



NATIONAL OPEN UNIVERSITY OF NIGERIA
Plot 91, Cadastral Zone, Nnamdi Azikiwe Expressway, Jabi, Abuja.

FACULTY OF SCIENCES
November Examination 2018

Course Code: MTH402
Course Title: General Topology
Credit Unit: 3
Time Allowed: 3 HOURS
Total: 70 Marks
Instruction: ATTEMPT NUMBER ONE (1) AND ANY OTHER FOUR (4) QUESTIONS

1. (a) Define closed set and limit point of a subset of a topological space. (4marks)
(b) let A be a subset of a topological space X . Let A^1 be the set of all limit points of A . then $\overline{A} = A \cup A^1$. Prove. (8marks)
(c) Define Hausdorff Space with one example (4marks)
(d) Let X be a Hausdorff Space, then for all $x \in X$, the singleton set $\{x\}$ is closed. Prove (6marks)
2. (a) Define Homeomorphism with one example (4marks)
(b) Let X, Y and Z be topological spaces. If $f : X \rightarrow Y$ and $g : Y \rightarrow Z$ are continuous, then the map $go f : X \rightarrow Z$ is continuous. Prove (8marks)
3. (a) State and prove the pasting theorem. (7marks)
(b) Let $f : Z \rightarrow X \times Y$ be given by $f(z) = (f_1(x), f_2(y))$. then f is continuous If and only if the functions $f_1 : Z \rightarrow X$ and $f_2 : Z \rightarrow Y$ are continuous. Prove (5marks)
4. (a) Define a compact set with one example (4marks)
(b) The real line \mathbb{R} endowed with the standard topology is not compact. Prove (8marks)

5. (a) Define Neighbourhood basis. (3marks)
- (a) Let \mathbb{R} be endowed with the standard topology. Then for all $x \in \mathbb{R}$, $W = \{(x - \epsilon, x + \epsilon), \epsilon > 0\}$ is a neighbourhood basis of x . Prove (9marks)
6. (a) (i) Define Baire space with an example (3marks)
- (ii) Define separability with an example (3marks)
- (b) Let X be a topological space, and A be a subset of X . if there exists a sequence $\{x_n\}$ of the elements of A converging to $x \in X$, then $x \in \overline{A}$. the converse holds if X is metrizable. Prove. (6marks)