UNIVERSITY OF COLOMBO, SRI LANKA

FACULTY OF ARTS

SECOND YEAR EXAMINATION IN ARTS (ONLINE), SEMESTER II - 2019/2020

GYG 2225 – MATHEMATICS

OPEN BOOK EXAMINATION

Instructions to Students:

- The question paper starts on page 2
- All written assessments must be **handwritten**. Handwriting must be **clear and readable**.
- Answers should be written on an **A4 size paper** (ruled/lined paper/or otherwise), using **a black ball point pen.**
- As is the case of an in-person examination, word processing or type setting of answers will not be permitted. This rule does not apply to any candidate who has been exempted by the University under applicable bylaws (e.g., due to visual impairment).
- The **index number must be written on the top right-hand side** of each page of the answer script. Do not write your name anywhere on the answer script.
- **Number the pages** of the answer script using the following format at the **bottom of the page**: E.g., if it consists of 5 pages 1/5, 2/5…etc.
- Use the **common front page** (provided on LMS) as the first page of the answer script. You may print, or hand write the front page which must be the first page of your assessment.
- The **total number of pages** should be indicated on the front page of the answer script.
- **Scan/take photos of the answer script and convert it to a single PDF file** in the order of the page numbers.
- The full page of the answer script must be properly covered in the scanned image, and the scanned image must be clear/readable.
- LMS does not permit individual pages to be uploaded separately.
- **The only acceptable file format is PDF. The PDF file should be named with your index number**, e.g. A 12345
- Uploading answer scripts as JPEG/JPG or any other form will not be permitted.
- Complete and upload the final version of the answer script to LMS **within the stipulated 24 hours.**
- Once the answer script has been uploaded to LMS, take **a screen shot of the full page** of the LMS with the word 'submitted', as an acknowledgement and keep with you.
- **If** there is an **unexpected technical issue** with the uploading of an answer script to LMS, you may send your answer script via email to exam2@arts.cmb.ac.lk within the stipulated 24-hour period.

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Duration: **24 hours** for completion and submission of answer scripts to LMS
The question paper consists of eight (8) questions. Answer **ALL** questions.

1. a. Solve the following simultaneous equations

(i) $\frac{x}{2} + \frac{y}{8} = 4$

$\frac{x}{3} - \frac{y}{2} = -2$ (4 marks)

(ii) $3x - 2y + z = 11$

$5x + 8y + 9z = 9$

$-7x + 6y + 4z = 17$ (6 marks)

b. Solve the following simultaneous equation using graphs.

$3x - 2y = 4$

$2x + 3y = 7$ (10 marks)

(Total Marks 20)

2. Solve the following quadratic equations using the given method.

a. Completing the square

(i) $2x^2 + 11x + 12 = 0$

(ii) $4x^2 - 5x - 9 = 0$ (5 marks)

b. Quadratic forumula

(i) $3x^2 - 8x - 3 = 0$

(ii) $2x^2 - 15x + 7 = 0$ (5 marks)

(Total Marks 10)

3. Calculate the following using P, Q, R and S matrices.

$$\mathbf{P} = \begin{pmatrix} 2 & 3 & -1 \end{pmatrix} \quad 1 \times 3$$

$$\mathbf{Q} = \begin{pmatrix} -2 & -1 \\ 4 & 0 \\ 3 & 2 \end{pmatrix} \quad 3 \times 2$$

$$\mathbf{R} = \begin{pmatrix} -3 & 0 \\ 2 & -1 \\ 1 & -2 \end{pmatrix} \quad 3 \times 2$$

$$\mathbf{S} = \begin{pmatrix} -1 & 0 & 2 \\ 3 & -2 & 1 \end{pmatrix} \quad 2 \times 3$$

a. P (3Q + R) (4 marks)

b. (Q – 2R) S (4 marks)

(Total Marks 8)

4. Solve the following system of simultaneous equations using 'Inverse Matrix Method'.

$$x + y - z = 4$$

$$x - 2y + 3z = -6$$

$$2x + 3y + z = 7$$ (12 marks)

(Total Marks 12)

5. a. The first term of an arithmetic series which consist of n terms is 119. When the last term is subtracted from the first term, the answer is 217. The sum of the series of n terms is 336. Find the number of terms, the last term and the sum of the first 17 terms of this series.

(5 marks)

b. When the fourth term is added to the fifth term of a Geometric series, the answer is 252. When the fifth term is subtracted from the fourth term, the answer is 180. Find the seventh term and the sum of the first 7 terms of this series.

(5 marks)

(Total Marks 10)

6. The horizontal distance between the two vertical lamp posts A and B of the same height is 163 meters. There is a 486 meters high vertical tower on the same plane in line with the two lamp posts. A string is drawn from the top of the lamp post A, by making an inclination angle of $52^0\,38'$, to the top of the tower. Another string is drawn from the top of the lamp post B, by making an inclination angle of $67^0\,16'$, to the top of the same tower. Calculate the following.

(Important : Ignore the length of the string which has taken to be tied.)

a. Height of a lamp post (4 marks)

b. Horizontal distances from the bottom of the lamp posts A and B to the bottom of the tower, separately.

(4 marks)

c. If a string is drawn from the bottom of the lamp post B to the top of the tower,

i. The length of that string and

ii. The depression angle of that string which makes with the top of the tower

(7 marks)

(Total Marks 15)

7. The internal angles of the hexagon ABCDEF are A = 126^0, B = 2x and C = E = x. In this, the angles AFD = x and CDF = 110^0. The length of sides DE = EF = 4 cm.

a. Find all the internal angles of the hexagon. (5 marks)

b. Calculate the circumference and the area of the escribed circle drawn to the triangle DEF by touching the side EF.

(10 marks)

(Total Marks 15)

8. a. Differentiate the following functions with respect to x.

i. $y = x^{2/3}$ (1 mark)

ii. $y = \frac{5}{x^{2/5}}$ (2 marks)

iii. $y = 2x^5 + 3x^4 - 6x^3 + 2x^2 - 7x + 3$ (2 marks)

b. Integrate the following functions with respect to x.

. i. $\int x^{1/5}\, dx$ (1 mark)

ii. $\int \frac{7}{x^{3/4}}\, dx$ (2 marks)

iii. $\int (10x^4 + 12x^3 - 9x^2 + 4x - 8)dx$ (2 marks)

(Total Marks 10)