MACHAKOS UNIVERSITY

University Examinations 2017/2018

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

SECOND YEAR, FIRST SEMESTER EXAMINATIONS FOR

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

DIPLOMA IN BUILDING AND CIVIL ENGINEERING

DIPLOMA IN MECHANICAL ENGINEERING

MATHEMATICS   IV

DATE: 5/12/2017   **TIME: 8.30-10.30 AM**

INSTRUCTIONS

Answer question **ONE** and any other **TWO** questions.

Show all your working.

QUESTION ONE (COMPULSORY)(30 MARKS)

1.   a)   Evaluate

   i) $\int \cos 6x \, \sin 2x \, dx$ (4 marks)

   ii) $\int \sin^2 x \cos^2 x \, dx$ (6 marks)

   iii) $\int \frac{5(x^2+x+3)}{x(x^2+2x+5)} \, dx$ (5 marks)

   b)   Integrate the following

   i) $\int \frac{(2+x)^2}{\sqrt{x}} \quad dx$ (5 marks)

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ii) $\int \frac{x}{1+x^2} \quad dx$ (5 marks)

iii) $\int_0^3 3x(3x^2 + 9)^{\frac{1}{2}} \quad dx$ (5 marks)

QUESTION TWO (20 MARKS)

a) Proof that $\int \sqrt{(x^2 + a^2)} \quad dx = \frac{a^2}{2}\left[\sinh^{-1}\frac{x}{a} + \frac{x}{a}\sqrt{(x^2 + a^2)} + c\right]$ (10 marks)

b) Use reduction formula to evaluate

   i) $\int e^{5x}\sin 3x \, dx$ (5 marks)

   ii) $\int x^3 e^{2x} \, dx$ (5 marks)

QUESTION THREE (20 MARKS)

a) Evaluate the definite integrals

   i) $\int_0^\pi x^2 \sin x \, dx$ (5 marks)

   ii) $\int_0^{\frac{\pi}{2}} \frac{1}{1+\cos x} \, dx$ (5 marks)

b) i) $\int \sin^2 x \quad dx$ (4 marks)

   ii) $\int \frac{5x^2 - x + 8}{(1-x)(1+x^2)} \, dx$ (6 marks)

QUESTION FOUR (20 MARKS)

Evaluate the integrals

   i) $\int_0^4 \sqrt{16 - x^2} \quad dx$ (10 marks)
   ii) $\int \frac{1}{4+x^2} \quad dx$ (5 marks)
   iii) $\int \frac{2x}{\sqrt{1-x^2}} \quad dx$ (5 marks)