Ex/UG/ECO/14/6/2017

BACHELOR OF ARTS EXAMINATION, 2017

(1st Year, 1st Semester)

ECONOMICS (HONOURS)

MATHEMATICS FOR ECONOMICS

Time : Two hours Full Marks : 30

Answer question no.1 and any two from the following:

1. a) Prove that P↔Q iff Q↔P

   b) Show the validity of the following argument: If all cats are black then tiffin is black; it is not the case that all cats are black. Therefore tiffin is not black. Name the logic law applied or the nature of the error.

   c) Given the function:

$$f(x)=\frac{x^2+4x-2}{x^2-2x+1}$$

   Can it be said that f(x) is bounded in [1,4]?

   d)Let f be a function whose domain contains –x, whenever it contains x. If f is integrable on [0,b] prove that:

   i. $\int_{-b}^{b} f(x)dx = 2\int_{0}^{b} f(x)dx$ whenever f(x) is even function

   ii. $\int_{-b}^{b} f(x)dx = 0$ whenever, f(x) is an odd function.

   e) Find the asymptotes & holes of the function f(x)=$\frac{(x-r)^2(x-k)}{(x-r)(x+k)}$ 2 x 5

2. a)Sketch the graph of the function: f(x) =$5x^3 - 5x^2 + 5x - 5$. Does the function have an extremum?

   b) State Roll's theorem and prove mean value theorem using Roll's theorem. 7+3

3.a) Find the domain&range of the function f(x)=$\frac{x^2-a}{(x-b)(x-c)}$ where a,b,c∈R & a>b>c.

b) Prove the function f(x)=ax +d is continuous using the definition of continuity.

c)Let f(x)=2x and g(x)=x^2 ,Check whether fog is surjective & / or injective

d) Use a truth table to prove the law of disjunctive syllogism

e) Suppose R is a relation on the set of integers such that xRy implies 2x-y=1 . Is it true that the relation is neither reflexive nor irreflexive? 2 x 5

4.a) Assume f is continuous on [a,b]. If $\int_a^b f(x)dx = 0$ prove that f(c)=0 for at least one c in [a,b].

b) Is the function f(x)=$\frac{x-1}{x+1}$ continuous in the interval (-2,1)? Explain your answer?

c)Answer without solving the equation between which of the following two values does the equation $3x^3 + 5x - 11 = 0$ have a solution?

a. Between -1,-2; b. between -1,0 ;c. between 0,1; d. between 1,2

d) Given K>0 prove that among all positive numbers x& y with x+y=K the sum x^2+y^2 is smallest when x=y.

e) Show that : $\neg(P \vee \neg Q) \vee (\neg P \wedge \neg Q) \Leftrightarrow \neg P$.(You can use either propositional logic laws or truth table) 2 x5