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Roll No.

SECOND SEMESTER

B.E. (ME/PE)

MID SEMESTER EXAMINATION **MARCH**  **2005**

ME/PE-111 ENGINEERING ECONOMICS & ACCOUNTANCY

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Attempt **ALL** questions.
Assume suitable missing data, if any.

- 1 Fill up the blanks: 3
- [a] Price elasticity of Coca Cola is _____ than one.
 - [b] _____ Five year plan is in progress in India
 - [c] Demand for normal goods _____ with increase in income.
 - [d] Variable cost is _____ proportionate to output.
 - [e] Cross elasticity of demand for substitute goods are _____.
 - [f] Economic goods are _____ in supply than the demand.
- 2 Differentiate between following : 9
- [a] Monopoly and Monopolistic competition.
 - [b] Financial investment and Real investment
 - [c] Average cost and Marginal cost
- 3 What do you mean by Opportunity cost? 2
- 4 Discuss criterion for selection of location for any business venture? 2
- 5 How labour is a unique factor of production? 2
- 6 Discuss the concept of Break even point? 2

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SECOND SEMESTER

B.E. (ME)

MID SEMESTER EXAMINATION MARCH

2005

ME/PE-112 MATHEMATICS-II

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Attempt ALL questions.
Selecting TWO parts from each question.
Assume suitable missing data, if any.

- 1(i) Show that at the point of the surface $x^x y^y z^z = c$, where $x = y = z$,

$$\frac{\partial^2 z}{\partial x \partial y} = -[x \log(ex)]^{-1}$$

- (ii) If $u = F(x-y, y-z, z-x)$, prove that

$$\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$$

- (iii) Find possible percentage error in computing the parallel resistance R of the three resistances R_1 , R_2 and R_3 from the formula

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

if R_1 , R_2 , R_3 are each in error by 1.2%.

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- 2(i) Find the rank of the matrix

$$\begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$$

- (ii) For what values of λ , the equations

$$x + y + z = 1$$

$$x + 2y + 4z = \lambda$$

$$x + 4y + 10z = \lambda^2$$

have a solution and solve completely in each case.

- (iii) Find eigen values and the associated eigen vectors of the matrix

$$\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$$

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- 3(i) Evaluate $\iint_R yz \, dx \, dy$, where R is the region bounded by the parabolas $y^2 = 4x$ and $x^2 = 4y$.

- (ii) Evaluate $\iiint (x + y + z) \, dx \, dy \, dz$ over the tetrahedron bounded by the coordinate planes and the plane $x + y + z = 1$.

- (iii) Find the volume of the cylinder with base radius a and height h.

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SECOND SEMESTER

B.E. (ME/PE)

MID SEMESTER EXAMINATION MARCH

2005

ME/PE-113 PHYSICS-II

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Attempt ALL questions.
Assume suitable missing data, if any.

- 1[a] Find the energies needed to remove a proton from ${}^4_2\text{He}$, than to remove a neutron, and finally to separate the remaining neutron and proton. Compare the total with the binding energy of ${}^4_2\text{He}$. 3
- [b] In a cyclotron adjusted to give a proton beam, the magnetic field is 15,000 oersted and extreme radius of the beam is 15 cm. Calculate the frequency of the oscillator and the energy of the emergent proton. 2
- 2[a] A reactor is developing nuclear energy at the rate of 30,000 kW. How many atoms of U^{235} undergo fission per sec.? How many kg of U^{235} would be used in 1000 hours of operation, assuming that on an average energy of 200 MeV is released per fission. 2
- [b] The fusion reaction $2 {}^2_1\text{H} \rightarrow {}^4_2\text{He} + \text{energy}$, is proposed to be used for the production of industrial power. Assuming the efficiency of the process to be 30%, find how many grams of deuterium will be consumed in a day for an output of 50,000 kW. 3

3[a] Explain the importance of the critical constants of a gas in the study of liquefaction of gases. What are Boyle temperature and temperature of inversion of a gas. How are these temperatures related in the case of a vander Waal's gas? 3

[b] The critical temperature and critical pressure of CO_2 is 31°C and 73 atmospheres respectively. Assuming CO_2 obeys vander Waal's equation compute the critical volume of CO_2 and estimate the diameter of CO_2 molecule. ($R = 82.07 \text{ cm}^3 \text{ atm K}^{-1}$) 3

4[a] Assuming Maxwell-Boltzmann distribution for molecular speed, show that the most probable speed is given by $\sqrt{2kT/m}$. 2 ½

[b] For oxygen molecules at N.T.P. calculate (i) root-mean-square speed (ii) average speed and (iii) most probable speed.

$$(k = 1.38 \times 10^{-23} \text{ J/K}) \quad 1 \frac{1}{2}$$

Atomic masses

$$n = 1.008665 u$$

$$^1\text{H} = 1.007825 u$$

$$^2\text{H} = 2.014102 u$$

$$^3\text{H} = 3.016050 u$$

$$^4\text{He} = 4.002603 u$$

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SECOND SEMESTER

B.E. (ME)

MID SEMESTER EXAMINATION **MARCH** 2005

ME-114 ENGINEERING MATERIALS

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Answer **ALL** questions.

Use separate answer sheets for both the parts.

For Air C_p 1.005 KJ/kg-K, $\gamma = 1.4$.

Assume missing data suitably, if any.

PART-A

- 1[a] Write the chemical reactions involved in lime soda process of water softening. 3
- [b] How scales are formed in the boiler? What are its disadvantages? 3
- [c] What are the requisites of good refractory? 2
- [d] How refractories are classified? 2

OR

- [a] Describe the ion exchange process for demineralization of water. 5
- [b] What is refractoriness? How it is determined? 3
- [c] Calculate the temporary & permanent hardness of water sample having following analysis: 2
- $Ca(HCO_3)_2 = 40 \text{ ppm}$ $MgCl_2 = 85 \text{ ppm}$
- $CaSO_4 = 136 \text{ ppm}$ $Mg(HCO_3)_2 = 73 \text{ ppm}$

PART-B

- 1[a] A pressure vessel of 0.45 m^3 volume contains an electric heating coil and is thermally insulated. The vessel is equipped with a release valve which allows gas to escape when the pressure in the vessel reaches 4 bar. The pressure vessel is filled with Nitrogen at a pressure of 1.35 bar and temperature of 15°C and

the gas is then heated until the temperature in the vessel is 160°C . Find the heat transfer

- (i) upto the time when release valve opens
- (ii) after this time

for Nitrogen $C_p = 1.045 \text{ KJ/kg-K}$, $\gamma = 1.4$

3

- [b] Air at 80 KPa and 127°C enters an adiabatic diffuser steadily at a rate of 6000 kg/hr and leaves at 100 KPa. The velocity of air stream is decreased from 230 to 30 m/s as it passes through the diffuser. Find

- (i) the exit temperature of the air
- (ii) the exit area of the diffuser

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- 2[a] A heat driven refrigeration system absorbs heat from low temperature T_E and rejects it to temperature T_C . This is being run by heat supplied from a high temperature source at a temperature of T_H such that $T_H > T_C > T_E$. Using first and second law of thermodynamics, derive the expression for maximum COP of refrigeration system in terms of temperatures.

3

- [b] Two insulated vessels A and B, each of 0.5 m^3 volume, are separated by a valve. Vessel A contains air at 8.5 bar and 25°C while B contains air at 3 bar and 45°C . Find temperature, pressure and change in entropy of the system when the valve is opened and equilibrium is attained after mixing.

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