

Total No. of Pages 1

Roll No.

SECOND SEMESTER

B.E. (ME/PE)

MID SEM EXAMINATION

March.

2006

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 in the blanks :
 - [a] Fixed cost per unit increases when production volume.....
 - [b] Financial and cost accounting are written up with.....basic documents.
 - [c] If value of export of any country is.....then value of import, than the country has adverse balance of payment.
 - [d] Price elasticity of demand for cocacola is.....than one.
 - [e] Tea and coffee aregoods.
 - [f] Sand near construction site is.....good. 3
- 2 Differentiate between following :
 - [a] Commercial bank and Central bank
 - [b] Perfect competition and Monopolistic competition.
 - [c] Fixed Cost and Variable cost 9
- 3 Why concept of Sunk Cost is not relevant for engineers? 2
- 4 What is the significance of Management Accounting? 2
- 5 What do you mean by Production Function? 2
- 6 What do you understand by the concept of Inflation? 2

Total No. of Pages 2

Roll No.

SECOND SEMESTER

B.E. (ME/PE)

MID SEM EXAMINATION

March

2006

ME/PE-112 MATHEMATICS-II

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Question No. 1 is compulsory.
Answer any **TWO** from the remaining questions.
Assume suitable missing data, if any.

1[a] Find the value of n so that the equation $V = r^n (3 \cos^2 \theta - 1)$ satisfies the relation

$$\frac{\partial}{\partial r} \left(r^2 \frac{\partial V}{\partial r} \right) + \frac{1}{\sin \theta} \frac{\partial}{\partial \theta} \left(\sin \theta \frac{\partial V}{\partial \theta} \right) = 0 \quad 3$$

[b] If $ax^2 + by^2 + cz^2 = 1$ and $lx + my + mz = 0$, find $\frac{dy}{dx}$ and $\frac{dz}{dx}$ by using partial derivatives. 3

2[a] Find the points on the surface $z^2 = xy + 1$ nearest to origin. 3½

[b] Evaluate $\iint \frac{r dr d\theta}{\sqrt{a^2 + r^2}}$ over one loop of the lemniscate $r^2 = a^2 \cos 2\theta$ 3½

3[a] Change the order of integration and evaluate it

$$\int_0^{a/\sqrt{2}} \int_y^{\sqrt{a^2 - y^2}} \log(x^2 + y^2) dx dy, (a > 0) \quad 3½$$

[b] Evaluate $\iiint z(x^2 + y^2 + z^2) dx dy dz$ through the volume of cylinder $x^2 + y^2 = a^2$ intercepted by the planes $z = 0$ and $z = h$. 3½

4[a] Find the dimensions of the rectangular box, open at top, of maximum capacity where surface is 432 sq.cm. 3½

[b] Find the volume of the solid surrounded by the surface

$$\left(\frac{x}{a}\right)^{2/3} + \left(\frac{y}{6}\right)^{2/3} + \left(\frac{z}{c}\right)^{2/3} = 1 \quad \text{3½}$$

Total No. of Pages 2

Roll No.

SECOND SEMESTER

B.E. (ME/PE)

MID SEM EXAMINATION

March 2006

ME/PE-113 PHYSICS-II

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Answer ALL questions.

Assume suitable missing data, if any.

- 1[a] What are hadrons? Write the Quark structures of nucleons. 1
- [b] In the meson theory of nuclear forces, neutrons and protons are never found with masses other than their usual masses. Why? 1
- [c] Why are accelerators required in nuclear physics. 1
- [d] How does β -spectrum differ from α -spectrum. Give the reason for the difference. 1
- 2[a] Explain the principle of Breeder Reactor. Why are these reactors so important in India's perspective? $1\frac{1}{2}$
- [b] For the d-t fusion reaction ${}^3_1\text{H} (d, n) {}^4_2\text{He}$, Calculate (i) the Q-value of the reaction (ii) the rate at which deuterium and tritium are consumed to produce 1MW. (Assume all energy from the fusion reaction is available). 2
- [c] What is a laser? Explain the terms: (i) Absorption (ii) spontaneous emission (iii) Stimulated emission. Give the expressions for Einstein's transition probabilities for above three transitions. $\frac{1}{2} + 1\frac{1}{2} + \frac{1}{2}$
- 3[a] Write the expression for Maxwell-Boltzmann speed distribution for the molecules of an ideal gas. Hence obtain

the expression for Maxwell-Boltzmann energy distribution and also plot it. 3

[b] Obtain the expressions for most probable energy and most probable speed of an ideal gas molecule. 3

[c] What is Joule-Thomson effect? Obtain an expression for temperature of inversion. Calculate the inversion temp of nitrogen for which van-der-waals constants are: $a = 1.390 \text{ atm. lit}^2 \text{ mol}^{-2}$ and $b = 0.0391 \text{ lit mol}^{-1}$ ($R = 0.0821 \text{ atm lit mol}^{-1} \text{ K}^{-1}$). 1+1+1

[d] Calculate the temperature in Kelvin, at which the average speed of H_2 molecules will be same as that of N_2 molecules at 35°C . 1

Atomic masses:-

n : 1.008665 u

^1H : 1.007825 u

^2H : 2.014102 u

^3H : 3.016050 u

^4He : 4.002603 u

Total No. of Pages 2

Roll No.

SECOND SEMESTER

B.E. (ME)

MID SEM EXAMINATION

March

2006

ME-114 ENGINEERING MATERIALS & THERMODYNAMICS

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Answer any **TWO** questions from **PART-A**.
Attempt both questions from **PART B**.
Use separate answer sheets for **PART-A &B**.
Assume suitable missing data, if any.
For air $C_p = 1.005 \text{ KJ/kg-K}$, $\gamma = 1.4$

PART-A

- 1[a] Describe batch lime soda process for softening of water. 3
- [b] What are refractories? How are they classified? 2
- 2[a] What is thermal spalling? How it can be minimized? 2
- [b] Explain why:
- (i) Boiler feed water should not contain excess sodium carbonate. 3
- (ii) Water containing large quantities of Fe^{2+} Mn^{2+} should not be softened by zeolite method. 3
- 3[a] Calculate the amount of lime and soda required for softening 1 lakh liters of water having following analysis:
- | | |
|----------------------------|----------------------------|
| $MgCl_2 - 95 \text{ ppm}$ | $CaSO_4 - 272 \text{ ppm}$ |
| $MgSO_4 - 120 \text{ ppm}$ | $H_2SO_4 - 49 \text{ ppm}$ |
| $SiO_2 - 4 \text{ ppm}$ | |
- [b] Explain any two moulding methods in manufacturing of refractories. 2

PART-B

- 1[a] 3m^3 of hydrogen at a pressure of 105 Kpa and 25°C is compressed adiabatically to 460 Kpa. The same mass is then expanded isothermally to the original volume. Calculate the final pressure of the gas and also the quantity of heat from the beginning of compression to the end of expansion. Determine the amount of heat that must be added or subtracted to reduce the gas after expansion to the original state of pressure and volume.

For H_2 , $C_p = 14.277 \text{ KJ/kg-K}$ and $\gamma = 1.4$ 2½

- [b] Two reversible heat engines A and B are arranged in series. A rejecting heat directly to B. Engine A receives 200 kJ at a temperature of 421°C from a hot source, while engine B is in communication with a cold sink at a temperature of 4.4°C . If the work output of A is twice that of B, Find

- (i) the intermediate temperature between engine A & B
- (ii) the efficiency of each engine
- (iii) the heat rejected to the cold sink. 2½

- 2[a] An ideal gas is compressed isentropically from state a to state b. It is then heated reversibly at constant volume to state c. After expanding isentropically to state d such that $T_b = T_d$, the gas is again reversibly heated at constant pressure to state e such that $T_e = T_c$. Heat is then rejected reversibly from the gas at constant volume till it returns to state a.

Express T_a in terms of T_b and T_c . If $T_b = 555\text{K}$ and $T_c = 835\text{K}$, estimate T_a , take $\gamma = 1.4$. 3 ½

- [b] A mass of 50 kg/min enter an open system at 2 bar and 100°C and an elevation of 100m above the datum. The same mass leaves the open system at 150m elevation with a pressure of 10 bar and a temperature of 300°C . The entrance velocity is 2400m/min and the exit velocity is 1200m/min. During the process, 50 MJ/hr heat is transferred to the open system and rise in enthalpy is 8 kJ/kg. Find out the power developed. 1½