2nd SEM. 2019

15

UNIVERSITY OF ESWATINI

Re-Sit EXAMINATION PAPER
2019

PROGRAMME: BSC. ABE

COURSE CODE: ABE104

TITLE OF PAPER: ENGINEERING MATHEMATICS

TIME ALLOWED: TWO (2) HOURS

SPECIAL MATERIAL REQUIRED: CALCULATOR

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY TWO OTHER QUESTIONS.

DO NOT OPEN THIS PAPER UNTIL PERMISSION HAS BEEN GRANTED BY THE CHIEF INVIGILATOR

SECTION ONE: COMPULSORY

QUESTION ONE

(a) Evaluate the following expressions, giving your answer both in standard form and in engineering notation;

i) $1.431 \times 10^{-1} + 7.3 \times 10^{-1}$ (3 marks)

ii) $(4.5 \times 10^{-2})(3.0 \times 10^{3})$ (3 marks)

iii) $3.24 \times 10^{-3} - 1.11 \times 10^{-4}$ (3 marks)

iv) $\frac{(2.4 \times 10^{3})(3.0 \times 10^{-2})}{(4.8 \times 10^{4})}$ (4 marks)

b) Evaluate the following, correct to three (3) decimal places;

i) $(\frac{3.60}{1.92})^2 + (\frac{5.40}{2.45})^2$ (3 Marks)

ii) $\frac{15}{7.6^2 - 4.8^2}$ (3 Marks)

c) Remove the brackets where possible and simplify the following expressions;

i) $2a - [3\{2(4a - b) - 5(a + 2b)\} + 4a]$ (3 marks)

ii) $\frac{(x^2 y^{\frac{1}{2}})(\sqrt{x^3}\sqrt{y^2})}{(x^5 y^3)^{1/2}}$ (4 marks)

iii) $\frac{1}{3} - \left(\frac{2}{5} + \frac{1}{4}\right) \div (\frac{3}{8} \times \frac{1}{3})$ (4 marks)

d) The current I amperes in an AC circuit is given by $I = \frac{V}{\sqrt{R^2 + X^2}}$. Evaluate the resistance R when V = 250v, I = 12.77A, and X = 16.2. (5 marks)

e) Solve the following inequalities

i) $|3x + 1| < 4$ (3 marks)

ii) $\frac{2x+3}{x+2} \leq 1$ (2 marks)

SECTION II: ANSWER ANY TWO QUESTIONS

QUESTION TWO

(a) Divide the general expression $aX^3 + bX^2 + cX + d$ by $(X - p)$ (7 marks)

(b) Resolve $\frac{2X^2 - 9X - 5}{x^3 + 2x^2 - 5x - 6}$ into partial fractions. (7 Marks)

(c) Find the quadratic equation whose roots are 1/3 and -2. (6 marks)

(d) Solve the following equations

i) $X^2 - 6x + 9 = 0$ (4 marks)

ii) Solve the following simultaneous equations $3p = 2q$ and $4p + q + 11 = 0$ with a method of your choice. (6 marks)

QUESTION THREE

(a) The Sag S at the center of a wire is given by the formula $S = \sqrt{(\frac{3d(l-d)}{8})}$. Make l the subject of the formula and evaluate l when d = 1.75, and S = 0.80. (6 Marks)

(b) The extension X(m) of an aluminium tie bar of length L(m) and cross –sectional A(m^2) when carrying a load of F Newtons is given by the modulus of elasticity $E = \frac{F.L}{A.x}$. Find the extension of the tie bar (in mm) when $E = 70 \times 10^9$ N/m, $F = 20 \times 10^6$ N, $A = 0.1$ m^2 and L = 1.4 m. (6 Marks)

(c) Differentiate the following with respect to X;
$Y = \frac{2}{3}X^3 - \frac{4}{X^3} + 4\sqrt{X^5} + 7$ (8 Marks)

(d) Integrate the following equation $\int \left(4 + \frac{3}{7}X - 6X^2\right) dX$ (10 Marks)

QUESTION FOUR

(a) i)Using SURD form, evaluate $\frac{3\,Tan\,60^0 - 2\,Cos\,30^0}{Tan\,30^0}$ (4 Marks)

iii)Given a triangle ABC, find the length of the side BC given that B = 78°, AC = 22.31 mm and AB = 17.92 mm. Also find the Area of the triangle. (6 marks)

(b) Plot a graph of $Y = 2X^2$ between the values of $-3 < X < 3$ and hence solve the equation $2X^2 - 8 = 0$ and $2X^2 - X - 3 = 0$ (10 Marks)

(c) Use the Newton – Raphson method to determine the positive roots of the quadratic equation $5X^2 + 11X - 17 = 0$, correct to 3 significant figures. Check the value of the roots by using the quadratic formula. (10 Marks)