The Open University of Sri Lanka
B.Sc / B.Ed Degree Programme /Continuing Education Programme
Final Examination 2006/2007
AMU 2183/AMU 4183-Mathematical Modeling III
Level – 04 – Applied Mathematics

040

Duration: Two and half hours

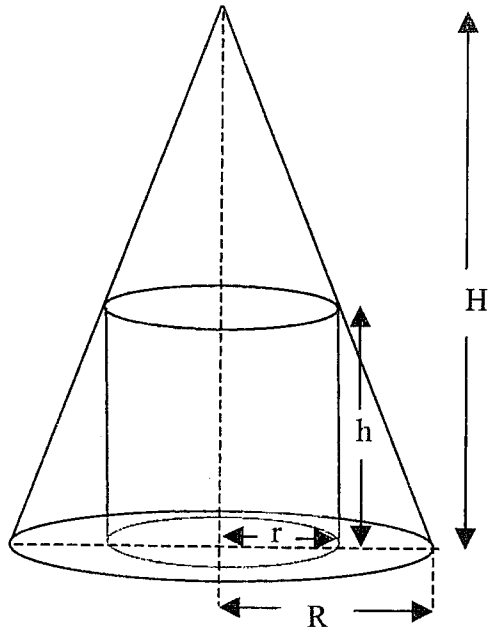
Date:17.11.2006	Time:9.30a.m-12.00noon

ANSWER **FOUR** QUESTIONS ONLY

(01) Imagine that there are 22 hostellers in your hostel including you and a cook. The hostellers themselves have weekly food committees, where the food committee is responsible for the supply of all food items during a period of one week. The purchases are determined by the food committee and made with funds provided by the 21 hostellers. While the cook gets free food and lodging. Suppose it is your turn to buy canned fish and a can of variety A costs Rs 21/=, While a can of variety B costs Rs 31/= your food committee gives you Rs 651/= with instructions that you should spend as much as possible and buy canned fish of both varieties.

By using algebraic method or trial & error method, show that it is possible to make a purchase with a saving of one rupee.

(02) Find the dimensions of the right circular cylinder of greatest volume that can be inscribed in a right circular cone of radius R and height H.



The cone and cylinder of problem (02)

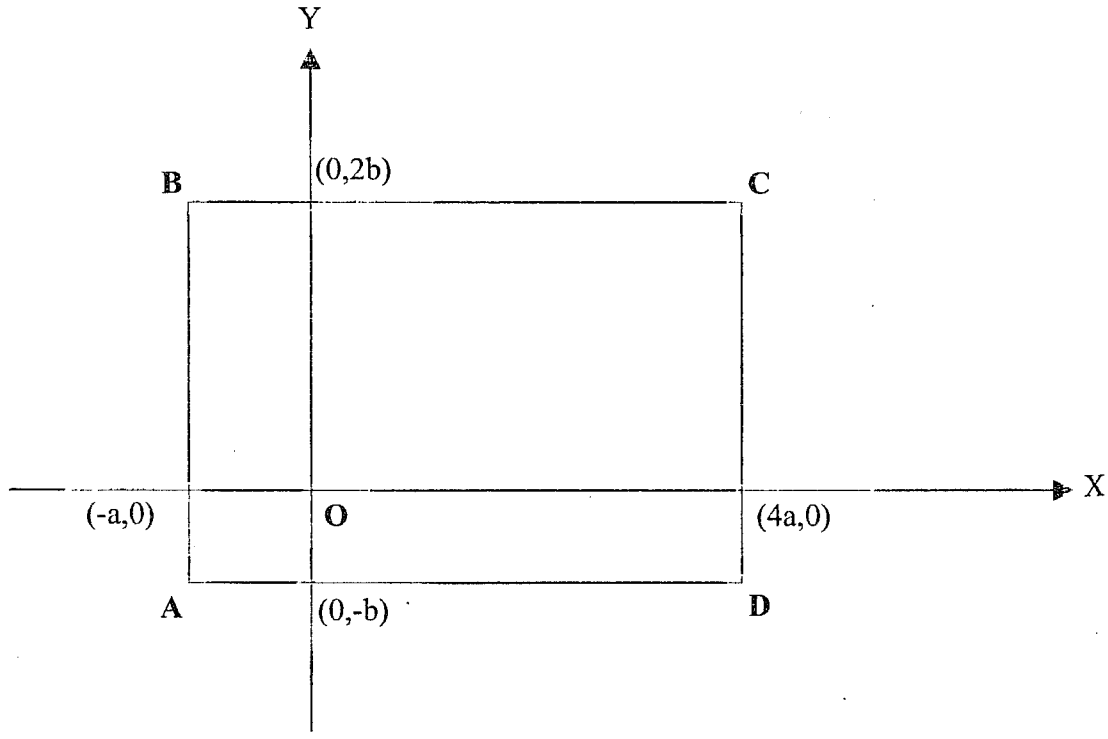
(03) What are the assumptions made in the derivation of the formula, given in the usual notation, $k\frac{d^2y}{dx^2}=-M$ for bending of beams?

A uniform beam of weight W_1 forms a horizontal bridge supported at its ends and a man of weight W_2 stands on it at a point distant *2l, n* from the ends. Show that the deflection under man's feet is,

$$\frac{W_1(4l^2+6nl+n^2)+16W_2nl}{12k(2l+n)}nl$$

Where, k is the flexural rigidity of the beam.

(04)



I) Find the co-ordinates of A, B, C and D.

II) If A B C D is rotated clockwise at an angle of 90° about the origin, find the new position of A, B, C & D.

(05) (a) In an Archeological wooden specimen only 30% of its original radio-carbon is 5568 years. If the radioactive decay is proportional to the amount of substance present, find the age of the specimen.

(b) The rate of change of temperature of a body is proportional to the difference between the temperature T of the body and temperature T_s of the surrounding medium.

A body where temperature T is initially 300°C is placed in a large block of Ice. Find its temperature after 180 seconds, if the temperature was 150°C after 120 seconds, what would be the temperature of the body after long time? Justify your answer.

(06) A person is interested in depositing money in the bank. So that at the end of six years he will have Rs.850, 000/=, in the bank. They offered him two schemes to make this scenario a possibility.

(a) Monthly installment of x rupees which will accumulate at a compound interest rate of 2.5% per month.

(b) A yearly installment of y rupees which will accumulate at a compound interest rate of 23% per year.

Find the values of x and y such that under scheme (a) and (b) the person's account will have Rs. 850,000 at the end of six years.