QUESTION FIVE

(a) Examine the series: $\frac{1}{1\cdot 2} - \frac{1}{2\cdot 2^2} + \frac{1}{3\cdot 2^3} - \frac{1}{4\cdot 2^4} + \cdots$ for absolute or conditional convergence. **[6mks]**

(b) Solve the equations: $\frac{x}{y+1} + \frac{y}{x+1} = \frac{5}{3}$ and $x^3 + y^3 = 2$ **[10mks]**

(c) (i) Differentiate w.r.t. x the function: $y = (\sin 3x)^x$ **[3mks]**

(ii) If $x = 5\cot\theta$ and $y = 10\operatorname{cosec}\theta$, evaluate $\frac{dy}{dx}$ at $\theta = \frac{\pi}{6}$ **[5mks]**

QUESTION SIX

(a) Solve the equations: $\sqrt[3]{x} + \sqrt[3]{y} = 3$ and $x + y = 9$ **[8mks]**

(b) Solve the differential equation: $y' + y\sec x = \tan x$, given that $y(\pi) = \pi$ **[8mks]**

(c) If $c = a + b - d$ represents the solution to an inexact differential equation given as: $y(1 + xy)dx + x(1 + xy + x^2y^2)dy = 0$, obtain the values of the constants a, b and d, and hence an expression for c. **[8mks]**

QUESTION SEVEN

(a) Solve the equations: $x^2 + 5y^2 = 21x$ and $x^2 + 2xy + y^2 = 11x$ **[8mks]**

(b) Obtain the solution of the differential equation: $y' + y\tan x = y^3\sec^4 x$ **[8mks]**

(c) Given that $y(0) = 1$, obtain the solution of the differential equation:

$(x^2 + 1)dy = (y^2 + 1)dx$ **[8mks]**

GOOD LUCK TO U ALL!!

$\left(x^2 + \frac{1}{x^2}\right) + 2$ $\left(x + \frac{1}{x}\right)$ $x^2 + \frac{1}{x^2} + 2$

$) - 2$

FEDERAL UNIVERSITY OYE-EKITI

ELECTRICAL & ELECTRONICS ENGINEERING

FIRST SEMESTER TEST

ENGINEERING MATHEMATICS I [ENG 201]

INSTRUCTION: Answer **All** the questions. *Clarity of work shall attract bonus marks!!!*

UNITS: 3 *Time Allowed*: 2 Hours

[2015/2016 ACADEMIC SESSION]

Date: 5th March, 2016.

$\frac{5}{15} = \frac{1}{15-3} + \frac{4}{15+1} - 2$

QUESTION 1 [20mks]

(a) Solve the differential equation: $(x^2 + 1)y' - y^2 - 1 = 0$; $y(0) = 1$ [10mks]

(b) Solve the equations: $x^2 - yz = 3$; $y^2 - xz = 5$; $z^2 - xy = -1$. [10mks]

QUESTION 2 [20mks]

(a) Examine the series: $\frac{1}{2} - \frac{4}{2^3+1} + \frac{9}{3^3+1} - \frac{16}{4^3+1} + \dots$ for absolute or conditional convergence. [10mks]

$-2x + 2y = x - 2$

$2 = x + 2x - 2y$

(b) Solve the equation: $(x^2 - 5)^2 = 2(x^2 - 2x + 5)$ [10mks]

$2 = 3x - 2y$

$2(x^2-5)\cdot 2x = 4x - 4$

QUESTION 3 [20mks]

(a) ~~Solve the equations: $u(v + w) = p$,~~ $v(w + u) = q$, $w(u + v) = r$. [10mks]

(b) If p, q, and r are the sides of a triangle PQR with semi-perimeter S, show that the roots are real, and that the solution can be expressed in the form:

$$u\cot\frac{1}{2}P = v\cot\frac{1}{2}Q = w\cot\frac{1}{2}R = \pm\sqrt{S}.\ \text{[10mks]}$$

$fQ = 1$

QUESTION 4 [20mks]

(a) An electric circuit consists of an 8 Ω resistor in series with an inductor of 0.5H, and a battery of E volts. At $t = 0$, the current $I = 0$. Using mathematical modelling, determine the current I at any time $t > 0$, and the maximum current if $E = 32e^{-8t}$

[10mks]

(b) Solve the equation: $x^2 + \frac{1}{x^2} + 7x - \frac{7}{x} = \frac{59}{4}$ [10mks]

$x^2 + 7x - \frac{59}{4} - \frac{7}{x} + \frac{1}{x^2} = 0$

QUESTION 5 [20mks]

(a) Evaluate $\int sin^{-1}xdx$ [10mks]

(b) Consider the differential equation: $xy' - y = x^3 \cos x$. Determine its exactness or otherwise, and hence find the solution of the equation, given that $y(\pi) = 0$. [10mks]

GOOD LUCK TO U ALL!!

Course Lecturer: Engr. G.K. IJEMARU

$)(x+y)$

FEDERAL UNIVERSITY OYE-EKITI
DEPARTMENT OF ELECTRICAL & ELECTRONICS
FIRST SEMESTER EXAMINATION
ENGINEERING MATHEMATICS I [ENG 201]

Academic Session: 2016/2017

Course Unit: 3

Time Allowed: 3 Hours

Exam Date: 29th March, 2017. **[Average Marks: 60]**

Instruction: Answer **Five** Questions in all.

[SECTION A]

Answer **All** the Questions in this Section.

QUESTION ONE

(a) Solve the equations: $yz = py + qz$; $zx = qz + rx$; and $xy = rx + py$. **[12mks]**

(b) Solve the equation: $5x^3 + 31x^2 + 31x + 5 = 0$ **[8mks]**

(c) Obtain the real roots of the equation: $(x^2 - 9x + 15)(x^2 - 9x + 20) = 6$ **[4mks]**

QUESTION TWO

(a) Investigate the convergence or divergence of the series: $\sum_{n=1}^{\infty} \frac{n}{\sqrt{4n^2+1}}$ **[6mks]**

(b) Given that $x = \pm\sqrt{\frac{pq}{2r}}$, $y = \pm\sqrt{\frac{qr}{2p}}$ and $z = \pm\sqrt{\frac{pr}{2q}}$, where $a + c = b + p$;

$a + b = c + q$; and $b + c = a + r$.

(i) If $\hat{A}$, $\hat{B}$ and $\hat{C}$ are the angles of a triangle ABC, show that the roots of x, y and z are real, and that the solution can be expressed as:
$x\cot\frac{1}{2}A = y\cot\frac{1}{2}B = z\cot\frac{1}{2}C = \pm\sqrt{S}$, where S is the semi-perimeter of the triangle. **[12mks]**

(ii) If Δ denotes the area of the triangle ABC in (i) above, show that
$\Delta^2 = x^2y^2z^2(yz + zx + xy)$ **[6mks]**

[SECTION B]

Answer Only **Three** Questions from this Section.

QUESTION THREE

(a) Solve the equation: $(x - a)^3 + (b - x)^3 = (b - a)^3$ **[5mks]**

(b) Use the ratio test to determine the range of values of x for which the series:
$\sum_{n=1}^{\infty} \frac{(n+1)x^n}{n^3}$ is convergent or divergent. **[8mks]**

(c) Evaluate the following integrals:

(i) $\int \sin^5 x \, dx$ **[8mks]**

(ii) $\int (x - 6)^3 \sin(x - 6)^4 \, dx$ **[3mks]**

QUESTION FOUR

(a) Prove that if $x + \frac{1}{x} = y + 1$, then $\frac{(x^2 - x + 1)^2}{x(x-1)^2} = \frac{y^2}{y-1}$. Hence, solve the equation:
$(x^2 - x + 1)^2 - 4x(x - 1)^2 = 0$ **[8mks]**

(b) Investigate whether the differential equation: $(1 - x^2y)dx + x^2(y - x)dy = 0$ is exact or not. Hence, find the solution of the equation. **[8mks]**

(c) Solve the equation: $\frac{1}{\sqrt{(a-x)} - \sqrt{a}} + \frac{1}{\sqrt{(a+x)} - \sqrt{a}} = \frac{\sqrt{a}}{x}$ **[8mks]**

Question 5: [30 marks]

(a) Use Cauchy's integral test to determine the convergence or divergence of the series:

$$\frac{1}{2\cdot3}+\frac{2}{3\cdot4}+\frac{3}{4\cdot5}+\cdots$$

[10 marks]

(b) Determine the coefficient of x^{11} in the series expansion of $5^5\left(\frac{x^2}{5}-\frac{5}{x}\right)^{10}$ *[10 marks]*

(c) Solve the differential equation: $y(1+xy)dx+x(1+xy+x^2y^2)dy=0$ *[10 marks]*

Question 6: [30 marks]

(a) Discuss the Convergence or Divergence of the series:

$$\frac{x}{(1^2+1)}+\frac{2^2x^2}{(2^2+1)}+\frac{3^2x^3}{(3^2+1)}+\cdots \text{ for real values of } x.$$ *[8 marks]*

(b) Solve the differential equation: $(6x-4y+1)dy-(3x-2y+1)dx=0$ *[12 marks]*

(c) Using Power series, show that $\tan^{-1}x=x-\frac{x^3}{3}+\frac{x^5}{5}-\frac{x^7}{7}+\cdots$ *[10 marks]*

Question 7: [30 marks] solved.

(a) Show that the solution of the differential equation: $x^2-3y^2+2xyy'=0$ is

$y=x\sqrt{8x+1}$ given that $y(1)=3$.

[10 marks]

(b) Check if the differential equation is exact and hence solve: $xy'-y=x^3\cos x$; given that $y(\pi)=0$

[10 marks]

(c) Solve the equation: $\frac{1}{\sqrt{a-x}-\sqrt{a}}+\frac{1}{\sqrt{a+x}-\sqrt{a}}=\frac{\sqrt{a}}{x}$ *[10 marks]*

$5^5\left(\frac{x^2}{5}-\frac{10}{5}\right)^{10}$

FEDERAL UNIVERSITY OYE-EKITI
FACULTY OF ENGINEERING
ENGINEERING MATHEMATICS I (ENG 201). **QUIZ NO.2**

Instruction: Answer all the questions. *Clarity of work shall attract Bonus Marks!!!*
Time Allowed: 1:40 Hours.
Quiz Date: 13th April, 2015.
Average Marks: 10
Session: 2014/2015 Academic Session

Solved. 1. (a) Investigate the Convergence or Divergence of the series: $\sum_1^\infty \frac{n}{\sqrt[3]{8n^3 + n^2 - 24}}$ **(8mks)**

(b) Using Power series, show that $\tan^{-1}x = x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + \cdots$ **(10mks)**

Exam. 2. (a) Discuss the Convergence or Divergence of the series:
$\frac{x}{(1^2 + 1)} + \frac{2^2x^2}{(2^2 + 1)} + \frac{3^2x^3}{(3^2 + 1)} + \cdots$ for real values of x Solved. **(8mks)**

(b) Determine the coefficient of x^{10} in the series expansion of $5^5\left(\frac{x^2}{5} - \frac{5}{x}\right)^8$. Solved **(10mks)**

3. (a) Evaluate $\cos x^2 \ln(1 + x)$ up to the 5th term, using power series expansion Solved **(8mks)**

(b) Solve the differential equation: $y(xy + 2)dx + x(xy + x^3y^3 + 2)dy = 0$ Solved **(10mks)**

4. (a) Show that the solution of the differential equation: $x^2 - 3y^2 + 2xyy' = 0$ is $y = x\sqrt{8x + 1}$ given that $y(1) = 3$. Solved. **(10mks)**

(b) Solve the differential equation: $(x - 2y + 5)dx + (2x - y + 4)dy = 0$ given that $y(1) = 2$ Solved **(12mks)**

5. (a) Solve the differential equation: $y' + y\sec x = \tan x$ solved. **(12mks)**

(b) Check if the differential equation is exact and hence solve: $xy' - y = x^3 \cos x$; given $y(\pi) = 0$. Solved **(12mks)**

$T_r = C^n_r\, a^{n-r} b^r$

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QUESTION FIVE

(a) Examine the series: $\frac{1}{1.2} - \frac{1}{2.2^2} + \frac{1}{3.2^3} - \frac{1}{4.2^4} + \cdots$ for absolute or conditional convergence. [6mks]

(b) Solve the equations: $\frac{x}{y+1} + \frac{y}{x+1} = \frac{5}{3}$ and $x^2 + y^2 = 2$ [10mks]

(c) (i) Differentiate w.r.t. x the function: $y = (\sin 3x)^x$ [3mks]

(ii) If $x = 5\cot\theta$ and $y = 10\,\mathrm{cosec}\,\theta$, evaluate $\frac{dy}{dx}$ at $\theta = \frac{\pi}{6}$ [5mks]

QUESTION SIX

(a) Solve the equations: $\sqrt[3]{x} + \sqrt[3]{y} = 3$ and $x + y = 9$ [8mks]

(b) Solve the differential equation: $y' + y\sec x = \tan x$, given that $y(\pi) = \pi$ [8mks]

(c) If $c = a + b - d$ represents the solution to an inexact differential equation given as: $y(1 + xy)dx + x(1 + xy + x^2y^2)dy = 0$, obtain the values of the constants a, b and d, and hence an expression for c. [8mks]

QUESTION SEVEN

(a) Solve the equations: $x^2 + 5y^2 = 21x$ and $x^2 + 2xy + y^2 = 11x$ [8mks]

(b) Obtain the solution of the differential equation: $y' + y\tan x = y^3\sec^4 x$ [8mks]

(c) Given that $y(0) = 1$, obtain the solution of the differential equation:

$(x^2 + 1)dy = (y^2 + 1)dx$ [8mks]

GOOD LUCK TO U ALL!!

$\frac{n}{(n+0)2^n}$

when n = 0

$= \frac{1}{(1+0)2^1} = \frac{1}{1.2}$

FEDERAL UNIVERSITY OYE-EKITI

ELECTRICAL & ELECTRONICS ENGINEERING

FIRST SEMESTER EXAMINATION

ENGINEERING MATHEMATICS I [ENG 201]

INSTRUCTION: Answer **FIVE (5)** questions in all, two (2) questions from section A and three (3) questions from section B. ***Clarity of work shall attract bonus marks!!!***

UNITS: 3

[2015/2016 ACADEMIC SESSION] ***Time Allowed:*** **3 Hours**

[SECTION A]

Answer only **TWO (2)** questions from this section

QUESTION 1 [30mks]

(a). Solve the equation: $(x^2-5)^2 = 2(x^2-2x+5)$ **[10mks]**

(b) Prove that if $x+\frac{1}{x} = y+1$, then $\frac{(x^2-x+1)^2}{x(x-1)^2} = \frac{y^2}{y-1}$. Hence, solve the equation: $(x^2-x+1)^2 - 4x(x-1)^2 = 0$ **[12mks]**

(c) If $x = 5\cot\theta$ and $y = 10\,\mathrm{cosec}\,\theta$, evaluate $\frac{dy}{dx}$ at $\theta = \frac{\pi}{6}$ **[8mks]**

QUESTION 2 [30mks]

(a) If $x^3y^3 + 2xy^4 - 3x^2y = 7$, find $\frac{dy}{dx}$ given that $y(2) = -1$. **[8mks]**

(b) Find the range of values of x for which the series: $\frac{x}{1.2} + \frac{x^2}{2.3} + \frac{x^3}{3.4} + \frac{x^4}{4.5} + \cdots$ is convergent or divergent. **[10mks]**

(c) Solve the equations: $x^2 + y^2 + xy = 84;\quad x + y + \sqrt{xy} = 14$ **[12mks]**

QUESTION 3 [30mks]

(i) Solve the equations: $x(y+z) = a,\ y(z+x) = b,\ z(x+y) = c.$ **[10mks]**

(ii) If a, b, and c from (i) above are the sides of a triangle ABC with semi-perimeter S, show that the roots are real, and that the solution can be expressed in the form:

$$x\cot\tfrac{1}{2}A = y\cot\tfrac{1}{2}B = z\cot\tfrac{1}{2}C = \pm\sqrt{S}.$$ **[14mks]**

(iii) If Δ denotes the area of the triangle ABC in (ii) above, prove that:

$$\Delta^2 = x^2y^2z^2(yz + zx + xy).$$ **[6mks]**

2

QUESTION FOUR

(a) Investigate the Convergence or Divergence of the series: $\sum_1^{\infty} \frac{n}{\sqrt{6n^3 + n^2 - 34}}$ [8mks]

(b) Solve the reciprocal equation: $x^2 + \frac{1}{x^2} + 7x - \frac{7}{x} = \frac{59}{4}$ [8mks]

(c) Solve the equation: $\frac{1}{\sqrt{(a-x)} - \sqrt{a}} + \frac{1}{\sqrt{(a+x)} - \sqrt{a}} = \frac{\sqrt{a}}{x}$ [8mks]

QUESTION FIVE

(a) Given that $y(0) = -1$, obtain the solution of the differential equation:
$y'\cos x + y\sin x = y^3\cos^2 x$ [10mks]

(b) If $x = 3\sec\theta$ and $y = 6\tan\theta$, evaluate $\frac{dy}{dx}$ at $\theta = \frac{\pi}{6}$ [5mks]

(c) Determine the range of values x for which the series
$\frac{(x-2)}{1} + \frac{(x-2)^2}{2} + \frac{(x-2)^3}{3} + \cdots$ is convergent or divergent. [9mks]

QUESTION SIX

(a) Solve the equations: $xyz = p^2x = q^2y = r^2z$. Hence, find the values of x, y and z given that $p = 10$, $q = 5$ and $r = 2$. [8mks]

(b) Discuss the convergence or divergence of the series:
$\frac{1}{1.3} + \frac{2}{3.5} + \frac{3}{5.7} + \frac{4}{7.9} + \ldots$ [8mks]

(c) Investigate the differential equation for exactness: $xy' - y = x^3\cos x$. Hence, find its solution given that $y(\pi) = 0$. [8mks]

QUESTION SEVEN

(a) Examine the series for absolute or conditional convergence:
$1 - \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} - \frac{1}{\sqrt{4}} + \cdots$ [8mks]

(b) Solve the equations: $x^2 + y^2 = 2y$ and $2xy - y^2 = y$ [8mks]

(c) An electric circuit consists of an 8 Ω resistor in series with an inductor of 0.5H, and a battery of E volts. At $t = 0$, the current $I = 0$. Using mathematical modelling, determine the current I at any time $t > 0$, and the maximum current if $E = 32e^{-8t}$ [8mks]

GOOD L

Instruction: Answer **questions 1 & 2** and any other three questions

Clarity of work shall attract **Bonus Marks!!** *Use of programmable calculators is highly prohibited!*

Time Allowed: 3 Hours

Exam Date: 27th May, 2015

Average Marks: 60%

Total Units: 3

Year: 2014/2015 Academic Session

Question 1: [30 marks]

Solve the equations: $u(v+w) = p$, $v(w+u) = q$, $w(u+v) = r$. If p, q, and r are the sides of a triangle PQR with semi-perimeter S, show that the roots are real and that the solution can be expressed in the form $u\cot\frac{1}{2}P = v\cot\frac{1}{2}Q = w\cot\frac{1}{2}R = \pm\sqrt{S}$. If Δ denotes the area of the triangle prove that $\Delta^2 = u^2v^2w^2(vw + wu + uv)$. *[30 marks]*

Solved

Question 2: [30 marks] Solved.

(a) If $x = 3\sec\theta$ and $y = 6\tan\theta$, evaluate $\frac{dy}{dx}$ at $\theta = \frac{\pi}{6}$ *[10 marks]*

(b) If $x^3 + 5x^6y^3 - 10x^4y^5 + xy = 0$, find $\frac{dy}{dx}$ *[8 marks]*

(c) Evaluate $\int \frac{dx}{(x+3)^2 + 25}$ *[12 marks]*

$\int \frac{dx}{(x+3)^2 - 25}$ $\quad$ $\int \frac{dx}{25\left(1+\frac{(x+3)}{25}\right)^2}$ $\quad$ $\frac{1}{25}\int \frac{dx}{1+\frac{(x+3)^2}{25}}$ $\quad$ $\frac{1}{25}\int \frac{dx}{\left(\frac{x+3}{5}\right)^2}$ $\quad$ $\frac{1}{25}\int$

Question 3: [30 marks] Solved.

(a) Solve the reciprocal equation: $3x^4 - 20x^3 - 94x^2 - 20x + 3 = 0$ *[10 marks]*

(b) Investigate the Convergence or Divergence of the series: $\sum_1^{\infty} \frac{n}{\sqrt[3]{8n^3 + n^2 - 24}}$ *[8 marks]*

(c) Solve the equations $x^4 + x^2y^2 + y^4 = 133$; $x^2 + xy + y^2 = 19$ *[12 marks]*

Question 4: [30 marks]

(a) Evaluate $\int x^4 \sin 2x dx$ *[10 marks]*

(b) Solve the equations: $x^2 + 2xy + 2y^2 = 3x^2 + xy + y^2 = 5$ *[10 marks]*

(c) Prove that $\frac{x}{e^x - 1}$ [illegible] $\frac{x}{2} + \frac{x^2}{2} - \frac{x^4}{720} + \cdots$ *[10 marks]*

$\int \frac{dx}{(x+3)^2 + 25}$ $\quad$ $\int \frac{dx}{25 + (x+3)^2}$ $\quad$ $\frac{1}{25}\int \frac{dx}{25 + \left(\frac{x+3}{25}\right)^2}$ $\quad$ $\frac{1}{2}\int \frac{dx}{1 + \frac{(x+3)^2}{25}}$ $\quad$ $\frac{1}{25}\int \frac{dx}{1 + \left(\frac{x+3}{5}\right)^2}$

$\frac{1}{5}\tan^{-1}u + C$ $\quad$ $\frac{1}{25}\int \frac{5\,du}{1+u^2}$

/...

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Question 5: [30 marks]

(a) Use Cauchy's integral test to determine the convergence or divergence of the series: [10 marks]

$\frac{1}{2 \cdot 3} + \frac{2}{3 \cdot 4} + \frac{3}{4 \cdot 5} + \cdots$

(b) Determine the coefficient of x^{11} in the series expansion of $5^5\left(\frac{x^3}{5} - \frac{5}{x}\right)^{10}$ [10 marks]

(c) Solve the differential equation: $y(1 + xy)dx + x(1 + xy + x^2y^2)dy = 0$ [10 marks]

Question 6: [30 marks]

(a) Discuss the Convergence or Divergence of the series: [8 marks]

$\frac{x}{(1^2 + 1)} + \frac{2^2x^2}{(2^2 + 1)} + \frac{3^2x^3}{(3^2 + 1)} + \cdots$ for real values of x.

(b) Solve the differential equation: $(6x - 4y + 1)dy - (3x - 2y + 1)dx = 0$ [12 marks]

(c) Using Power series, show that $\tan^{-1}x = x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + \cdots$ [10 marks]

Question 7: [30 marks]

(a) Show that the solution of the differential equation: $x^2 - 3y^2 + 2xyy' = 0$ is [10 marks]

$y = x\sqrt{8x + 1}$ given that $y(1) = 3$.

(b) Check if the differential equation is exact and hence solve: $xy' - y = x^3 \cos x$; given that $y(\pi) = 0$ [10 marks]

(c) Solve the equation: $\frac{1}{\sqrt{a-x} - \sqrt{a}} + \frac{1}{\sqrt{a+x} - \sqrt{a}} = \frac{\sqrt{a}}{x}$ [10 marks]

$$\frac{dy}{dx} = \frac{(3x - 2y + 1)}{(6x - 4y + 1)}$$

$a_1 b_2 = a_2 b_1$

$3(4) = 6(2)$

Type 2

$\frac{2}{2} + \frac{1}{1}$

FEDERAL UNIVERSITY OYE-EKITI

FACULTY OF ENGINEERING

ENGINEERING MATHEMATICS I (ENG 201). QUIZ NO.1

Instruction: Answer all the questions.
Time Allowed: 2Hours
Quiz Date: 9th February, 2015
Average Marks: 15
Session: 2014/2015 Academic Session

1. Solve the equations: $x(y+z)=a$, $y(z+x)=b$, $z(x+y)=c$. If a, b, c are the sides of a triangle ABC with semi-perimeter S, show that the roots are real, and that the solution can be expressed in the form $x\cot\frac{1}{2}A = y\cot\frac{1}{2}B = z\cot\frac{1}{2}C = \pm\sqrt{S}$. If Δ denotes the area of the triangle, prove that $\Delta^2 = x^2y^2z^2(yz+zx+xy)$. [10 MARKS]

Solved Ex

2. (a) Solve the equation: $2x^5 - 10x^4 + 3x^3 + 20x^2 + 19x + 6 = 0$, using reduction to simpler factors method. [10 MARKS]

Solved

(b) Solve the reciprocal equation: $3x^5 + 2x^4 + 5x^3 + 5x^2 + 2x + 3 = 0$ [10 MARKS]

Solved

3. (a) Solve the equation: $\frac{a}{x} + \frac{b}{y} = 2$; $\frac{a^2}{x} + by = a^2 + b^2$ [10 MARKS]

Solved. Exam.

(b) Solve the equations: $x^2 - yz = 3$; $y^2 - xz = 5$; $z^2 - xy = -1$ [10 MARKS]

Solved

4. (a) Solve the equation $\frac{1}{\sqrt{a-x}-\sqrt{a}} + \frac{1}{\sqrt{a+x}-\sqrt{a}} = \frac{\sqrt{a}}{x}$ [10 MARKS]

Solved Exam

(b) Solve the equations: $x^2 - x - y = 0$; $2x^2 + xy + 2y^2 = 5(x+y)$ [10 MARKS]

Solved

5. (a) Solve the equations: $x^4 + x^2y^2 + y^4 = 133$; $x^2 + xy + y^2 = 19$ Exam.

Solved

(b) Differentiate the following functions w.r.t x:

I. $y = \sqrt{1-x^3}$ [5 MARKS]

Solved

II. $y = \frac{5^x}{\cos 4x}$ [5 MARKS]

Solved Exam

6. (a) Evaluate the following integrals:

I. $\int \frac{dx}{(x+3)^2 + 25}$ [5 MARKS]

Solved Exam

5

II. $\int \frac{2x-1}{x^2-8x+15}dx$ [5 MARKS]

Solved

III. $\int x^3e^{-x}dx$ [10 MARKS]

Solved Exam

(b) If $x^3y^3 + 2xy^4 - 3x^2y = 7$, find $\frac{dy}{dx}$ at $x=2$, $y=-1$ [5 MARKS]

Solved. Probability 5

GOOD LUCK!!!!

YOU ARE WELCOME TO FACULTY OF ENGINEERING.

........................ENGR G.K. IJEMARU & ENGR F.O. AJAYI

$\frac{9/2 \ln x-5}{5/2 \ln x-3}$

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[SECTION B]

Answer any **THREE (3)** questions from this section.

QUESTION 4 [30mks]

(a) Evaluate $\int \frac{x+4}{x^3+3x^2-10x} dx$ **[10mks]**

(b) Solve the differential equation: $(x^2+1)y' - y^2 - 1 = 0;\ y(0) = 1$ **[10mks]**

(c) Discuss the convergence or divergence of the series: $\frac{1}{1.2} + \frac{2}{3.5} + \frac{3}{5.7} + \frac{4}{7.9} + \cdots$ **[10mks]**

QUESTION 5 [30mks]

(a) Solve the reciprocal equation: $x^4 - x^3 - 4x^2 + x + 1 = 0$ **[10mks]**

(b) Use Cauchy's root test to show that $\sum_1^\infty \frac{[(n+1)r]^n}{(n^n + r)}$ is convergent if $r < 1$ and divergent if $r \geq 1$. **[10mks]**

(c) Show that the solution of the differential equation: $x^2 - 3y^2 + 2xyy' = 0$ is $y = x\sqrt{8x+1}$ given that $y(1) = 3$ **[10mks]**

QUESTION 6 [30mks]

(a) Solve the equations: $\frac{x}{5y+1} + \frac{y}{3x+1} = \frac{4}{15}$; $3x + 5y = 2$ **[10mks]**

(b) Evaluate $\int \cos^{-1} x dx$ **[10mks]**

(c) Determine the interval of convergence or divergence of the following series: $\frac{(x-3)}{1^2} + \frac{(x-3)^2}{2^2} + \frac{(x-3)^3}{3^2} + \cdots$ **[10mks]** Solvd by N Page 174 No 6c

QUESTION 7 [30mks]

(a) An electric circuit consists of an $8\ \Omega$ resistor in series with an inductor of 0.5H, and a battery of E volts. At $t = 0$, the current $I = 0$. Using mathematical modelling, determine the current I at any time $t > 0$, and the maximum current if $E = 32e^{-8t}$ **[9mks]**

(b) Solve the equations: $x^2 - yz = 3;\ y^2 - xz = 5;\ z^2 - xy = -1$. **[13mks]**

(c) Determine whether the differential equation: $(2y-3)dx + xdy = 0$ is exact or not, and hence find the solution of the equation given that $y(-2) = 0$. **[8mks]**

FEDERAL UNIVERSITY OYE-EKITI
FIRST SEMESTER EXAMINATION
ENGINEERING MATHEMATICS 1 (ENG 201)

Instruction: Answer *questions 1 & 2* and any other three questions.
Clarity of work shall attract Bonus Marks!! Use of programmable calculators is highly prohibited!
Time Allowed: 3 Hours.
Exam Date: 27th May, 2015.
Average Marks: 60%
Total Units: 3
Year: 2014/2015 Academic Session

Question 1: [30 marks]

Solve the equations: $u(v+w) = p$, $v(w+u) = q$, $w(u+v) = r$. If p, q, and r are the sides of a triangle PQR with semi-perimeter S, show that the roots are real, and that the solution can be expressed in the form $u\cot\frac{1}{2}P = v\cot\frac{1}{2}Q = w\cot\frac{1}{2}R = \pm\sqrt{S}$. If Δ denotes the area of the triangle, prove that $\Delta^2 = u^2v^2w^2(vw + wu + uv)$. *[30 marks]*

Question 2: [30 marks]

(a) If $x = 3\sec\theta$ and $y = 6\tan\theta$, evaluate $\frac{dy}{dx}$ at $\theta = \frac{\pi}{6}$ *[10 marks]*

(b) If $x^3 + 5x^6y^3 - 10x^4y^5 + xy = 0$, find $\frac{dy}{dx}$ *[8 marks]*

(c) Evaluate $\int \frac{dx}{(x+3)^2 + 25}$ *[12 marks]*

Question 3: [30 marks]

(a) Solve the reciprocal equation: $3x^4 - 20x^3 - 94x^2 - 20x + 3 = 0$ *[10 marks]*

(b) Investigate the Convergence or Divergence of the series: $\sum_1^\infty \frac{n}{\sqrt[3]{8n^3 + n^2 - 24}}$ *[8 marks]*

(c) Solve the equations: $x^4 + x^2y^2 + y^4 = 133$; $x^2 + xy + y^2 = 19$ *[12 marks]*

Question 4: [30 marks]

(a) Evaluate $\int x^4 \sin 2x dx$ *[10 marks]*

(b) Solve the equations: $x^2 + 2xy + 2y^2 = 3x^2 + xy + y^2 = 5$ *[10 marks*

(c) Prove that $\frac{x}{e^x - 1} = 1 - \frac{x}{2} + \frac{x^2}{2} - \frac{x^4}{720} + \cdots$ *[10 mark*

FEDERAL UNIVERSITY OYE-EKITI
DEPARTMENT OF ELECT/ELECT. ENGINEERING
ENGINEERING MATHEMATICS I [ENG 201]
FIRST SEMESTER EXAMINATION

Academic Session: 2017/2018
Course Unit: 3
Time Allowed: 3 Hours
Exam Date: 23rd May, 2018.
Instruction: *Answer Five Questions in all, two questions from section A and three questions from section B.*

[SECTION A]

Answer **All** the Questions in this Section.

QUESTION ONE

(a) Solve the equations: $x(y+z) = a$, $y(z+x) = b$, and $z(x+y) = c$. **[10mks]**

(b) If a, b, c form the sides of a triangle ABC, show that the solution in (a) above can be expressed in the form: $x\cot(½)A = y\cot(½)B = z\cot(½)C = \pm\sqrt{S}$, where S is the semi-perimeter of the triangle. **[8mks]**

(c) If Δ denotes the area of triangle ABC in (b) above, calculate the value of Δ to the nearest whole number, given that x = 2.5cm, y = 3.2cm and z = 4cm. **[6mks]**

QUESTION TWO

(a) Solve the equations: $x^2 + y^2 + xy = 84$; $x + y + \sqrt{xy} = 14$ **[8mks]**

(b) Obtain the solution of the homogeneous differential equation:
$(y^3 - 2x^2y)dx + (x^3 - 2xy^2)dy = 0$, given that x = 1, when y = 1. **[8mks]**

(c) Evaluate $\int \cos^{-1}x dx$ **[8mks]**

[SECTION B]

Answer Only **Three (3)** Questions from this Section.

QUESTION THREE

(a) Solve the equation: $x^5 + x^4 - 3x^3 - 9x^2 - 14x - 8 = 0$ **[8mks]**

(b) If $c = a(x,y) + b(x,y) - d(x,y)$ represents the solution to an inexact differential equation given as: $y(1+ xy)dx + x(1+ xy + x^2y^2)dy = 0$, obtain the values of a, b and d, and hence an expression for c. **[8mks]**

(c) Use Cauchy's integral test to determine the convergence or divergence of the series: $\frac{1}{2\,.\,3} + \frac{2}{3\,.\,4} + \frac{3}{4\,.\,5} + \cdots$ **[8mks]**

FEDERAL UNIVERSITY OYE-EKITI

DEPARTMENT OF ELECTRICAL & ELECTRONIC ENGINEERING
ENGINEERING MATHEMATICS I, ENG 201
FIRST SEMESTER EXAMINATION

Academic Session: 2018/2019
Course Unit: 3
Time Allowed: 3 Hours
Exam Date: 15th June, 2019.
Instruction: *Answer Five Questions in all, 2 questions from section A & 3 questions from section B*

[SECTION A]

Answer All the Questions in this Section.

QUESTION ONE

(a) Solve the equations: $x(y+z) = a$, $y(z+x) = b$, and $z(x+y) = c$. **[10mks]**

(b) If a, b, c form the sides of a triangle ABC, show that the solution in (a) above can be expressed in the form: $x\cot(\frac{1}{2})A = y\cot(\frac{1}{2})B = z\cot(\frac{1}{2})C = \pm\sqrt{S}$, where S is the semi-perimeter of the triangle. **[8mks]**

(c) If Δ denotes the area of triangle ABC in (b) above, calculate the value of Δ to the nearest whole number, given that $x = 2.5$cm, $y = 3.2$cm and $z = 4$cm. **[6mks]**

QUESTION TWO

(a) Solve the equations: $yz = py + qz$; $zx = qz + rx$; and $xy = rx + py$. **[10mks]**

(b) Show that the solution of the differential equation: $x^2 - 3y^2 + 2xyy' = 0$ is $y = x\sqrt{8x+1}$ given that $y(1) = 3$ **[8mks]**

(c) Evaluate $\int \cos^{-1}x dx$ **[6mks]**

[SECTION B]

Answer Only Two (2) Questions from this Section.

QUESTION THREE

(a) Solve the equation: $x^5 + x^4 - 3x^3 - 9x^2 - 14x - 8 = 0$ **[8mks]**

(b) If $c = a(x,y) + b(x,y) - d(x,y)$ represents the solution to an inexact differential equation given as: $y(1+xy)dx + x(1+xy+x^2y^2)dy = 0$, obtain the values of a, b and d, and hence an expression for c. **[8mks]**

(c) Use Cauchy's integral test to determine the convergence or divergence of the series: $\frac{1}{2\cdot 3} + \frac{2}{3\cdot 4} + \frac{3}{4\cdot 5} + \cdots$ **[8mks]**

QUESTION FOUR

(a) Prove that if $x + \frac{1}{x} = y + 1$, then $\frac{(x^2-x+1)^2}{x(x-1)^2} = \frac{y^2}{y-1}$. Hence, solve the equation: $(x^2 - x + 1)^2 - 4x(x-1)^2 = 0$ **[8mks]**

(b) Investigate the Convergence or Divergence of the series: $\sum_1^\infty \frac{n}{\sqrt[3]{8n^3 + n^2 - 24}}$ **[8mks]**

(c) Given that $y(0) = 1$, obtain the solution of the differential equation: $(x^2+1)dy = (y^2+1)dx$ **[8mks]**

QUESTION FIVE

(a) Given that $y(0) = -1$, obtain the solution of the differential equation: $y'\cos x + y\sin x = y^3\cos^2 x$ **[8mks]**

(b) Determine the range of values x for which the series: $\frac{(x-2)}{1} + \frac{(x-2)^2}{2} + \frac{(x-2)^3}{3} + \cdots$ is convergent or divergent. **[8mks]**

c) Investigate the differential equation for exactness: $x^2y' - y' = x^3y$. Hence, find its solution given that $y(0) = 1$. **[8mks]**

FEDERAL UNIVERSITY OYE-EKITI
DEPARTMENT OF ELECTRICAL & ELECTRONICS
FIRST SEMESTER EXAMINATION
ENGINEERING MATHEMATICS I [ENG 201]

Academic Session: 2016/2017
Course Unit: 3
Time Allowed: 3 Hours
Exam Date: 29th March, 2017.
Instruction: Answer **Five** Questions in all. **[Average Marks: 60]**

[SECTION A]

Answer **All** the Questions in this Section.

QUESTION ONE

(a) Solve the equations: $yz = py + qz$; $zx = qz + rx$; and $xy = rx + py$. **[12mks]**
(b) Solve the equation: $5x^3 + 31x^2 + 31x + 5 = 0$ **[8mks]**
(c) Obtain the real roots of the equation: $(x^2 - 9x + 15)(x^2 - 9x + 20) = 6$ **[4mks]**

QUESTION TWO

(a) Investigate the convergence or divergence of the series: $\sum_{n=1}^{\infty} \frac{n}{\sqrt{4n^2+1}}$ **[6mks]**

(b) Given that $x = \pm\sqrt{\frac{pq}{2r}}$, $y = \pm\sqrt{\frac{qr}{2p}}$ and $z = \pm\sqrt{\frac{pr}{2q}}$, where $a + c = b + p$; $a + b = c + q$; and $b + c = a + r$.

(i) If $\hat{A}$, $\hat{B}$ and $\hat{C}$ are the angles of a triangle ABC, show that the roots of x, y and z are real, and that the solution can be expressed as: $x\cot\frac{1}{2}A = y\cot\frac{1}{2}B = z\cot\frac{1}{2}C = \pm\sqrt{S}$, where S is the semi-perimeter of the triangle. **[12mks]**

(ii) If Δ denotes the area of the triangle ABC in (i) above, show that $\Delta^2 = x^2y^2z^2(yz + zx + xy)$ **[6mks]**

[SECTION B]

Answer Only **Three** Questions from this Section.

QUESTION THREE

(a) Solve the equation: $(x-a)^3 + (b-x)^3 = (b-a)^3$ **[5mks]**
(b) Use the ratio test to determine the range of values of x for which the series: $\sum_{n=1}^{\infty} \frac{(n+1)x^n}{n^3}$ is convergent or divergent. **[8mks]**
(c) Evaluate the following integrals:
(i) $\int \sin^5 x \, dx$ **[8mks]**
(ii) $\int (x-6)^3 \sin(x-6)^4 \, dx$ **[3mks]**

QUESTION FOUR

(a) Prove that if $x + \frac{1}{x} = y + 1$, then $\frac{(x^2-x+1)^2}{x(x-1)^2} = \frac{y^2}{y-1}$. Hence, solve the equation: $(x^2 - x + 1)^2 - 4x(x-1)^2 = 0$ **[8mks]**
(b) Investigate whether the differential equation: $(1 - x^2y)dx + x^2(y - x)dy = 0$ is exact or not. Hence, find the solution of the equation. **[8mks]**
(c) Solve the equation: $\frac{1}{\sqrt{(a-x)} - \sqrt{a}} + \frac{1}{\sqrt{(a+x)} - \sqrt{a}} = \frac{\sqrt{a}}{x}$ **[8mks]**