



COMSATS University Islamabad (Vehari Campus)  
DEPARTMENT OF Computer Sciences  
Second Sessional FA 18

Instructor: Dr. Asfand Fahad  
Course: Multivariable Calculus (MTH-105)  
Program: BSCS-B16, BSSE-B10  
Student Name : AHMER IOBAL

Time: 90 Minutes  
Marks: 15  
Date: 19-11-2018  
Reg. No. SPIR-BSE-  
002

Q.1 (i) Let  $F(x, y) = \frac{x}{x+y^2}$ . Find the domain of  $F$ . Sketch the domain. What does it represent?

(ii) Let  $r_1(t)$  and  $r_2(t)$  be two vector valued functions. Show that

$$\frac{d}{dt}(r_1(t) \cdot r_2(t)) = r_1(t) \cdot r_2'(t) + r_1'(t) \cdot r_2(t).$$

(iii) Let  $A(2, -1, 0)$ ,  $B(2, 1, -1)$  and  $C(-1, 1, 2)$  be three points in space. Find the area of triangle determined by joining  $A$ ,  $B$  and  $C$ . Also find a unit vector perpendicular to the plane containing  $A$ ,  $B$  and  $C$ .

(02+03+03)

Q.2 (i) Let  $r(t) = \frac{t-1}{t^2+4t-5}i + \tan(t)j + \ln(1+t)k$ .

(a) Find the Domain of  $r$ .

(b) Find the points where  $r$  is discontinuous.

(c) Also find the continuous extension of  $r$  where it is possible.

(ii) Let  $r(t) = \frac{4}{9}(1+t)^{\frac{3}{2}}i + \frac{4}{9}(1-t)^{\frac{3}{2}}j + \frac{1}{3}tk$  represents position of particle in space. Find the angle between velocity and acceleration of particle when  $t = 0$ .

(iii) Let  $r(t) = (3 \sin 2t)i + (3 \cos 2t)j + \sqrt{13} tk$  be a vector-valued function. Find the length of the curve determined by  $r(t)$  from  $t = 0$  to  $t = \pi$ .

(03+02+02)