Eluvial horizons*
6.	EC - 0.75 - 2.25	F.	< 0.002 mm.
7.	Light mineral	G.	Igneous rocks
8.	Black alkali	H.	Solum plus parent material(A + b + C)
9.	Zone of wash in	I.	sp. gravity < 2.85 (g/cm^3)
10.	White alkali	J.	sp. gravity >2.85 (g/cm^3)

Q.9   Decide whether the following statement are TRUE or FALSE   (5.0)

1.   Soil is recycling system for nutrients.
2.   The process of formation of flocks is called deflocculation.
3.   Soil is a three dimensional body having length, breadth and depth.
4.   Clay soils always contain higher amount of sand particles.
5.   Generally, the particle density of normal soil is 2.65 g/cc.
6.   Finer is the texture of the soil higher is the bulk density.
7.   The solid zone is known as earth crust.
8.   The deep black soils are also known as regurs.
9.   Soil usually contains more nitrate nitrogen than nitrite at any time.
10.   Potassium (K) makes more tolerant to drought, cold, insects and diseases

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Semester: First (Regular) B.Tech (Agri.Engg.)

Semester End Examination -2018 (Regular-Fifth Deans)

Subject: Surveying and Leveling   Course No.: C.E.-1.1.5

Date: 13-12-2019   Time: 10:00 to 12:00 hrs

Day: Friday   Marks: 50

Q.1   Answer the following questions: (Any Three)   **15**

(A)   Write down the use of following instruments:

(i) Arrow   (ii) chain   (iii) U-fork

(iv) Ranging staff   (v) Plumb bob

(B)   Define the following terminology:

(i) Contour line   (ii) Horizontal line   (iii) Bench mark   (iv) Fore bearing

(v) Magnetic declination

(C)   Describe in detail: Principle of Surveying.

(D)   Describe with sketch: Procedure of plane table surveying.

Q.2   Answer the following questions: (Any Four)   **20**

(A)   Short note: Prismatic compass survey by radiation method.

(B)   Short note: Direct ranging methods

(C)   Describe in detail : Plane table survey by traverse method

(D)   Short note: Temporary Adjustment of Dumpy Level.

(E)   Short note: Linear measurement methods

Q.3   Answer the following questions: (Any Three)   **15**

(A)   The bearings of the sides of traverse ABCDE are as follows:

Line	FB	BB
AB	107°	287°
BC	22°	202°
CD	281°30'	101°30'
DE	189°	9°
EA	124°30'	304°30'

Compute the interior angles.

(B) Find the reduced level of each point by appropriate method for following readings. Apply the usual checks. The first reading was taken with staff held upon a benchmark of elevation 100.00 meter. The observation were taken at every 30 meter interval. Provide the necessary checks and also find the gradient between first and last point.

Station point	BS	IS	FS	R.L
1	0.385			100.00
2		1.030		
3		1.925		
4		2.825		
5		3.730		
6			4.685	

(C) A 20 m chain was found to be 10 cm too long after chaining distance of 1800 m. it was found to be 20 cm too long at the end of day's work after chaining total distance of 2800 m. If the chain was 10 cm too short at the beginning of the work, find the true distance measured.

(D) The following perpendicular offsets were taken at 20 m intervals from a survey line to an irregular boundary line:
1.2, 6.3, 4.2, 4.3, 7.2, 7.5, and 9.2 meters. Calculate the area enclosed between the survey line and the irregular boundary using simpson's rule and trapezoidal rule.

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College of Agricultural Engineering & Technology, Junagadh / Godhra / Dediapada
### SEMESTER END EXAM (Regular) Fifth Deans'

Subject : Engineering Mechanics
Course No. : CE-1.1.6
Semester : 1st B.Tech. (Agril. Engg.)

Date : 16-12-2019
Time: 10.00-12.00
Max. Marks: 50

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1. **Answer the following questions as directed:**   (12)

    i.   Define 'Couple'. List different properties of a couple.

    ii.   Define Beam and sketch various types of beams.

    iii. State the Lami's theorem of forces. Also Find the tension T in the string and reaction R of the wall if a sphere of weight 100 N tied to a smooth wall by a string as shown in Figure.
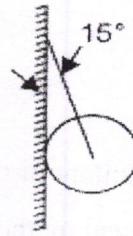
    iv.   Define the Coefficient of Friction and write the laws of friction.

2. **Attempt the following questions. (attempt any 2)**   (14)

    i.   State and prove Parallel axis theorem and Perpendicular axis theorem

    ii.   State and explain Parallelogram and Triangle law of forces.

    iii. State and prove Varignon's theorem for principle of moments.

3. **Solve the following numerical problems: (attempt any 4)**   (24)

    i.   A block weighing 150 KN is placed on a rough inclined plane making angle 30^0 with horizontal. If coefficient of friction is 0.25, find out the force applied on the block parallel to the plane, so that the block is just on the point of moving up the plane. Also find the angle of friction.

    ii.   A system of connected flexible cables shown in Fig. is supporting two vertical forces 200 N and 250 N at points B and D. Determine the forces in various segments of the cable.
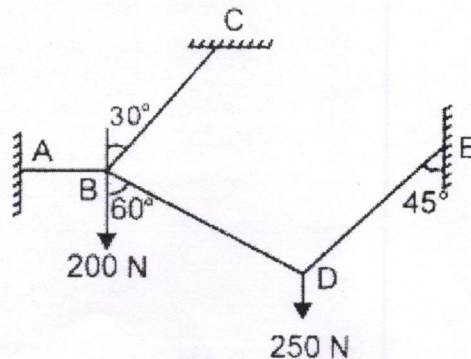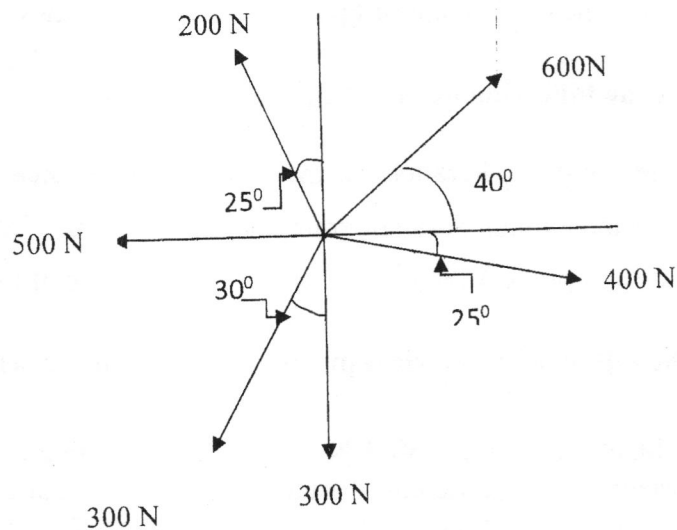
iii. Two tensile forces acting at an angle 120^0 between them. The bigger force is 40 KN. The resultant is perpendicular to the smaller force. Find the smaller force and the resultant force.

iv. Determine the moment of inertia of the symmetric I-section shown in Fig. about its centroidal axis x-x and y-y.
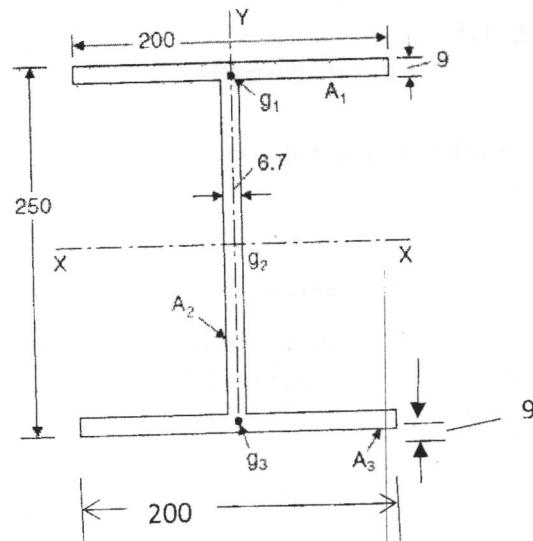
v. Determine the resultant of the concurrent, co-planar force system shown in Fig. by:

i)   Graphical method   ii) Analytical method

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Semester: 1st (Regular – V Dean's) B. Tech (Agril. Engg.)   **Date:** 17/12/2019
Course No: ME 1.1.8   **Time:** 10.00 - 12.00
Subject: Heat and Mass Transfer   **Total Marks:** 50.00

Q.1   **Multiple Choice Questions:**   5

   i.   When the Raynold's Number is as low as 100, the flow through the system will be
   _____

   a. laminar   b. transient   c. supersonic   d. turbulent

   ii.   An extended surface is used specifically to enhance heat transfer between a solid and
   adjoining fluid is termed as _____.

   a. pin   b. shaft   c. plate   d. fin

   iii. $M^1 L^{-1} T^{-2}$ is the dimension of following quantity

   a. Energy   b. Dynamic viscosity   c. Force   d. Pressure

   iv.   In natural convection, where warmer or cooler fluid next to the solidsurface causes a
   circulation because of a _____ difference resulting fromthe temperature differences
   in the fluid.

   a. mass   b. density   c. sp. gravity   d. thermal conductivity

   v.   The ratio of inertia forces to that of viscous forces is known as,

   a. Nusselt's   b. Raynold's   c. Prandtl's   d. Grashof's

Q.2   **Explain in brief (Any Four)**   10

i	Absorptivity	**ii**	Reflectivity	**iii**	Transmissivity
iv	Black body	**v**	White Body	**vi**	Gray body

Q.3   **Solve the following (Any Three)**   15

   i.   A 5 m high and 12 m long composite wall of a cold storage is made up of 100 mm
   thick brick wall as the outside wall. The inner wall surface is of fiber glass of 60 mm
   thick. In between the two walls an insulating board 20 mm thick is placed. The
   coefficient of thermal conductivity for the   three layers is given below.
   Brick wall: 1.15 W/m.k, Fiber glass: 0.04 W/m.k, Insulating board: 0.06 W/m.K. Its
   outside atmospheric temperature is 27°C and cold room temperature is 8 °C. Calculate
   the heat loss per hour through the wall. Also determine the interface temperatures.

   ii.   A wall of a building is made up of composite materials having a 100 mm, 100 mm, 10
   mm and 6 mm layers of brick (1.3 W/m °C), glass fibre (0.038 W/m °C), gypsum
   plaster (0.17 W/m °C) and part board (0.12 W/m °C), respectively. If inside and
   outside convection coefficients are 70 W/m² °C and 10 W/m² °C, respectively, what is
   the overall heat transfer coefficient? For unit area and inside and outside temperature
   32 and 4 °C, then how much is the heat transfer?

   iii.   A hollow spherical system having inside radius100 cm, 5 mm thick (2.4 W/m °C)
   insulated with 10 mm thick (2.4 W/m °C) sheet and finally covered with 5 mm thick

glass fiber (0.12 W/m °C). If the material inside sphere is at -90 °C and at outside is 55 °C, findout overall resistance and total heat transfer.

iv. A thick stainless steel pipe with internal diameter 25 mm and external diameter 50mm is used to transport hot oil of temperature125 °C. The outside temperature is25 °C. The pipe is covered with 20 mm thick layer of insulation of thermal conductivity 0.035 W/mK. The thermal conductivity of stainless steel may be taken as 20 W/mK. Find the heat loss through the pipe.

v. A thick walled tube of stainless steel (A) having thermal conductivity k=16 W/mK and dimensions of 0.0254 m ID and 0.0508 m OD is covered with a 0.0254 m layer of asbestos (B) insulation having thermal conductivity, k= 0.025 W/mK. The inside wall temperature of the pipe is 150 °C and the outside surface of the insulation at 30 °C. For 1 m length of the pipe calculation the heat loss.

Q. 4   **Explain the following (Any Two)**   **10**

i. Explain LMTD for "Parallel Flow".

ii. Explain modes of heat transfer.

iii. Explain general heat conduction equation in Cartesian Coordinates.

iv. Explain heat conduction through composite wall.

Q. 5   **Answer the following (Any Two):**   **10**

i. [a] Reynold's Number(Re)   [b] Nusselt number(Nu)

ii. Explain fick's law.

iii. Explain Stefan- Boltzmann Law

iv. Calculate the heat loss from a plate of size 2.5 X 1 m^2 if the air is moved along the plate at a speed of 3600 m/h and the temperatures of ambient air and the top of the surface of the plate are 25 °C and 92 °C.