ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION **SUMMER SEMESTER, 2018-2019**
DURATION: 1 Hours 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. **Use separate answer scripts for each sections.**
Figures in the right margin indicate marks.

Section-A

1. a) What is indefinite integral? Explain with examples, why it is necessary to add the integral constant to the result in indefinite integral? 08

   b) Suppose that T months from now, the population P(T) of Gazipur City will be changing at the rate of (550+2T)3/2 people per month. If the current population is approximately 1850000 then what will be the populations after 6 years from now? 13.33

   c) Evaluate the followings (any three): 12

   i) $\int 3x^5\sqrt{x^3+1}\,dx$, ii) $\int Sin(lnx)\,dx$, iii) $\int 8\,cos^2x\,sin^4x\,dx$, iv) $\int_0^{\ln 4}\frac{e^t}{\sqrt{e^{2t}+9}}dt$

2 a) Obtain the reduction formula for $\int cos^n x\,dx$ and then evaluate $\int_0^{\pi/2} cos^5 x\,dx$ 10

   b) Express the integrand as a sum of partial fractions and then evaluate the following: 12

   i) $\int \frac{2x+1}{x^2-7x+12}dx$, ii) $\int \frac{e^{4x}+2e^{2x}-e^x}{e^{2x}+1}dx$

   c) Evaluate $\int_{-r}^{r}\sqrt{r^2-x^2}\,dx$. Also graph the integrand and then verify your result using appropriate formula from geometry. 11.33

Section-B

3. a) Define Degree and Order of a Differential Equation with an example. Find the Differential equation of all straight lines at a unit distance from the origin. 10

   b) Define Exact Differential Equation. Find the necessary and sufficient condition for a Differential equation to be exact. 15

   c) Solve the following Differential Equations: 8.33

   $(ye^x+2e^x+y^2)dx-(e^x+2xy)dy=0$, $y(0)=6$

4. a) What do you know about integrating factor? Show that for first Order Linear Differential Equation integrating factor, $I.F=e^{\int p(x)dx}$ 09

   b) Find the family of curves which satisfy the following Differential equations: 16

   i) $(2x^2+y)dx+(x^2y-x)dy=0$

   ii) $(x^3+y^2\sqrt{x^2+y^2})dx-(xy\sqrt{x^2+y^2})dy=0$

   c) Two 9 volt batteries are connected in series in which the inductance is $\frac{1}{4}$ henry and resistance is 8 ohms. Determine the current i, if the initial current is zero. 8.33