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Roll No. ....

**SECOND SEMESTER**

**B.E. (ME/PE)**

**MID SEM EXAMINATION**

**March 2007**

**ME/PE-111 ENGINEERING ECONOMICS &  
ACCOUNTANCY**

*Time: 1 Hour 30 Minutes*

*Max. Marks : 20*

**Note :** Answer **ALL** questions.

Assume suitable missing data, if any.

- 1 Fill up the blanks:
  - [a] Sand near river is a .....commodity.
  - [b] Land gets.....for its contribution in production.
  - [c] In....., there is only one producer.
  - [d] Cost of producing additional unit is called as.....cost.
  - [e] Journal and ledger refer to.....document in double entry system of book keeping.
  - [f] Reserve bank of India is.....bank. 3
- 2 Differentiate between
  - [a] Monopolistic completion and Perfect competition
  - [b] Price elasticity of demand and Cross elasticity of demand.
  - [c] Tax and Subsidy 9
- 3 Discuss credit creation by bank. 2
- 4 What do you mean by accountancy? 2
- 5 What is production function? 2
- 6 What is inflation? 2

## SECOND SEMESTER

## B.E. (ME/PE)

## MID SEM EXAMINATION

March

2007

## ME/PE-112 MATHEMATICS-II

Time: 1 Hour 30 Minutes

Max. Marks : 20

**Note :** Answer **ALL** questions, selecting any **TWO** parts from each question.

Assume suitable missing data, if any.

1[a] Verify Euler's theorem for the function

$$u = \sin^{-1} \frac{x}{y} + \tan^{-1} \frac{y}{x}$$

[b] If  $u = u\left(\frac{y-x}{xy}, \frac{z-x}{xz}\right)$ , show that

$$x^2 \frac{\partial u}{\partial x} + y^2 \frac{\partial u}{\partial y} + z^2 \frac{\partial u}{\partial z} = 0$$

[c] Obtain Taylor's series of the function  $f(x, y) = \tan^{-1}\left(\frac{y}{x}\right)$  in powers of  $(x-1)$  and  $(y-1)$  upto second degree terms. Also, compute  $f(1.1, 0.9)$  approximately upto three places of decimal.

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2[a] The radius of the base and the altitude of a can in the shape of a right circular cone are measured correct to 1%. Find the maximum possible percentage error in the volume of the cone.

[b] Evaluate  $\iint_R y^2 dx dy$ , where  $R$  is the area outside the circle  $x^2 + y^2 = ax$  and inside the circle  $x^2 + y^2 = 2ax$

[c] Evaluate

$$\int_0^{2a} \int_{x^2/4a}^{3a-x} (x^2 + y^2) dy dx$$

by changing the order of integration.

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3[a] Find the stationary values of  $x^2 + y^2 + z^2$  subject to  $ax^2 + by^2 + cz^2 = 1$  and  $lx + my + nz = 0$ .

[b] Evaluate  $\iiint \frac{dx dy dz}{\sqrt{1-x^2-y^2-z^2}}$ , the integral being extended to the positive octant of the sphere  $x^2 + y^2 + z^2 = 1$ .

[c] Find the volume under the plane  $z = x+y$  and above the area cut from the first quadrant of the ellipse  $4x^2 + 9y^2 = 36$ .

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**SECOND SEMESTER**

**B.E. (ME/PE)**

**MID SEM EXAMINATION**

**March**

**2007**

**ME/PE-113 PHYSICS-II**

**Time: 1 Hour 30 Minutes**

**Max. Marks : 20**

**Note : Answer ALL questions.**

**Assume suitable missing data, if any.**

- 1 (i) Both  $U^{235}$  and  $Pu^{239}$  are fissionable elements but  $Pu^{239}$  is preferred in nuclear reactors. Why? 1
- (ii) When fission occurs, several neutrons are released and the fission fragments are beta-radioactive. Why? 1
- (iii) Why do nuclei tend to have more neutrons than protons at high mass numbers. 1
- (iv) Calculate the minimum energy (in MeV) of a photon that will break the nucleus  ${}^7_3Li$  into an  $\alpha$ -particle and a triton. 1
- 2[a] Use the semiempirical binding energy formula to calculate the binding energy of  ${}^{64}_{30}Zn$ . What is the percentage discrepancy between this figure and the actual binding energy (given :  $a_v = 14.1 \text{ MeV}$ ,  $a_s = 13.0 \text{ MeV}$ ,  $a_c = 0.595 \text{ MeV}$ ,  $a_a = 19.0 \text{ MeV}$ ,  $a_p = 33.5 \text{ MeV}$ ) 2
- [b] A cyclotron in which the magnetic flux density is 3 weber/m<sup>2</sup> and whose dees radius is 0.5 m, is used to accelerate (i) protons (ii)  $\alpha$ -particles. What must be the frequency of the p.d. applied across the dees in each case? Also calculate the maximum kinetic energy of the emerging particles. The mass of a proton is  $1.67 \times 10^{-27} \text{ kg}$  and the charge on it is  $1.6 \times 10^{-19} \text{ C}$ . 2
- [c] Explain the terms : (i) stimulated emission (ii) Metastable states (iii) population inversion (iv) pumping 2
- 3[a] State Gauss's law and establish its differential form. Show that  $\text{curl } \vec{E} = 0$  and explain its physical meaning. 3

- [b] Suppose that the electric field in a region is  $\vec{E} = kr^3\hat{r}$ , in spherical coordinates ( k is constant) (i) find charge density  $\rho$  (ii) find the total charge in a sphere of radius R, centered at the origin. 2

- 4[a] Define the three electric vectors  $\vec{D}$ ,  $\vec{E}$ , and  $\vec{P}$ . Obtain the relation between these three electric vectors. 3

- [b] What is coefficient of self inductance. Find the self inductance of a toroidal coil with rectangular cross section (inner radius a, outer radius b, height h), which carries a total of N turns. 2

Atomic masses:

$$n = 1.008665 \text{ u}$$

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

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

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

$$^7\text{Li} = 7.016004 \text{ u}$$

$$^{64}\text{Zn} = 63.929 \text{ u}$$

**SECOND SEMESTER****B.E. (PE)****MID SEM EXAMINATION****March 2007****PE-114 ENGINEERING MATERIAL AND METALLURGY****Time: 1 Hour 30 Minutes****Max. Marks : 20**

**Note :** Answer **ALL** questions from Part-A.  
 Answer Q.1 and any **ONE** from rest of Part-B.  
 Use separate answer sheets for Part-A and B.  
 Assume suitable missing data, if any.

**Part-A**

- 1 Show for the BCC crystal structure that the unit cell edge length 'a' and the atomic radius R are related through  $a = 4R/\sqrt{3}$ , copper has a FCC structure and an atomic radius of 0.1278 nm. The mass of Cu atom is  $1.055 \times 10^{-25}$  g. Calculate the density. Describe the difference between elastic and plastic deformation and show with fig. effect of cold plastic deformation on mechanical property. Why do bcc metals tend to have high strengths. **5**

- 2 Define slip system and prove that

$$T = \frac{\sigma}{2} \sin 2\theta$$

where T = Shear stress

$\sigma$  = Tensile stress

What is mechanical twinning? Define fatigue life and explain how is it correlated to crack initiation and propagation. Explain primary secondary and tertiary creep. Name some metals which are resistant to creep and draw stress vs rupture life time diagram. **5**

**Part-B**

- 1[a] What are the requisites of good refractories. **2**  
 [b] Name the types of dryers used for drying formed shapes during manufacture of refractories. **1**  
 [c] Write a brief note on soft abrasives. **2**
- 2[a] Explain the following properties of refractories: **3**  
 (i) Thermal spalling  
 (ii) Thermal conductivity  
 [b] Give a Moho's scale of hardness. **2**
- 3[a] State the uses of refractories. **1**  
 [b] Write a short note on following abrasives:  
 (i) Corundum  
 (ii) Silicon carbide **4**