**The Open University of Sri Lanka**
**B.Sc. /B.Ed. Degree Programme**
**Final Examination - 2011/2012**
**Applied Mathematics – Level 04**
**AMU2183/AME4183- Mathematical Modelling III**

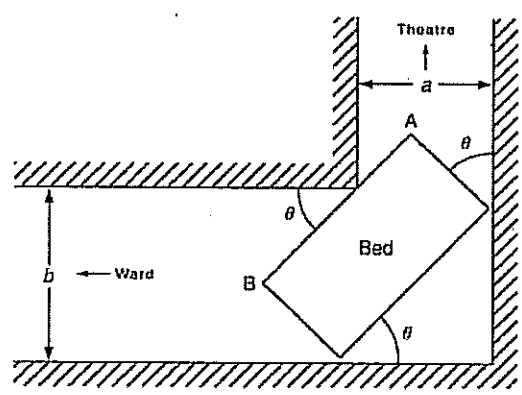
**Duration: Two hours**

**Date : 17.01.2012** **Time: 9.30a.m. -11.30a.m.**

**Answer Four Questions Only**

01. A super market having a stock clearance promotion for its two products A and B. There are a total of 70 of these two products. The super market gives away free shampoo packets and dishwashing liquid packets to customers who buy product A or B. Unfortunately the stocks are limited. If a customer purchases product A, he will get one shampoo packet less and 2 dishwashing liquid packets more than if he had purchased product B. The difference between the total number of dishwashing liquid packets and shampoo packets is 20. The number of shampoo packets and dishwashing liquid packets received by a customer who purchases product A is 6. Find out how many each of products was available in the supermarket and how the free products were distributed.

02. In a hospital, corridor has a right angle bend and the widths of the corridors are $a$ and $b$ as given in the figure. Beds have to be wheeled along this corridor, negotiating the right angle bend. If a bed is pushed along the corridor from the ward to the operating theatre by hospital staff at a fair speed without inconveniencing the patient, find out the maximum width of a bed that can pass round a corner.




Figure

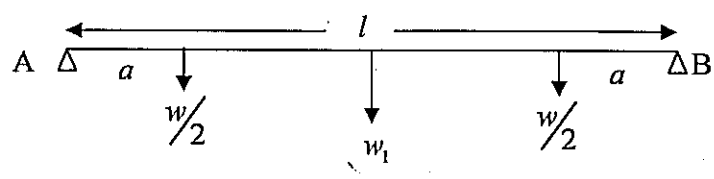
03. A sample of a radioactive isotope of radium losses half of its radioactive nuclei every 1500years. Assume that rate of radioactive nuclei decay is proportional to the number of nuclei which are present in the sample.

(i) Write a formula to find the amount of radioactive nuclei at a given time.

(ii) Using the formula derived in (i) find the time that the sample of radioactive nuclei will remain 85% of the original radioactive nuclei.

(iii) Find the percentage of the sample of radioactive isotope of radium in 100 years from now.

04. What are the assumptions made in the derivation of the formula $\left(k\frac{d^2y}{dx^2}=-M\right)$, bending of beam, where $k$ is the flexural rigidity of the beam.




AB is a uniform beam with weight $w_1$ loaded as shown in above figure.

Find the maximum deflection of the beam.

05. A person is interested in depositing Rs.500 in the bank and installment basis at the end of each month for 5 years. He also wants to make an initial deposit of Rs. 50,000.
Bank offered him two schemes.

- 15% yearly interest compounded monthly for installments and the same yearly interest compounded yearly for the initial deposit
- 2.5% monthly interest compounded monthly for the installments and the initial deposit as well.

Determine which scheme will give higher returned at the end of the 5 years of period?

06. (a) A person has taken a loan of Rs.250, 000 from a bank 25 years ago at an interest rate of 15% compounded monthly which has to be paid over a period of 30 years.

(i) What is his monthly equal payment?

(ii) How much money has he paid so far in order to settle this loan entirely?

(b) A bank advertises that the interest is compounded continuously at the rate of 10% annually. If Rs. 150,000 is invested on the first day of the year,

(i) What is the effective yearly interest rate?

(ii) How long will it take an investment to double?