



School of Computing Skills

Session: 2019-20 (Summer / Winter Semester)

B. Voc. Program, Fifth Semester,

End-Sem. Examination

ITN

Course Code: 1504

Time: 2 Hours

Course Name: Internet of Things

Max. Marks: 50

Instruction: Read the questions carefully before answering.

Section – A

10X01 = 10 Marks

<p>Q1. MQTT stands for _____</p> <p>a) MQ Telemetry Things b) MQ Transport Telemetry c) MQ Transport Things d) MQ Telemetry Transport</p>	<p>Q2. How many USB ports are present in Raspberry Pi 3?</p> <p>a) 5 b) 2 c) 4 d) 3</p>
<p>Q3. _____ board allows sewn into clothing.</p> <p>a) UNO b) RedBoard c) LilyPad d) Mega</p>	<p>Q4. How power supply done to RPi?</p> <p>a) USB connection b) Internal battery c) Charger d) Adapter</p>
<p>Q5. What is the default user in Debain on Raspberry Pi?</p> <p>a) Default b) User c) Pi d) Root</p>	<p>Q6. What bit processor is used in Pi 3?</p> <p>a) 64-bit b) 32-bit c) 128-bit d) Both 64 and 32 bit</p>
<p>Q7. Do Arduino provides IDE Environment?</p> <p>a) True b) False</p>	<p>Q8. Which is the software or a programming language used for controlling of Arduino?</p> <p>a) Assembly Language b) C Languages c) JAVA d) Any Language</p>
<p>Q9. Which communication protocols are used in IoT?</p> <p>a) HTTP b) MQTT c) CoAP d) all of the mentioned</p>	<p>Q10. How sensors can get connected to the internet?</p> <p>a) Using GSM p) Using Blue Tooth c) Using Wi-Fi d) All of the mentioned</p>



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Section – B

04X04 = 16 Marks

- Q1. What is hardware serial port in Arduino Uno? Which pins are used for hardware serial port in Uno?
- Q2. What is cloud in IoT and what are its uses?
- Q3. What are examples of IoT devices?
- Q4. Write a simple program for Arduino to blink an LED.

Section – C

04X06 = 24 Marks

- Q1. How do you declare multiple software serial ports in Arduino Uno? Give Example.
- Q2. What do you mean by GPS? What kind of data is provided by GPS? What are the applications where GPS can be used?
- Q3. How do you connect SIM808 module to the Arduino board? Explain by drawing a neat diagram including power supply connection.
- Q4. What is software serial in Arduino and why it is used?



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Ans1. D

Ans2. C

Ans3. C

Ans4. A

Ans5. C

Ans6. A

Ans7. A

Ans8. D

Ans9. D

Ans10. D

Ans1. Hardware serial in Uno board is used to communicate between computer and Arduino. This can also be used to communicate with any other device, which supports the serial communication. Digital pins 0 and 1 are used for hardware serial communication in Arduino Uno.

Ans2. IoT Cloud is a platform from that is designed to store and process Internet of Things IoT data. The platform is built to take in the massive volumes of data generated by devices, sensors, websites, applications, customers and partners and initiate actions for real-time responses. For example, wind turbines could adjust their behavior based on current weather data.

Ans3. Consumer connected devices include smart TVs, smart speakers, toys, wearables and smart appliances. Smart meters, commercial security systems and smart city technologies -- such as those used to monitor traffic and weather conditions -- are examples of industrial and enterprise IoT devices.

Ans4.



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```
int ledPin = 13;           // LED connected to digital pin 13
void setup()
{
  pinMode(ledPin, OUTPUT); // sets the digital pin as output
}
void loop()
{
  digitalWrite(ledPin, HIGH); // sets the LED on
  delay(1000);                // waits for a second
  digitalWrite(ledPin, LOW);  // sets the LED off
  delay(1000);                // waits for a second
}
```

Ans1. Serial is used for communication between the Arduino board and a computer or other devices. All Arduino boards have at least one serial port (also known as a UART or USART): Serial. It communicates on digital pins 0 (RX) and 1 (TX) as well as with the computer via USB. Yes it is used while USB communication between computer and Arduino. No separate library is required to use hardware serial. A separate library needs to be included for using the software serial.

Ans2. GPS stands for Global Positioning System. It uses the satellites to acquire the positioning data. There are various kind of data obtained by GPS. The main are, Latitude, Longitude, Speed and Height. To get the positioning data the GPS antenna should be open to the sky.

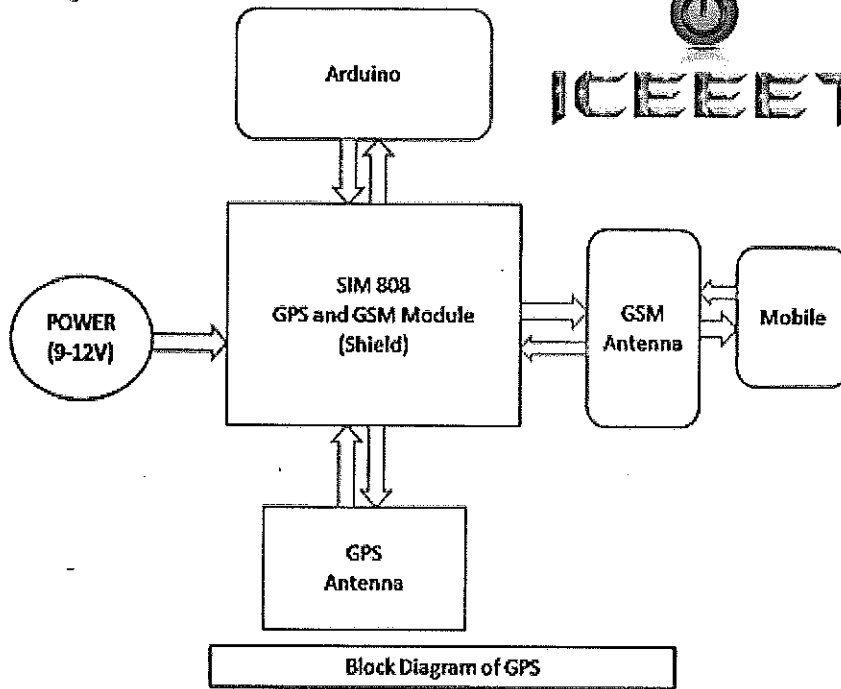
GPS is generally used for real time asset tracking applications. Some of the examples of applications of a GPS device are, Vehicle tracking, pet tracking, asset tracking, person tracking, employee tracking, fleet tracking, drone flying, missile guidance etc.

Ans3. We use the software serial at pin 7 and 8 of Arduino. 12 V power supply is given to both Arduino and SIM808 module. GSM and GPS antennas are attached to the SIM module.

The Tx pin of SIM module is connected to the Rx pin of Arduino and Rx pin of SIM module is connected to Tx pin of Arduino.



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Ans4. Using software serial allows you to create a serial connection on any of the digital i/o pins on the Arduino. This should be used when multiple serial connections are necessary. If only one serial connection is necessary, the hardware serial port should be used. One example is when we connect GSM board like SIM 808 to Arduino we create a software serial because hardware serial is already being used for communication between computer and Arduino. The SoftwareSerial library has been developed to allow serial communication on other digital pins of the Arduino, using software to replicate the functionality (hence the name "SoftwareSerial"). It is possible to have multiple software serial ports with speeds up to 115200 bps.



Registration No.:

School of Computing Skills

Session: 2019-20 (Summer Semester)

B. Voc. Program, I Semester,

End-Sem. Examination

Course Code: ITN1105

Time: 2 Hours

Course Name: Operating System

Max. Marks: 50

Instruction: All questions are compulsory.

Section – A

10X01 = 10 Marks

- Q1. What will happen when a process terminates?
a) **It is removed from all queues**
b) It is removed from all, but the job queue
c) Its process control block is de-allocated
d) Its process control block is never de-allocated
- Q2. What will happen when a process closes the file?
a) per-process table entry is not removed
b) **system wide entry's open count is decremented**
c) all of the mentioned
d) none of the mentioned
- Q3. Which protocol establishes the initial logical connection between a server and a client?
a) **transmission control protocol**
b) user datagram protocol
c) mount protocol
d) datagram congestion control protocol
- Q4. Which of the following scheduling algorithms gives minimum average waiting time?
a) FCFS
b) **SJF**
c) Round Robin
d) Priority
- Q5. What is not an important part of security protection?
a) **Large amount of RAM to support antivirus**
b) Strong passwords
c) Audit log periodically
d) Scan for unauthorized programs in system directories
- Q6. How does an antivirus of today identify viruses?
a) **Previously known patterns**
b) It can detect unknown patterns
c) It can take high priority to increase scanning speed
d) None of the mentioned
- Q7. Which of the following condition is required for a deadlock to be possible?
a) mutual exclusion
b) a process may hold allocated resources while awaiting assignment of other resources
c) no resource can be forcibly removed from a process holding it
d) **all of the mentioned**



Q8. When memory is divided into several fixed sized partitions, each partition may contain

- a) **exactly one process**
- b) at least one process
- c) multiple processes at once
- d) none of the mentioned

Q9. What is Trojan horse?

- a) It is a useful way to encrypt password
- b) It is a user which steals valuable information
- c) **It is a rogue program which tricks users**
- d) It's a brute force attack algorithm

Q10. Buffering is done to _____

- a) cope with device speed mismatch
- b) cope with device transfer size mismatch
- c) maintain copy semantics
- d) **all of the mentioned**

Section – B

04X04 = 16 Marks

Q1. What are different types of kernel? How kernel improves memory performance?

Ans. **Monolithic Kernel.** This kernel type has all required functionality inside the kernel, schedulers, device drivers, memory management etc all in a memory space owned by the kernel. Monolithic kernels typically have the highest data throughput of all kernels and is best used in large servers or job dedicated servers.

MicroKernel. This kernel type uses the minimum set-up required for scheduling, memory management and inter-process communication. This vastly reduces the amount of memory required for kernel use. Microkernels are typically found in real time systems.

Hybrid Kernel. This is a mix between the 2 above. The kernel is larger than micro but smaller than monolithic. The device drivers will be attached to the kernel as required when starting up or running. These kernels are typically found on desktops, your Windows, Mac and Linux OS flavours.

Nanokernel. This kernel type only offers hardware abstraction, there are no services and the kernel space is at a minimum. Nanokernels are also very good for embedded projects.

Exo-Kernel. This kernel is the smallest kernel that I know of. It offers process protection and resource handling and nothing else. The programmer using this kernel is responsible for correctly accessing the device they wish to use.

The linux kernel attempts to optimize RAM utilization, in that it occupies unused RAM with caches. This is done on the basis that unused RAM is wasted RAM.

Q2. What is buffering and how it can improve the performance of a computer system?

Ans. A buffer contains data that is stored for a short amount of time, typically in the computer's memory (**RAM**). The purpose of a buffer is to hold data right before it is used. For example, when you download an audio or video file from the Internet, it may load the first 20% of it into a buffer and then begin to play. While the clip plays back, the computer continually downloads the rest of the clip and stores it in the buffer.

Q3. What is multiprogramming and differentiate with multitasking with suitable example.



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BSU. Multiprogramming is a rudimentary form of parallel processing in which several programs are run at the same time on a uniprocessor. Since there is only one processor, there can be no true simultaneous execution of different programs. Instead, the operating system executes part of one program, then part of another, and so on. To the user it appears that all programs are executing at the same time.

If the machine has the capability of causing an interrupt after a specified time interval, then the operating system will execute each program for a given length of time, regain control, and then execute another program for a given length of time, and so on. In the absence of this mechanism, the operating system has no choice but to begin to execute a program with the expectation, but not the certainty, that the program will eventually return control to the operating system.

The ability to execute more than one *task* at the same time, a task being a program. The terms *multitasking* and *multiprocessing* are often used interchangeably, although multiprocessing implies that more than one CPU is involved.

In multitasking, only one CPU is involved, but it switches from one program to another so quickly that it gives the appearance of executing all of the programs at the same time.

There are two basic types of multitasking: *preemptive* and *cooperative*. In preemptive multitasking, the operating system parcels out CPU *time slices* to each program. In cooperative multitasking, each program can control the CPU for as long as it needs it. If a program is not using the CPU, however, it can allow another program to use it temporarily. OS/2, Windows 95, Windows NT, the Amiga operating system and UNIX use preemptive multitasking.

Q4. What is directory and elaborate about information stored in directory?

Ans. A **directory** is a location for storing files on your computer. Directories are found in a hierarchical file system, such as Linux, MS-DOS, OS/2, and UNIX.

For example of output from the Windows/DOS tree command. It shows all the local and subdirectories (e.g., the "big" directory in the cdn directory). When looking at this overview, the current directory is the root directory of the C: drive. It's called the "root" directory because there is nothing beneath it, and the other directories "branch" off of it. If you are using an operating system with multiple user accounts, the directory may also be referred to as a home directory.

Section – C

04X06 = 24 Marks

Q1. Discuss program threats and system threats in an operating system.

Ans. Operating system's processes and kernel do the designated task as instructed. If a user program made these process do malicious tasks, then it is known as **Program Threats**. One of the common example of program threat is a program installed in a computer which can store and send user credentials via network to some hacker. Following is the list of some well-known program threats.

- **Trojan Horse** – Such program traps user login credentials and stores them to send to malicious user who can later on login to computer and can access system resources.
- **Trap Door** – If a program which is designed to work as required, have a security hole in its code and perform illegal action without knowledge of user then it is called to have a trap door.
- **Logic Bomb** – Logic bomb is a situation when a program misbehaves only when certain conditions met otherwise it works as a genuine program. It is harder to detect.
- **Virus** – Virus as name suggest can replicate themselves on computer system. They are highly dangerous and can modify/delete user files, crash systems. A virus is generally small code embedded in a program. As user accesses the program, the



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virus starts getting embedded in other files/ programs and can make system unusable for user.

System threats refers to misuse of system services and network connections to put user in trouble. System threats can be used to launch program threats on a complete network called as program attack. System threats creates such an environment that operating system resources/ user files are misused. Following is the list of some well-known system threats.

- **Worm** – Worm is a process which can choked down a system performance by using system resources to extreme levels. A Worm process generates its multiple copies where each copy uses system resources, prevents all other processes to get required resources. Worms processes can even shut down an entire network.
- **Port Scanning** – Port scanning is a mechanism or means by which a hacker can detects system vulnerabilities to make an attack on the system.
- **Denial of Service** – Denial of service attacks normally prevents user to make legitimate use of the system. For example, a user may not be able to use internet if denial of service attacks browser's content settings.

Q2. What is security in operating systems? Describe different security model types for operating system?

Ans. Security refers to providing a protection system to computer system resources such as CPU, memory, disk, software programs and most importantly data/information stored in the computer system. If a computer program is run by an unauthorized user, then he/she may cause severe damage to computer or data stored in it. So a computer system must be protected against unauthorized access, malicious access to system memory, viruses, worms etc.

Different types of security model types are:

<p>Type A</p> <p>Highest Level. Uses formal design specifications and verification techniques. Grants a high degree of assurance of process security.</p>
<p>Type B</p> <p>Provides mandatory protection system. Have all the properties of a class C2 system. Attaches a sensitivity label to each object. It is of three types.</p> <ul style="list-style-type: none">• B1 – Maintains the security label of each object in the system. Label is used for making decisions to access control.• B2 – Extends the sensitivity labels to each system resource, such as storage objects, supports covert channels and auditing of events.• B3 – Allows creating lists or user groups for access-control to grant access or revoke access to a given named object.
<p>Type C</p> <p>Provides protection and user accountability using audit capabilities. It is of two types.</p> <ul style="list-style-type: none">• C1 – Incorporates controls so that users can protect their private information and keep other users from accidentally reading / deleting their data. UNIX versions are mostly C1 class.



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C2 – Adds an individual-level access control to the capabilities of a C1 level system.

Type D

Lowest level. Minimum protection. MS-DOS, Window 3.1 fall in this category.

Q3. Calculate the average waiting time and turn around time for following data according to Round robin method:

Process	Arrival Time	Burst Time
P1	0	10
P2	1	4
P3	2	5
P4	3	3

Ans. Turn Around Time = Completion Time - Arrival Time

Waiting Time = Turn Around Time - Burst Time

Q4. Write short notes on:

- Semaphores
- Deadlock

Ans.(a) Semaphores are integer variables that are used to solve the critical section problem by using two atomic operations, wait and signal that are used for process synchronization.

The definitions of wait and signal are as follows:

1. Wait

The wait operation decrements the value of its argument S, if it is positive. If S is negative or zero, then no operation is performed.

2. Signal

The signal operation increments the value of its argument S.

There are two main types of semaphores i.e. counting semaphores and binary semaphores. Details about these are given as follows:

1. Counting Semaphores

These are integer value semaphores and have an unrestricted value domain. These semaphores are used to coordinate the resource access, where the semaphore count is the number of available resources. If the resources are added, semaphore count automatically incremented and if the resources are removed, the count is decremented.



The binary semaphores are like counting semaphores but their value is restricted to 0 and 1. The wait operation only works when the semaphore is 1 and the signal operation succeeds when semaphore is 0. It is sometimes easier to implement binary semaphores than counting semaphores.

(b) **Deadlock:** A deadlock happens in operating system when two or more processes need some resource to complete their execution that is held by the other process.

A deadlock can be detected by a resource scheduler as it keeps track of all the resources that are allocated to different processes. After a deadlock is detected, it can be resolved using the following methods:

1. All the processes that are involved in the deadlock are terminated. This is not a good approach as all the progress made by the processes is destroyed.
2. Resources can be preempted from some processes and given to others till the deadlock is resolved.

It is very important to prevent a deadlock before it can occur. So, the system checks each transaction before it is executed to make sure it does not lead to deadlock. If there is even a slight chance that a transaction may lead to deadlock in the future, it is never allowed to execute.

It is better to avoid a deadlock rather than take measures after the deadlock has occurred. The wait for graph can be used for deadlock avoidance. This is however only useful for smaller databases as it can get quite complex in larger databases.