(Knowledge for Development)

KIBABII UNIVERSITY

KIBU

UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR

END OF SEMESTER EXAMINATIONS
YEAR ONE SEMESTER ONE EXAMINATIONS

FOR THE DEGREE OF
MASTER OF SCIENCE IN INFORMATION TECHNOLOGY (IT)

COURSE CODE : MIT 814

COURSE TITLE : COMPUTER NETWORKS

DATE: 31/07/2021   TIME: 9:00 A.M – 12:00 NOON

INSTRUCTIONS TO CANDIDATES
ANSWER QUESTIONS ONE AND ANY OTHER TWO.

QUESTION ONE [20 MARKS]

a) Kibabii University has implemented a datacenter to aid in the provision of services. The services are provided with the help of the integrated systems such as access control system, CCTV security system, Fire suppression system, Precision air control system, Facility management, and Power backup utility system. The datacenter manager has also implemented a content delivery network (CDN) of geographically distributed group of servers which work together to provide fast delivery of Internet content.

    i.   What are the benefits of using a CDN? [3 marks]

    ii.   How does a CDN improve website load times? [3 marks]

    iii.   Discuss the implementation mechanism used by CDN to protect data?

[2 marks]

b) The Internet of things (IoT) describes the network of physical objects (also referred to as things) that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the Internet. Things have evolved due to the convergence of multiple technologies, real-time analytics, machine learning, ubiquitous computing, commodity sensors, and embedded systems. Traditional fields of embedded systems, wireless sensor networks, control systems, automation (including home and building automation), and others all contribute to enabling the Internet of things.

    i.   What technological issues may hinder the development of IoT in today's world?

[4 marks]

    ii.   What impact will the proliferation of IoT have on the Kenya's Big Four Agenda? [4 marks]

    iii.   How would the County and National Governments address or respond to cybersecurity concerns about IoT? [4 marks]

QUESTION TWO [20 MARKS]

Kibabii University backbone (also referred to as core) network is a part of a computer network which interconnects networks, providing a path for the exchange of information between different LANs (subnetworks). This backbone ties together diverse networks in the same building, in

different buildings in a campus environment, or over wide areas. The areas considered for connectivity include administration, academia, library, hostels, health among others serving students, teaching and non-teaching staff in the University. Lately, due to COVID-19, learning, teaching and working from home, has brought about poor network performance. You have been consulted to ascertain whether the traffic demand on the internet exceeds capacity, or if the internet does not manage the traffic efficiently leading to congestion. Further, discuss the effects of congestion and congestion control techniques to improve the network performance of the institution. [20 marks]

QUESTION THREE [20 MARKS]

a) Discuss the four (4) functions utilized by Integrated Services Architecture (ISA) to manage congestion and provide QoS transport over IP-based internets, is defined in overall terms in RFC 1633. [7 marks]

b) The simplest approach that can be used by a router is a first-, in, first-out (FIFO) queuing discipline at each output port. As long as the queue is not empty, the router transmits packets from the queue, taking the oldest remaining packet next. Describe the drawbacks of this queuing approach. [6 marks]

c) The networking industry has tried to overcome the drawbacks of FIFO queuing by implementing a number of more complex routing algorithms in routers. These algorithms involve the use of multiple queues at each output port and some method of prioritizing the traffic to provide better service. Discuss these queuing approaches. [7 marks]

QUESTION FOUR [20 MARKS]

a) Why would a Network Engineer for Kibabii University advise University Management to integrate NFV and SDN in their core network backbone? [4 marks]

b) Today most organizations have implemented systems and hosted on the networked environment. The network domains can be made of physical and virtual components, and the performance factors are different when identifying each key performance indicator (KPI). With this in mind, what are the end-to-end KPIs for a network domain?

[6 marks]

c) What kind of changes do you see in the traditional network planning and capacity management processes due to NFV and SDN? [4 marks]

d) What is your opinion on how the performance assurance competitive landscapes will evolve as a result of NFV? Specifically, how will they evolve in terms of assuring the network and service performance domains? [6 marks]

QUESTION FIVE [20 MARKS]

a) What is the difference between a multicast IP packet and a unicast IP packet? [3 Marks]

b) Describe how the following algorithms are implemented in multicast routing protocols available today.

   i)   Multicast OSPF (MOSPF) [3 marks]

   ii)   Protocol-Independent Multicast (PIM) [3 marks]

c) To provide an Internet-wide delivery service, it is necessary to define multicast routing protocols. A multicast routing protocol is responsible for the construction of multicast packet delivery trees and performing multicast packet forwarding. Explain the algorithms that may potentially be employed by multicast routing protocols in the provision of this service. [6 marks]

d) The Distance Vector Multicast Routing Protocol reduces the amount of information routed in a network. What other benefits are gained from the development of a hierarchical version of the DVMRP upon implementation. [6 marks]