UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF INDUSTRIAL TECHNOLOGY

FINAL EXAMINATION

JANUARY 2016 SEMESTER

COURSE CODE	:	JCB 30503
COURSE TITLE	:	INDUSTRIAL COMMUNICATION SYSTEMS
PROGRAMME LEVEL	:	BACHELOR
DATE	:	20 MAY 2016
TIME	:	2.30 PM – 5.30 PM
DURATION	:	3 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. This question paper consists of ONE (1) section.
4. Choose FOUR (4) questions in section A.
5. Please write your answers on the answer booklet provided.
6. Please answer all questions in English only.

THERE ARE 8 PAGES OF QUESTIONS EXCLUDING THIS PAGE.

SECTION A (Total: 100 marks)

INSTRUCTION: Answer FOUR (4) questions ONLY.
Please use the answer booklet provided.

Question 1

(a) Among the Medium, Protocol, Message and Transmission, choose the one that is correctly representing the *information* to be communicated in a data communications system.

(1 mark)

(b) In data communication, this element serves as one of the key elements for a Protocol. It refers to the 'meaning' of each section of bits. It also identifies the way for a particular pattern to be interpreted, and the action be taken based on that interpretation. State the name of the key element.

(1 mark)

(c) Figure 1 illustrates the wiring pin-out information for the standard (T568A) Unshielded Twisted Pair (UTP) cable. In order to obtain a Cross-Over cable, some modifications on the wires' sequence must be done. Re-draw the diagram in Figure 1 to show the wire map for a Cross-Over (T568B) UTP cable.

(4 marks)

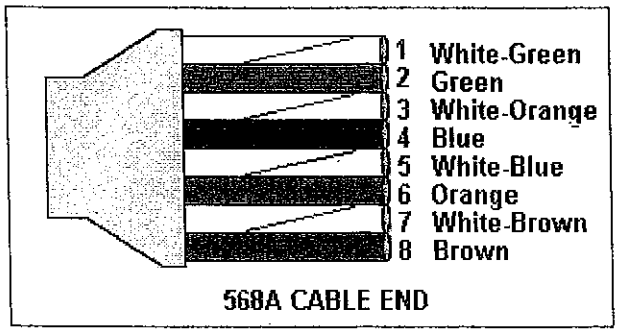

Figure 1: Wiring Pin-Out for Standard (T568A) UTP Cable

(d) The Open Systems Interconnection (OSI) reference model specifies standards with the term 'open' chosen to emphasize the fact that by using these international standards, a system may be defined which is open to all other systems obeying the same standards throughout the world.

i. With the aid of a diagram that shows the ordering of the layers, describe the OSI Seven-Layer model. Write the example or the areas of function for each layer.

(15 marks)

ii. Contrast the OSI model with the TCP/IP reference model.

(4 marks)

Question 2

(a) Satellite systems are a form of microwave radio transmission whereby the transmitter sends the signal up to the satellite. The signal is amplified and then transmitted back to the earth on another frequency. Based on Figure 2 below, indicate the type of orbit for the satellite.

(1 mark)

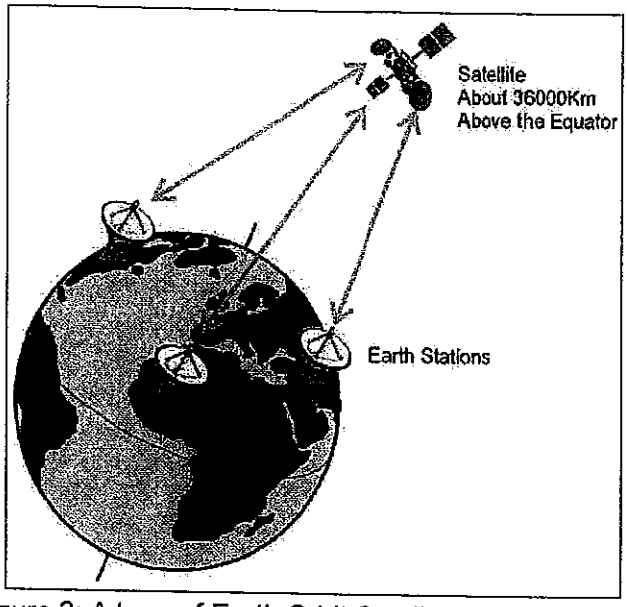

Figure 2: A type of Earth Orbit Satellite Communication

(b) Investigate **TWO (2)** differences between the Wireless Sensor Networks (WSN) and Mobile Ad-Hoc Network (MANETS).

(4 marks)

(c) There are two main approaches possible with fiber-optic cables, namely the Single Mode (or Monomode) Cabling and Multimode Cabling. With the aid of a diagram, differentiate the *Single Mode* and *Multimode* propagation of a fiber optic cable. In your explanation, include also the **TWO (2)** main types of *Multimode* fiber optic propagation.

(6 marks)

(d) TCP/IP is the most widely used protocol in computer networks today, due to the popularity of the internet. Based on the TCP/IP protocol scope, explain the below terms:

i. *Host*

ii. *IP*

iii. *UDP*

(6 marks)

(e) The RS-232 interface standard was issued in the USA in 1969 by the Engineering Department of the Electronic Industries Association (EIA). The RS-232 interface standard was developed for the single purpose of interfacing Data Terminal Equipment (DTE) and Data Circuit Terminating Equipment (DCE) employing serial binary data interchange.

i. State the number of pins or electrical connections for the RS-232 standard interface and indicate the type of *duplex* that it is operating.

(2 marks)

ii. Identify **TWO (2)** types of test equipments used to troubleshoot the RS-232 cable when the data communication link does not function.

(2 marks)

iii. Evaluate on **TWO (2)** limitations for the RS-232 interface standard.

(4 marks)

Question 3

(a) The Network Layer delivers data in the form of a packet from source to destination. There is an indicator in order for the Network Layer to know the source of the packet. Provide the name of the indicator. Give another name of the indicator in the TCP/IP protocol.

(2 marks)

(b) Figure 3 shows the major components of a fiber optic cable. State the name for each of the alphabet *A, B* and *C*.

(3 marks)

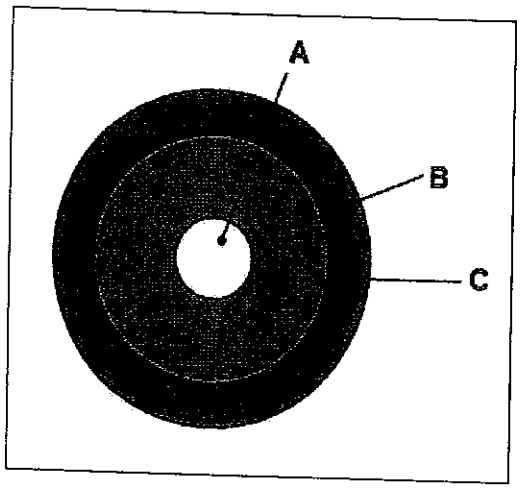

Figure 3: Fiber-optic Cable Components

(c) The fiber optic cable uses 'reflection' to guide light through a channel. Explain on the possibility for this to happen by the nature of light.

(3 marks)

(d) Interpret the word *GPS*. Provide **THREE (3)** functions of a GPS system.

(5 marks)

(e) The Korean and Spanish general managers need to come to an agreement by telephone, but neither speaks each other's language. Further, neither has on hand a translator that can translate straight into the other's language. However, both have English translators on their staff. Draw a diagram similar to the TCP/IP reference model with the telephone line as bottom communication channel and describe the interaction at each level.

(5 marks)

(f) The RS-485-A standard is one of the most versatile of the RS interface standards. It is an extension of RS-422 and allows multiple devices to communicate on a pair of wires.

i. Provide **THREE (3)** types of shielding for an RS-485 installation.

(3 marks)

ii. Examine **TWO (2)** ways that *noise* can be induced into an RS-485 circuit.

(4 marks)

Question 4

(a) Indicate the best and easiest way to check a Cat 5e cable for damage.

(2 marks)

(b) Evaluate **TWO (2)** ways that a Radio propagation distance can be increased in Wireless Sensor Networks.

(2 marks)

(c) Calculate the minimum time required to download 1 million bytes of information by using a 1 MBps modem.

(3 marks)

(d) In setting up a home network that connects with the internet, we need to have an *ISP*. Interpret the term ISP. Up to today, determine **TWO (2)** examples of ISP in Malaysia.

(3 marks)

(e) With the aid of a diagram, illustrate the hardware architecture for Wireless Sensor Motes.

(5 marks)

(f) The Modbus industrial protocol was developed in 1979 to make communication possible between automation devices. Modbus is an application layer (OSI layer 7) messaging protocol that provides client/server communication between devices connected to different types of buses of networks, as in Figure 4.

i. Outline the **FOUR (4)** types of message for this client/server model of Modbus.

(4 marks)

ii. There are no installations that undergo a trouble-free setup. In general, there are **TWO (2)** distinct groups of commonly faced problems and faults that occur in the installation of Modbus equipments in industry. Explain each of them and provide example in your answer for each of them.

(6 marks)

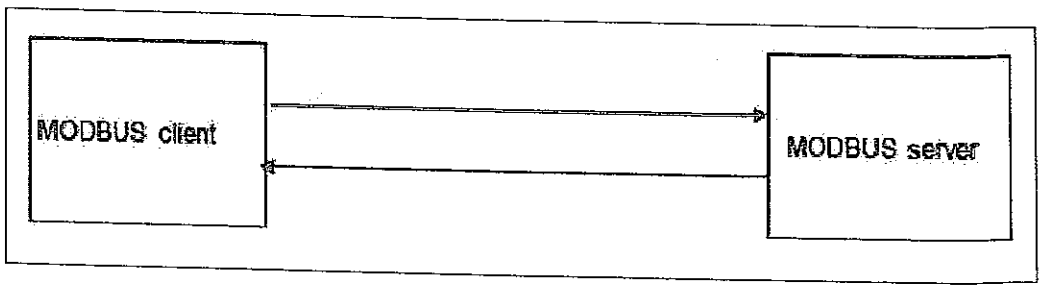

Figure 4: Modbus Client/Server Interaction

Question 5

(a) Describe the Half-Duplex communication.

(2 marks)

(b) Describe the role of radio layer in Bluetooth and determine the distance that a Bluetooth device can go.

(2 marks)

(c) A *Protocol* is needed in a Data Communication. Justify the reasons on that.

(3 marks)

(d) Point out **TWO (2)** common characteristics and **ONE (1)** different characteristic that the TinyOS is having as compared to the traditional OSs (e.g. Microsoft Windows).

(3 marks)

(e) There are various ways that can be performed to test the Fiber Optic cable. The main purpose of the tests is to locate broken fibers. Explain **TWO (2)** ways to locate the broken fibers.

(6 marks)

(f) With the aid of a diagram, explain **THREE (3)** topologies that the Wireless LANs can be configured into. Provide example in your answer.

(9 marks)

END OF EXAMINATION PAPER