



The Open University of Sri Lanka
Faculty of Engineering Technology
Diploma/Degree in Industrial Studies (Agriculture)
Final Examination 2009/2010

AEZ3238 Mathematics for Agriculture

Date : 26.03.2010
Time : 1400-1700
Duration : Three (03) hours

Registration No: Index No.....

Instructions

1. This question paper consists of two sections.

SECTION 1

Contains FIFTEEN (15) questions. You are required to answer all questions. Answers should be written in the space provided for each question. No additional paper is provided. You may spend about **one hour** to answer this section.

SECTION 2

Contains SIX (06) essay type questions. You are required to answer **ONLY FOUR (04)** questions. You may spend about **two hours** to answer the questions in this section.

2. Read the questions carefully before answering.
3. It is **EXTREMELY IMPORTANT** that you do not remove the SECTION I of the question paper from the examination hall.

4. Please note that you should write your registration number in the space provided above. Do not write your name.
5. In case of doubt, please consult the supervisor or an invigilator conducting the examination.

SECTION I : Answer all questions.

1. Simplify the following algebraic expressions

$$(I) 3a + 2 [b + 2c] - [2b - c]$$

$$(II) 7x [y - \{ 2y - (x - y) \}]$$

2. Multiply the following expressions

$$(I) (2x + y) (3x - 2y)$$

$$(II) (2a - 3b) (4a^2 + 6ab + ab^2)$$

3. Find the division of the following and write the quotient and the remainder

$$(x^3 + 8x^2 - 3x + 8) / (x - 2)$$

4. Factorize

$$(I) 3tx - 2sx + 15ty - 10sy$$

$$(II) 2y^2 - 3y - 2$$

5. Solve the following equation

$$(x - 2)/4 + (x + 1)/3 = 1$$

6. Solve the following simultaneous equations

$$2x - 3y = 15$$

$$3x - 7y = 27.5$$

7. Solve the following quadratic equations

$$(I) 5t^2 = 12t$$

$$(II) (y - 1)/8 = 2/(y - 1)$$

8. Convert the following angels in degrees to radians

$$(I) 75^\circ$$

$$(II) 210^\circ$$

$$(III) 420^\circ$$

9. Convert the following angels measured in radians to degrees

(I) $4\pi/3$

(II) $\pi/24$

(III) 6

10. Prove the following identities

(I) $1/(\cot A + \tan A) = \sin A \cos A$

(II) $(1 - \tan A)/(1 + \tan A) = (\cot A - 1)/(\cot A + 1)$

11. Find the value of

(I) $\sin 75^\circ$

(II) $\cos 210^\circ$

12. Differentiate the following functions with respect to x

(I) $y = (4x^3 - 3 + x^2 - 2x)/x$

(II) $y = (x^2 - 1)(a - x^3)$

13. Differentiate with respect to x

$Y = (x^2 - 3)/(x + 1)$

14. Integrate the followings

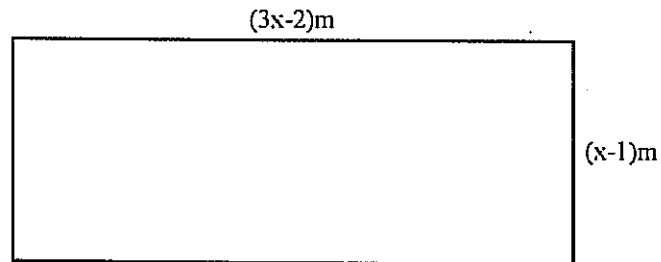
(I) $\int (2x^2 - (1/x^2) + x) dx$

(II) $\int \sin 2x dx$

15. Find the resultant of the following forces 8N and 6N acting at angle of 120°

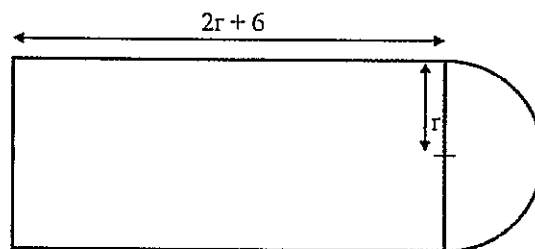
SECTION II: Answer any four questions.

- (1) (i) A rectangular shape land has length and breath, $3x - 2$ and $x + 1$ meters respectively. (See Figure)



- (a) Write an expression for the perimeter of the land in terms of x and simplify it.
- (b) If the perimeter of the land is 198m, find the value of x
- Hence find
- (c) The length and breath of the land
- (d) Area of the land
- (ii) A rectangular land has it width x meters and length 6m more than the width. If the area of the land is 1080m^2 .
- (a) Write an expression to find the area of the land in term of x .
- (b) Find the value of x and length and width in meters.

- (02) Consider the following shape of land.



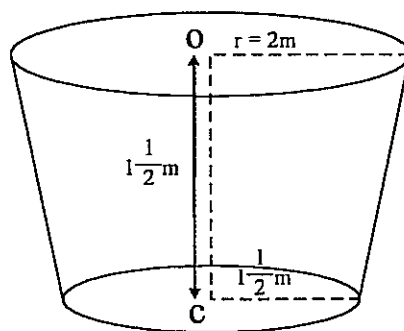
It consists with two parts, one with rectangular shape and other with semicircles shape which are attached together.

If the radius of the semicircle is ' r ' and the length of the rectangular shape land is 6 m more than it width.

- (i) Write an expression for the area of the rectangular shape of land in terms of 'r' and simplify.
- (ii) Write an expression for the area of the semicircular and in terms of 'r'
(take $\pi = \frac{22}{7}$)
- (iii) If the total land has an area of 375 m^2 , find the value of 'r'
- (iv) If the total land has an area of 375 m^2 , find the value of 'r'
- (b) Solve the following simultaneous equation
- $$\begin{aligned} 2x + y &= 12 \\ 3y - 2x &= 56 \end{aligned}$$
- (c) Given that $3h + 2x = 2f - gx$
Express x in terms of f, g and h
- (03) (a) if $\sin \alpha = \frac{4}{5}$ and $\cos \beta = \frac{7}{25}$

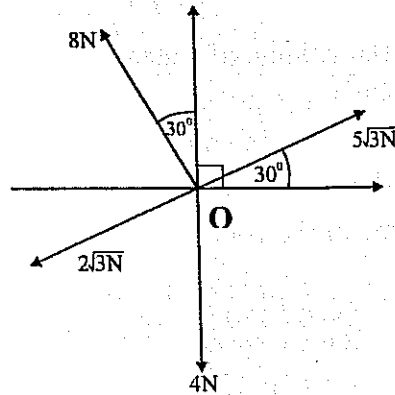
Find (i) $\sin(\alpha - \beta)$
 $\cos(\alpha + \beta)$

(b)



The above basket shape vessel use in Agriculture. It is made out of a hollow cone by cutting some part and join the bottom with circular laminar of radius $\frac{1}{2} \text{ m}$. If radius of the above circle is 2 m and height $OC = \frac{1}{2}$

- (5) (a) A set of forces acting on a point O is shown below

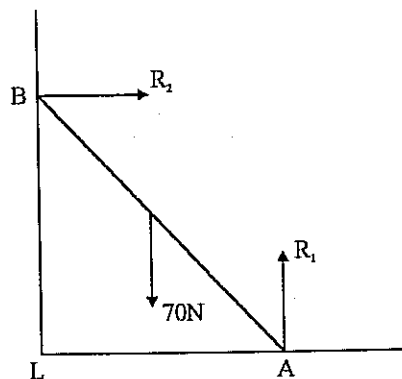


Resolve the above system and

- (i) Find the total Horizontal component.
 - (ii) Find the total vertical component.
 - (iii) Find the resultant of the above system of forces
 - (iv) The angle which resultant make with Horizon
- (b) A ladder **AB** of weight 70 N is kept on a rough ground and a smooth wall as shown below. The ground meets the wall at Point L.

$$AB = 2\text{m and}$$

$$AL = 1\text{m}$$

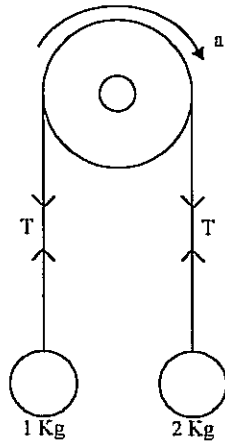


- (i) Find the perpendicular reaction forces R_1 and R_2 at points A and B
- (ii) What is the size of friction force acting at A and state which direction it acts.

6) (i) State Newton's 3 Laws of motion.

(ii) Prove the equation $F = ma$

(iii)



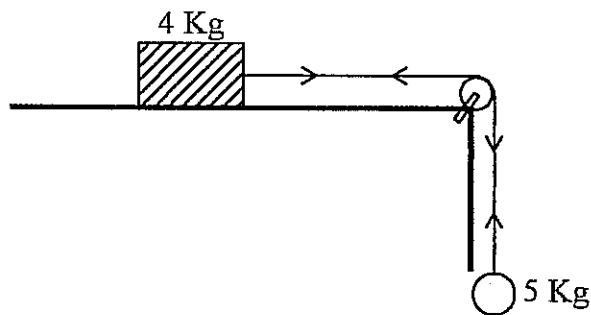
2 particles of mass 2 Kg and 1 Kg are hang around a smooth pully using an inelastic string as shown in figure.

Calculate the

(a) Common acceleration of the system

(b) Tension of the string.

(iv)



Two Objects of masses 5 Kg and 4 Kg are kept as show in figure using a smooth pulley attach to the table and a inelastic sting. If the system is released from rest.

What is the,

- (a) Common acceleration of the system?
- (b) Tension of the String?
- (c) If the 4Kg object has to move 2 m along the table to come to the edge, how long it will take to do so.