B.Sc. Engg. / HD CSE 1st Semester (63)

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07 March 2016 (Afternoon)

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

MID SEMESTER EXAMINATION

DURATION: 1 Hour 30 Minutes

WINTER SEMESTER, 2015-2016

FULL MARKS:100

Math 4141: Geometry and Differential Calculus

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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a) Define rectangular and oblique axes. Transform the equation $2x^2+4xy+4y^2-2x-4y-2=0$ to rectangular axes through the point (2,-1) and inclined at angle 45^0. 10.33

b) Discuss the nature of the conic $4x^2+4xy+y^2+4x+3y+2=0$. If the conic $2xy+4x-6y+k=0$ represents a pair of straight lines, find the value of k. 10

c) Show that the equation $bx^2-2hxy+ay^2=0$ represents a pair of straight lines which are at right angle to the pair given by the equation $ax^2+2hxy+by^2=0$. 13

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a) Define the direction ratios and cosines of a line. What are the direction cosines of x, y and z axes? Test whether 0,-1, 1 are directions ratios or cosines. 10

b) Find the projection of a segment of a line AB on an another line CD, where the points A,B,C and D are (0,1,-1), (1,2,3),(-1,0,1) and (2,-2,3) respectively. 10

c) If the edges of a rectangular parallelopiped are a, b and c then show that the angles between the four diagonals are given by $cos^{-1}\left(\frac{\pm a^2 \pm b^2 \pm c^2}{a^2+b^2+c^2}\right)$. 13.33

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a) Write down the conditions for perpendicularity and parallelism between two planes. Find the angle between the planes $x+2y+2z=7$ and $2x-y+z=6$. 13.33

b) Find the equation of the plane passing through the intersection of the planes $x+2y+3z+4=0$ and $4x+3y+2z+1=0$, and perpendicular to the plane $x+y+z+9=0$. 10

c) Find the equation of the plane passing through the point (2, 3,-1) and parallel to the plane $3x-4y+7z=0$. 10

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a) Define function, domain and range. Find the domain and range of the following functions: 10

i. $y = \sqrt{9-x^2}$ ii. $y = \frac{4}{3-x}$.

Draw the graph of the function $y = |x-2|-1$.

b) Define increasing, decreasing, even, and odd functions with examples. Test whether the functions $y = x^2+x$, $y = cotx$, and $y = 5$ are even, odd or neither. 13.33

c) Suppose the population model of a city is given by $P = P_0 e^{RT}$, where P is the total population, P_0 is the initial population, R is the annual growth rate and T is the number of years. If the population of that city is 50,000 then find how much time is required for the population to double considering the annual growth rate at 2.50% 10