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UNIVERSITY OF SWAZILAND

RE-SIT EXAMINATION PAPER
2017

PROGRAMME: BSC. ABE

COURSE CODE: ABE 104

TITLE OF PAPER: ENGINEERING MATHEMATICS

TIME ALLOWED: TWO (2) HOURS

SPECIAL MATERIAL REQUIRED: CALCULATOR

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY TWO OTHER QUESTIONS.

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SECTION ONE: COMPULSORY

QUESTION ONE

a) Evaluate the following, each correct to 4 decimal places
   i) $73.84 - 113.247 + 8.21 - 0.068$ (2marks)
   ii) $1\frac{9}{16}$ (2marks)

b) Convert the following to a proper fraction
   i) 0.4375 (2marks)
   ii) 4.285 (2marks)

c) Evaluate the following
   i) $3\frac{2}{3} - 2\frac{1}{6}$ (4marks)
   ii) $\frac{1}{3} - \left(\frac{2}{5} + \frac{1}{4}\right) \div \left(\frac{3}{8} \times \frac{1}{3}\right)$ (6marks)

d) Determine the value of $\frac{7}{6}$ of $\left(3\frac{1}{2} - 2\frac{1}{4}\right) + 5\frac{1}{8} \div \frac{3}{16} - \frac{1}{2}$ (8marks)

e) When mixing a quantity of paints, dyes of four different colours are used in the ratio of $7:3:19:5$. If the mass of the first dye used is $3\frac{1}{2}$ g, determine the total mass of the dyes used. (6marks)

f) i) The impedance of an AC circuit is given by $Z = \sqrt{(R^2 + X^2)}$. Make the reactance X the subject. (4marks)
   ii) The volume V of a sphere is given by $V = \frac{2}{3}\pi r^3$. Find r in terms of V. (4marks)

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SECTION II: ANSWER ANY TWO QUESTIONS

QUESTION TWO

a) Determine the quadratic equation whose roots are 1/3 and -2. (10marks

b) Factorize the following equation using the factor theorem, $x^3 + 4x^2 + x - 6$. Hence solve the equation $x^3 + 4x^2 + x - 6 = 0$. (12marks)

c) Solve the following simultaneous equations and verify the results
$\frac{x}{5} + \frac{2y}{3} = \frac{49}{15}$ and $\frac{3x}{7} - \frac{y}{2} + \frac{5}{7} = 0$ (8marks)

QUESTION THREE

a) Convert the following equation into the sum of three partial
fractions, $\frac{2x^2 - 9x - 35}{(x+1)(x-2)(x+3)}$ (20marks)

b) The relationship between the temperature on a Fahrenheit scale and that on a Celcius scale is given by $F = \frac{9}{5}C + 32$. Express $113°F$ in degrees Celcius. (4 marks)

c) A rectangular laboratory has a length equal to one and a half times its width and a perimeter of 40 m. Find its length and width. (6marks)

QUESTION FOUR

a) Write the following expression $\log\left(\frac{16 \times \sqrt[4]{5}}{(\sqrt[4]{81})^3}\right)$
in terms of log 2, log 3, and log 5. (10marks)

b) Solve the equation $\log 2t^3 - \log t = \log 16 + \log t$ (8 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. (12marks)