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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2022/2023**

COURSE NAME : ENGINEERING
TECHNOLOGY MATHEMATICS II

COURSE CODE : BDX 10502

PROGRAMME CODE : BDX

EXAMINATION DATE : JULY / AUGUST 2023

DURATION : 2 HOURS

INSTRUCTION : 1. ANSWER **FOUR (4)** FROM **FIVE (5)**
QUESTIONS **ONLY**

2. THIS FINAL EXAMINATION IS
CONDUCTED VIA **CLOSED BOOK**.

3. STUDENTS ARE **PROHIBITED** TO
CONSULT THEIR OWN MATERIAL OR
ANY EXTERNAL RESOURCES DURING
THE EXAMINATION CONDUCTED VIA
CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

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Q1 (a) Solve the system of linear equation below by Gauss-Seidel iteration method.

$$\begin{aligned} x_1 + 5x_2 &= 9 \\ 2x_2 + 9x_3 &= 6 \\ 8x_1 + 2x_2 + 2x_3 &= 9 \end{aligned}$$

(15 marks)

(b) Find and classify all the extreme points (if exist) for $f(x,y) = e^x \cos y$

(10 marks)

Q2 (a) Evaluate the Lagrange Interpolating Polynomial for data $f(0) = 1, f(2) = -1, f(4) = -1$ and $f(6) = 1$. Hence, evaluate $f(3), f(5)$ and $f(6.5)$, if applicable.

(15 marks)

(b) Use triple integrals to evaluate the volume of the solid G, if G is the solid within the cylinder $x^2 + y^2 = 1$ and bounded by the planes $y + z = 5$ and $z = 0$

(10 marks)

Q3 A periodic function $f(x)$ is defined by

$$f(x) = \begin{cases} 1, & -1 < x < 0 \\ 3, & 0 < x < 1 \end{cases}$$

and

$$f(x) = f(x+2)$$

a) Sketch the graph of the function over $-3 < x < 3$

(6 marks)

b) Solve the Fourier coefficients corresponding to the function.

(10 marks)

c) Solve the corresponding Fourier series.

(9 marks)

Q4 (a) Evaluate nodal displacements, stresses in each materials and the reaction forces as shown in **Figure Q4(a)**.

(15 marks)

(b) Evaluate the root of $x + \ln x = 0$ with $x_0 = 1$ by using Newton Raphson Method. Iterate until $|f(x_i)| < \epsilon = 0.005$.

(10 marks)

- Q5** (a) Determine the general solution of the following equation

$$\cot y \frac{dy}{dx} = \cot x$$

(10 marks)

- (b) Solve the following differential equation

$$x^2(1 - y) \frac{\partial y}{\partial x} = y^2(1 + x) = 0,$$

which satisfies the condition $y = 1$ when $x = 1$.

(15 marks)

-END OF QUESTION -

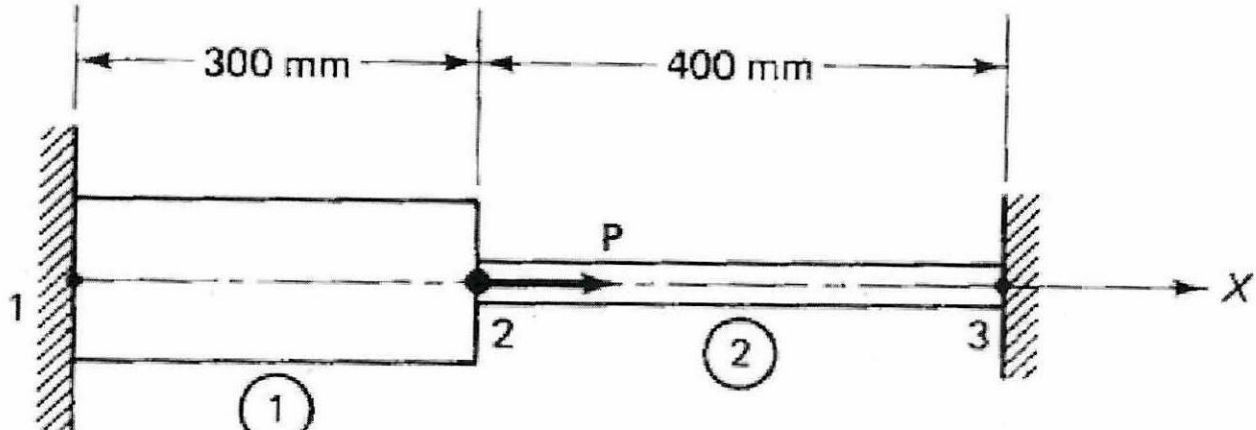
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FIGURE



Aluminum

Steel

$$A_1 = 2400 \text{ mm}^2$$

$$A_2 = 600 \text{ mm}^2$$

$$E_1 = 70 \times 10^9 \text{ N/m}^2$$

$$E_2 = 200 \times 10^9 \text{ N/m}^2$$

Figure Q4(a)

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