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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

$$n = 1.008665 u$$

$$^1H = 1.007825 u$$

$$^2H = 2.014102 u$$

$$^3H = 3.016050 u$$

$$^4He = 4.002603 u$$

SECOND SEMESTER**B.E. (PE)****MID SEMESTER EXAMINATION MARCH 2005****PE-114 ENGINEERING MATERIALS AND METALLURGY***Time: 1 Hour 30 Minutes**Max. Marks : 20***Note :** Answer **ALL** questions.

Use separate answer sheets for Part A and Part B.

PART-A

- 1 Explain the difference between a unit cell and a single crystal. What is strain hardening and what effects does it have on metals. What is a slip system and its significance? Calculate the linear density of atoms along the [111] direction in BCC tungsten (atomic radius 0.137 nm). Define Miller indices. (5)
- 2 Define fatigue fracture and write the factors and processes that reduce fatigue strength. How creep rupture data helps design engineers to select materials at high temperatures? Write at least five situations where creep is especially important. Discuss the importance of ductile-brittle transition temperature (DBTT). Show will fig. variation in DBTT with alloy composition vis-a vis M_n steels with various M_n levels. (5)

PART-B

- 1[a] Discuss the following properties of refractories :
(i) Thermal spalling (ii) Refractoriness (4)
- [b] Describe Thin film or Boundary lubrication mechanism. (3)
- [c] What are abrasives? How are they classified? Give the preparation of silicon carbide abrasives. (3)
- OR**
- 1[a] Discuss moulding techniques for manufacturing refractories. (3)
- [b] Write any two important functions of lubricants. (2)
- [c] Explain Extreme pressure lubrication mechanism. (3)
- [d] Write a note on soft abrasives. (2)

