

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Semester Final Examination

Course No.: Math 4121

Course Title: Mathematics I

Winter Semester, A. Y. 2020-2021

Time: 1 hour 30 minutes

Full Marks: 75

There are 4 (**four**) questions. Answer **any 3 (three)** questions. The symbols have their usual meanings. The examination is **Online**. Marks of each question and corresponding CO and PO are written in the brackets.

1. Workout the following: (9+8+8)
 - (i) $\int \frac{(3x+4)dx}{\sqrt{(5+6x-7x^2)}}$ (CO1)
 - (ii) $\int \frac{dx}{x\sqrt{1+x^n}}$ (PO1)
 - (iii) $\int e^{2x} \frac{1+\sin 2x}{1+\cos 2x} dx$

2. a) Find the reduction formula for (9)
 $I_n = \int \sin^n x dx$ (CO1)
(PO1)

- b) Evaluate $\int_0^{\frac{\pi}{4}} \frac{\sin^2 4x}{(\sin^3 2x + \cos^3 2x)^2} dx$ (8)
(CO1)
(PO1)

- c) Evaluate $\int_0^{2\pi} x \sin^6 x \cos^8 x dx$ (8)
(CO2)
(PO2)

3. a) Evaluate $\int_0^{1.5} \frac{\sqrt{x+1} e^{x^2} dx}{\sqrt{1+4x^2}}$ by Simpson's rule taking 12 (13)
subintervals. (CO2)
(PO2)

- b) Find the length of the arc of the parabola $y^2 = 16x$ which is (12)
intercepted between the points of intersection of the parabola (CO2)
and the straight line $3y = 8x$. (PO2)

4. a) Find the area of all the loops of the curves $r = a \cos n\theta$ (13)
if (i) n is odd (ii) n is even. (CO3)
(PO12)

- b) Find the volume formed by the revolution of the hypocycloid (12)
 $x = a \cos^3 \theta, y = b \sin^3 \theta$ about the y-axis. (CO3)
(PO12)