

UNIVERSITY OF COLOMBO, SRI LANKA

FACULTY OF ARTS

FIRST YEAR EXAMINATION IN ARTS (SEMESTER I) – 2015/2016

FND 1107 – BASIC MATHEMATICS

(Time: Two Hours)

Answer any five (05) questions

No. of questions: 07

No. of pages: 05

(Each question carries equal marks)

Calculators are not permitted

(i) Simplify and state whether each of the following is rational or irrational.

(a) $\left(3\frac{1}{2} - 1\frac{2}{3}\right) \div 12\frac{5}{6}$ (4 marks)

(b) $\frac{2\sqrt{18} \times 3\sqrt{21}}{6\sqrt{42}}$ (4 marks)

(c) $(\sqrt{64} + \sqrt{75}) - (8 + \sqrt{48})$ (4 marks)

(ii) Simplify.

(a) $\left(\frac{1}{64x^6}\right)^{\frac{1}{3}} \times \sqrt{\frac{16}{(x^{-4})^2}}$ (4 marks)

(b) $\sqrt[3]{\frac{27a^0b^2}{(a^3b)^{-1}}}$ (4 marks)

(Total : 20 marks)

02. (i) Simplify.

(a) $P = \left(\frac{a}{b} - \frac{b}{a}\right) \div \frac{(a^2 + 2ab + b^2)(a - b)}{2a^2b + 2ab^2}$ (5 marks)

(b) $Q = \left(p + \frac{1}{2}\right)^2 + (p + 2)^3$ (4 marks)

(ii) If $a = -7$, $b = -2$ and $c = 5$, find the value of $T = \frac{a^2 + b^2 - c^2}{(a + b + c)}$. (3 marks)

(iii) Make n as the subject of the following formulae.

$S = a + (n^2 - 1)d$ (4 marks)

(iv) Find the range of values of x satisfying the following inequality and represent your answer on the number line.

$\frac{1}{3}(18x - 1) \geq 5\left(x + \frac{2}{15}\right)$ (4 marks)

(Total : 20 marks)

03. (i) Find the value of K .

$\log_2(5K - 9) = 4$ (4 marks)

(ii) If $\lg 3 = 0.4771$ and $\lg 5 = 0.6990$, evaluate $J = \lg\left(\frac{27}{\sqrt[3]{125}}\right)$ (4 marks)

(iii) Simplify without using logarithmic tables.

(a) $M = \frac{\log_5 64}{\log_5 16}$ (4 marks)

(b) $N = \lg 6 - \frac{1}{2}\lg 81 + \lg 60 + 2\lg 5$ (4 marks)

(iv) Solve for x .

$\frac{1}{2}\log_5 9 + 2\log_5 x = 4\log_5 3 - \frac{1}{4}\log_5 81$ (4 marks)

(Total : 20 marks)

Solve for x .

$$\frac{1}{2} \times 32^{x+2} = 8^{x-1} \quad (5 \text{ marks})$$

$$\left| 5 - \frac{x}{2} \right| = 4 \quad (5 \text{ marks})$$

ii. Solve the following equation using the solution formulae.

$$3t^2 - 7t = -2 \quad (5 \text{ marks})$$

iii. Solve the following simultaneous equations.

$$m + 7n = 21 \quad (5 \text{ marks})$$

$$3m - 2n = 17$$

(Total : 20 marks)

1. Rs.8,000 will be divided between A and B in the ratio $7 : 5$ and between B and C in the ratio $2:3$. Find the amount obtainable by A , B and C . (3 marks)

2. 5 men working 7 hours a day can finish a piece of work in 15 days. Thus how many days will it take for 12 men working 8 hours a day to finish it? (2 marks)

3. A man's wage of labor is Rs.600 per day. If his wage will be increased to Rs.720 from next month, find the percentage of increase in the wage. (3 marks)

4. A person deposited Rs. 500 000 at 12% interest per annum as a fixed deposit in a certain bank company. Find the total amount to be collected at the end of 3 years,

(i) on simple interest basis (3 marks)

(ii) on compound interest basis with annual compounding (4 marks)

(iii) on compound interest basis with semi-annual compounding (5 marks)

(Total : 20 marks)

06.(i) A college of Education received 100 applications. Out of them 55 have applied for Mathematics and 41 for English.

18 have applied for Mathematics and English.

9 have applied for Mathematics and Information Technology.

10 have applied only for Information Technology.

5 have applied for all three subjects.

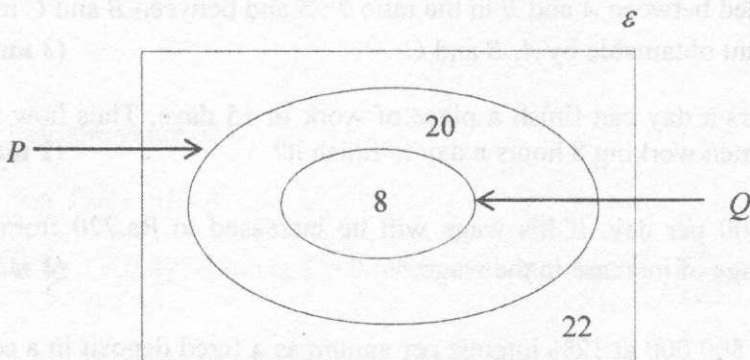
(a) Display above data in a Venn diagram. (4 marks)

(b) How many have applied only for Mathematics? (1 mark)

(c) If 35 have applied for Information technology, then how many have applied only for one subject? (2 marks)

(d) How many have applied for other subjects? (1 mark)

(ii) A Cardinality Venn diagram is given.



Find $n(P)$, $n(P \cap Q)$, $n(P \cap Q^c)$, $n[(P \cup Q)^c]$ and $n(\epsilon)$ (5 marks)

(iii) Verify that $n(A \cup B) = n(A) + n(B) - n(A \cap B)$ for the following sets A and B .

$$A = \{x; 1 \leq x < 20 \text{ and } x = k^2, k \in \mathbb{Z}\}$$

$$B = \{x; 1 < x \leq 20 \text{ and } x = 4k, k \in \mathbb{Z}\}$$

(Total: 20 marks)

X and Y are two events of a random experiment. If $P(X) = \frac{1}{5}$, $P(Y) = \frac{3}{5}$ and

$P(X \cap Y) = \frac{1}{10}$, evaluate the following probabilities.

(a) $P(X')$ (3 marks)

(b) $P(X \cup Y)$ (3 marks)

(a) $P(X \cup Z) = \frac{7}{10}$ and if X and Z are mutually exclusive events, then find $P(Z)$. (3 marks)

(b) If Y and Z are independent events, find $P(Y \cap Z)$. (2 marks)

In a random experiment, a biased coin and an unbiased coin were tossed. (The probability of having head of the biased coin is 0.8)

(a) Construct a probability tree diagram to represent this experiment. (3 marks)

(b) Find the probability of the following events:

$U = \{ \text{having both heads} \}$ (2 marks)

$V = \{ \text{having only one head} \}$ (2 marks)

$W = \{ \text{having at least one head} \}$ (2 marks)

(Total : 20 marks)

On Simple Interest, $A_n = P \left(1 + \frac{Rn}{100} \right)$

On Compound Interest, $C_n = P \left(1 + \frac{R}{100} \right)^n$

Principal

Rate of interest per period

Number of periods