144

B.Sc. Engg. SWE 2nd Semester 06 August 2018 (Morning)

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Software Engineering (SE)

MID SEMESTER EXAMINATION **SUMMER SEMESTER, 2017-2018**

DURATION: 1 Hour 30 Minutes **FULL MARKS: 100**

Math 4241: Integral Calculus and Differential Equations

Programmable calculators are not allowed. Do not write anything on the question paper.

There are 4 (four) questions. Answer any 3 (three) of them.

Figures in the right margin indicate marks.

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1. a) What are anti-derivative and integral curves? Find the anti-derivative of $\sin x$ and draw the integral curves. 12

   b) Find the area function A(x) between the graph $f(x)=3x-3$ and the interval [2, x] and show that $A'(x)=f(x)$. 6

   c) Evaluate the following integrals : 15.33

   i. $\int x^3\sqrt{x^2+1}dx$ ii. $\int \frac{1}{x^2}\sqrt{2-\frac{1}{x}}dx$ iii. $\int \frac{e^x}{4+e^{2x}}dx$

2. a) A particle moves on a coordinate line with acceleration $a=\frac{d^2s}{dt^2}=15\sqrt{t}-\frac{3}{\sqrt{t}}$ subject to the condition $s'(1)=4$ and $s(1)=0$, then answer the following questions: 8.33

   i. The velocity v in terms of t.

   ii. The position s in terms of t.

   b) Find the reduction formula $\int \cos^n xdx$ and using reduction formula evaluate $\int \cos^5 xdx$ 10

   c) Evaluate the following integrals 15

   i. $\int \tan^{-1} xdx$ ii. $\int \cos^3 x\sin^2 xdx$ iii. $\int \sec^3 x\tan xdx$

3. a) Solve the followings: 12

   i. $(x^2+4)\frac{dy}{dx}=3,\quad y(2)=0$ ii. $(t^2+2t)\frac{dx}{dt}=2x+2\quad (t,x>0),\quad x(1)=1$

   b) Use the Heaviside method to evaluate $\int \frac{x+3}{2x^3-8x}dx$ 10

   c) Evaluate the following integrals: 11.33

   i. $\int \frac{e^t}{e^{2t}+3e^t+2}dt$ ii. $\int \frac{1}{x^{\frac{3}{2}}-\sqrt{x}}dx$

4. a) Find the area of $f(x)=x^3$ on the interval [2, 6] using right endpoints. 10

   b) Sketch the region whose are represented by the definite integral and evaluate the integral using appropriate formula. 10

   i. $\int_{=-1}^{3}|2x-1|dx$ ii. $\int_0^1\sqrt{1-x^2}dx$

   c) If $f(x)=\begin{cases}2x & x\le 1\\ 2 & x>1\end{cases}$ then find 13.33

   i. $\int_0^1 f(x)dx$ ii. $\int_{-1}^1 f(x)dx$ iii. $\int_1^{10} f(x)dx$ iv. $\int_{\frac{1}{2}}^5 f(x)dx$