University of Eswatini

Resit Examination, 2020/2021

BASS I

Title of Paper : Elementary Quantitative Technique I

Course Code : MAT101

Time Allowed : Three (3) Hours

Instructions

1. This paper consists of TWO sections.
   a. SECTION A(COMPULSORY): 40 MARKS
      Answer ALL QUESTIONS.
   b. SECTION B: 60 MARKS
      Answer ANY THREE questions.
      Submit solutions to ONLY THREE questions in Section B.
2. Each question in Section B is worth 20%.
3. Show all your working.
4. Special requirements: None

THIS PAPER SHOULD NOT BE OPENED UNTIL PERMISSION HAS BEEN GIVEN BY THE INVIGILATOR.

SECTION A: ANSWER ALL QUESTIONS

A1. (a) Use the Cramer's rule to solve

$$\begin{aligned} 5x - 7y &= 27 \\ 3x - 4y &= 16. \end{aligned}$$

[6]

(b) Find the determinant of the matrix

$$B = \begin{pmatrix} 4 & -2 & 1 \\ 0 & 5 & 3 \\ 1 & 0 & -1 \end{pmatrix}$$

[3]

(c) Simplify

$$\frac{48x^5b^{-4}}{5a^{-3}y^4} \div \frac{16x^{-4}b^3}{20a^3y^{-4}}$$

[3]

(d) Find the sum of the first 28 terms of $-8, 1, 10, \ldots$ [4]

(e) Use the binomial theorem to expand $\left(x + \frac{2}{x^2}\right)^4$. [5]

(f) Express as a single logarithm: $4\log\left(\frac{ab}{c}\right) + 3\log\left(\frac{bc}{a}\right)$ [3]

(g) Solve without using calculator: $3\log_{12} 2 + \log_{12} 3 + \log_{12} 6$. [3]

(h) Solve the simultaneous equation

$$\begin{aligned} 2m + n &= 5 \\ 3m - 11 &= 2n \end{aligned}$$

[4]

(i) Use synthetic division to find the quotient and remainder when $P(u) = u^4 - 13u^2 - 4$ is divided by $s(u) = u + 3$. [4]

(j) A water balloon is catapulted into the air so that its height h in meters after t seconds is $h = -4.9t^2 + 27t + 2.4$

i. How high is the balloon after 1 second?

ii. For how long is the balloon more than 30m high?

[5]

SECTION B: ANSWER ANY 3 QUESTIONS

B2. Given the matrices

$$A = \begin{pmatrix} 1 & -2 & 4 \\ -2 & 0 & 7 \\ 3 & 8 & -5 \end{pmatrix}$$

(a) Find the minors M_{ij} of the matrix A. [9]

(b) Using the minors, find the cofactor α_{ij}. [9]

(c) Hence find the determinant matrix. [2]

B3. (a) Use long division to find the quotient and remainder of

$$\frac{2x^5 - 7}{x - 1}$$

[5]

(b) Given that $(x + 3)$ is a factor of the cubic polynomial $P(x) = \alpha x^3 + 3x^2 + \beta x - 12$, and that dividing $P(x)$ by $(x + 1)$ leaves a remainder of -6, find the values of α and β. [5]

(c) Solve for x in the following equation

$$2^x + 2^{-x} = \frac{5}{2}.$$

[4]

(d) Without using calculator, use the laws of logarithms to evaluate

i. $3 \log_{0.1} 5 + \log_{0.1} 48 - \log_{0.1} 6$ [3]

ii. $\dfrac{\log_2 36 - \log_2 12}{\log_2 9}$ [3]

B4. (a) Find the value(s) of x such that the sequence $2x-5,\ x-4,\ 10-3x, \ldots$ is in geometrical progression. [4]

(b) If the sum of the $2nd$ and $3rd$ term of a geometric progression is 6, while the sum of the $3rd$ and $4th$ terms is -12. Find the first term . [6]

(c) Expand and simplify term by term $\left(x^2 + \frac{1}{2}y\right)^6$. [6]

(d) Use the binomial theorem to find the exact value $(2+\sqrt{3})^4$. [4]

B5. (a) Prove that

i. $\dfrac{1-2\cos^2 x}{\sin x \cos x} = \tan x - \cot x$ [5]

ii. $\dfrac{\sin\theta + \tan\theta}{\cot\theta + \csc\theta} = \sin\theta\tan\theta$ [5]

iii. $\dfrac{\tan x - \sin x}{\sin^3 x} = \dfrac{\sec x}{1+\cos x}$ [5]

(b) Find a particular solution of $\sin 2\theta + \cos\theta = 0$ in the interval $-\pi < \theta \leq \pi$. [5]

B6. (a) A computer bought for $E13,500$ depreciates at a rate of 9.5 percent per year. If its value is given by

$$V(t) = 13,500e^{-0.095t}$$

where t is its age in years, find its value after

i. 3years.

ii. 5years. [3,3]

(b) Find the undirected distance from the point $C(3,4)$ to the line $2x-y+5$. [4]

(c) Given the points $(-4,7)$ and $(3,2)$

i. Find the slope of the line passing through the points

ii. Use the slope to find the y-intercept

iii. Find the equation of a line passing through the points

[3,4,3]

END OF EXAMINATION