Subject: Embedded System (22532)

Chapter No.	Name of chapter	Marks With Option
1	Introduction to embedded systems	16
2	Programming using embedded “C”	26
3	Communication protocols and standards	16
4	Interfacing input & output devices	26
5	Real Time Operating System	18
	Total Marks :	102

SAMPLE BOARD THEORY PAPER PATTERN FOR E&TC

Q.1		**Attempt any FIVE** **5*2=10**
	a)	Compare RISC and CISC architecture
	b)	Draw architecture of RTOS
	c)	Write a program to gate a byte from P1 wait for half second and then send it to port 2
	d)	Draw the interfacing diagram of LED with 8051
	e)	Differentiate between general OS and RTOS
	f)	Differentiate between Asynchronous and asynchronous transmission
	g)	State the features of PCI
Q.2		**Attempt any THREE** **3*4=12**
	a)	State applications of PIC,AVR,ARM & 8051 µc
	b)	Write the program to generate a frequency of 1kHZ on port pin P2.7
	c)	Draw & explain the format of I2C protocol
	d)	Draw the interfacing diagram of stepper motor with 8051 and also write C program to rotate motor clockwise
Q.3		**Attempt any THREE** **3*4=12**
	a)	A key is connected at p3.2 & 8 LED's are connected to P1 write 'c' program to display 0 to 255 in binary on LED's when a key is processed
	b)	Explain following design metrics of embedded system- a) NRE Cost b) Unit Cost c) c) Memory d) operating system
	c)	Explain what is watchdog timer and semaphore?
	d)	Draw the pin out diagram of RS-232. State the function of each pin
Q.4		**Attempt any FOUR** **3*4=12**

	a)	Explain features of USB
	b)	Write a 'c' program to transfer 'yes' serially at baud rate 9600 continuously used 8 bit data & 1 stop bit.
	c)	Draw the interfacing diagram of 7 segment display with 8051.
	d)	Explain the following characteristics of RTOS- a. Scalability b. Predictability c. Reliability d. Consistency
	e)	Write a C program to make bulb ON/OFF using relay. Also draw interfacing diagram.
Q.5		**Attempt any TWO 2*6=12**
	a)	Classify embedded system in detail-6m
	b)	Assume that 1Hz external clock is fed to timer P3.5 write a program for counter 1 in mode 2 to display the state of TL1 of P1
	c)	Draw the interfacing diagram of 4x4 keypad with 8051. Also write c program to display the key on LCD
Q.6		**Attempt any TWO 2*6=12**
	a)	Draw the interfacing diagram of DAC with 8051. Also write c-program togenerate triangular wave by DAC 0808
	b)	Write a program that continuously gets single bit of data from P1.7 and send it to P1.0 while simultaneously create a square wave of 200µs period on P2.5
	c)	Explain various task scheduling algorithms in RTOS

CLASS TEST - I

PAPER PATTERN

Syllabus:-

Unit No.	Name of the Unit	Course Outcome (CO)
1	**Introduction to embedded systems**	**CO-532.1**
2	**Programming using embedded "C"**	**CO-532.2**
3	**Communication protocols and standards**	**CO-532.3**

Q.1	**Attempt any FOUR** **4*2=8Marks**	Course Outcome (CO)
a)	Differentiate between RISC & CISC.	CO-532.1
b)	Write Applications of PIC & AVR.	CO-532.1
c)	Write a C program to add 55H & 66H send result to port 1	CO-532.2
d)	Draw block diagram of embedded system.	CO-532.1
e)	Differentiate between Synchronous & Asynchronous Communication.	CO-532.3
f)	Find the contents of port after execution of following code:	CO-532.2
Q.2	**Attempt any THREE** **3*4=12 Marks**	
a)	Write a C program to monitor bit P1.5. If it is high send 55h to P0 otherwise send AAH to P2	CO-532.2
b)	Draw pin diagram of RS-232. State the function of all pins.	CO-532.3
c)	Explain any four design metrics of embedded system.	CO-532.1
d)	Write a C program to generate square wave of 5kHz on P1.5 continuously.	CO-532.2
e)	Explain I^2 C Protocol.	CO-532.3
f)	Write a program to find 2's Complement of 56h.Store the result in P1.	CO-532.2

CLASS TEST - II

PAPER PATTERN

Syllabus:-

Unit No.	Name of the Unit	Course Outcome (CO)
3	**Communication protocols and standards**	CO-532.3
4	**Interfacing input & output devices**	CO-532.4
5	**Real Time Operating System**	CO-532.5

Q.1	**Attempt any FOUR** 4*2=8Marks	Course Outcome (CO)
a)	Real Time Operating System	CO-532.5
b)	Real Time Operating System	CO-532.5
c)	Communication protocols and standards	CO-532.3
d)	Interfacing input & output devices	CO-532.4
e)	Communication protocols and standards	CO-532.3
f)	Interfacing input & output devices	CO-532.4
Q.2	**Attempt any THREE** 3*4=12 Marks	
a)	Interfacing input & output devices	CO-532.4
b)	Real Time Operating System	CO-532.5
c)	Communication protocols and standards	CO-532.3
d)	Interfacing input & output devices	CO-532.4

COURSE OUTCOME (CO)

COURSE: - EMBEDDED SYSTEM (22532) **PROGRAMME: - E&TC**

CO.NO	Course Outcome
CO-532.1	Select the relevant microcontrollers for various industrial applications
CO-532.2	Use embedded C programming to maintain embedded systems
CO-532.3	Interpret the communication standards of embedded system
CO-532.4	Develop basic applications using embedded systems
CO-532.5	Interpret features of Real Time Operating system

1. Introduction to Embedded Systems

Position in Question Paper **Total Marks-12**

Q.1. a) 2-Marks.
Q.1. c) 2-Marks.
Q.2. a) 4-Marks.
Q.3. a) 4-Marks.
Q.4. b) 4-Marks

Descriptive Question

1. Compare RISC and CISC architecture.
2. State applications of PIC, AVR, ARM & 8051 µc.
3. Explain block diagram of embedded system.
4. Classify embedded system in detail.
5. Explain following design metrics of embedded system-
   a) NRE Cost
   b) Unit Cost
   c) Memory
   d) Operating system
6. Write features of AVR &PIC controllers.
7. List applications of Harvard architecture.

MCQ Question

(Total number of Question=Marks*3=12*3=36)

Note: Correct answer is marked with **bold.**

1. A Microcontroller at-least should consist of _____ .
   a) RAM, ROM, I/O devices, serial and parallel ports and timers
   b) CPU, RAM, I/O devices, serial and parallel ports and timers
   c) CPU, RAM, ROM, I/O devices, serial and parallel ports and timers
   d) CPU, ROM, I/O devices and timers

2. Unlike microprocessors, microcontrollers make use of batteries because they have _____ .
   a) High power dissipation
   b) Low power consumption
   c) Low voltage consumption
   d) Low current consumption

3. Microcontrollers classified on the basis of internal bus width _____ .
   a) 4,8,16,32 bits
   b) 9,12,16,24 Bits
   c) 4,12,16,64 Bits
   d) 1,2,3,4 bits

4. CISC and RISC means _____
   a) Complete Instruction Set Counter, Reduced Instruction Set Computer
   b) Complex Instruction Set Computer, Reduced Instruction Set Computer
   c) Complex Instruction Set Computer, Reliable Instruction Set Computer
   d) Complete Instruction Set Computer, Reliable Instruction Set Counter

5. _____ is the most appropriate criterion for choosing the right Microcontroller of our choice.
   a) Speed
   b) Availability
   c) Cost
   d) All of Above

6. Television set or Air conditioner can be categorized as _____
   a) Small Scale Embedded System
   b) Large Scale Embedded System
   c) Stand Alone Embedded System
   d) Network Embedded System

7. The bit size of the 89C51 Microcontroller is _____
   a) 12 Bits
   b) 10 Bits
   c) 8 Bits
   d) 24 Bits

8. Von neumann architecture has _____
   a) Separate Data & Program Memory
   b) Common Data & Program Memory
   c) Two data Memory
   d) Two Program Memory

9. Out of following is not a type of Microcontroller:
   a) PIC
   b) AVR
   c) ARM
   d) PLA

10. Which are the processors based on RISC?
   a) **SPARC**
   b) 80386
   c) MC68030
   d) MC68020

11. What is 80/20 rule?
   a) **80% instruction is generated and 20% instruction is executed**
   b) 80% instruction is executed and 20% instruction is generated
   c) 80%instruction is executed and 20% instruction is not executed
   d) 80% instruction is generated and 20% instructions are not generated

12. Which is the first company who defined RISC architecture?
   a) Intel
   b) **IBM**
   c) Motorola
   d) MIPS

13. Which of the following processors execute its instruction in a single cycle?
   a) 8086
   b) 8088
   c) 8087
   d) MIPS R2000

14. How is memory accessed in RISC architecture?

a) **load and store instruction** c) memory instruction
b) opcode instruction d) bus instruction

15. Which of the following statements are true for von Neumann architecture?
a) **shared bus between the program memory and data memory**
b) separate bus between the program memory and data memory
c) external bus for program memory and data memory
d) external bus for data memory only

16. Which company further developed the study of RISC architecture?
a) Intel c) **university of Berkeley**
b) Motorola d) MIPS

17. Which of the following is an 8-bit RISC Harvard architecture?
a) **AVR** c) 8051
b) Zilog80 d) Motorola 6800

18. Which of the following processors has CISC architecture?
a) AVR c) Blackfin
b) Atmel d) **Zilog Z80**

19. Which architecture is followed by general purpose microprocessors?
a) Harvard architecture c) None of the mentioned
b) **Von Neumann architecture** d) All of the mentioned

20. Which of the following allows the reuse of the software and the hardware components?
a) **platform based design** c) peripheral design
b) memory design d) input design

21. Which of the following is the design in which both the hardware and software are considered during the design?
a) platform based design c) **software/hardware codesign**
b) memory based design d) peripheral design

22. API stand for?
a) address programming interface c) accessing peripheral through interface
b) **application programming interface** d) address programming interface

23. What are the essential tight constraint/s related to the design metrics of an embedded system?
a) Ability to fit on a single chip c) Fast data processing
b) Low power consumption **d) All of the above**

24. Which characteristics of an embedded system exhibit the responsiveness to the assortments or variations in system's environment by computing specific results for real-time applications without any kind of postponement?
a) Single-functioned Characteristic b) Tightly-constraint Characteristics
c) **Reactive & Real time Characteristics** d) All of the above

25. Which of the following is a process of analyzing the set of possible designs?
a) **design space exploration** c) compilation
b) scheduling d) hardware/software partitioning

26. Which of the following is a meet-in-the-middle approach?
a) peripheral based design b) **platform based design**

c) memory based design
d) processor design

27. Which one of the following offers CPUs as integrated memory or peripheral interfaces?
a) **Microcontroller**
b) Microprocessor
c) Embedded system
d) Memory system

28. How many bits does an MC6800 family have?
a) 16
b) 32
c) 4
d) 8

29. How is the protection and security for an embedded system made?
a) OTP
b) **IPR**
c) Memory disk security
d) Security chips

30. In real time operating system _____
a) all processes have the same priority
b) a task must be serviced by its deadline period
c) process scheduling can be done only once
d) kernel is not required

31. Hard real time operating system has _____ jitter than a soft real time operating system.
a) **Less**
b) More
c) Equal
d) none of the mentioned

32. For real time operating systems, interrupt latency should be _____
a) **Minimal**
b) Maximum
c) Zero
d) dependent on the scheduling

33. In rate monotonic scheduling _____
a) shorter duration job has higher priority
b) longer duration job has higher priority
c) priority does not depend on the duration of the job
d) none of the mentioned

34. Time duration required for scheduling dispatcher to stop one process and start another is known as _____
a) process latency
b) **dispatch latency**
c) execution latency
d) interrupt latency

35. The _____ Operating System pays more attention to the meeting of the time limits.
a) Network
b) Distributed
c) Online
d) Real-time

36. Which scheduling amount of CPU time is allocated to each process?
a) equal share scheduling
b) none of the mentioned
c) earliest deadline first scheduling
d) **proportional share scheduling**

2. Programming using embedded "C"

Position in Question Paper Total Marks-16

Q.1. b) 2-Marks.
Q.1. d) 2-Marks
Q.2. c) 4-Marks.
Q.3. b) 4-Marks.
Q.4. c) 4-Marks.
Q.5. b) 4-Marks.
Q.6. b) 4-Marks

Descriptive Question

1. A key is connected at p3.2 & 8 LED's are connected to P1 write 'c' program to display 0 to 255 in binary on LED's when a key is processed.
2. Write a program to gate a byte from P1 wait for half second and then send it to port 2.
3. Write a program to subtract 23H from 74H store the result at P1.
4. Write the program to generate a frequency of 1 kHz on port pin P2.7.
5. Assume that 1Hz external clock is fed to timer P3.5 write a program for counter 1 in mode 2 to display the state of TL1 of P1.
6. Write a 'c' program to transfer 'yes' serially at baud rate 9600 continuously used 8bit data & 1 stop bit.
7. Write a program that continuously gets single bit of data from P1.7 and send it to P1.0 while simultaneously create a square wave of 200µs period on P2.5.

MCQ Question

(Total number of Question=Marks*3=16*3=48)

Note: Correct answer is marked with **bold.**

1. Number of I/O ports in the 89C51 Microcontroller are _____
   a) 7 Ports
   c) 2 Ports
   b) 4 Ports
   d) Ports
2. If we push data onto the stack then the stack pointer _____
   a) increases with every push
   c) increases & decreases with every push
   b) decreases with every push
   d) none of the mentioned
3. The number of Timers/ Counters in 8051 Microcontroller are _____
   a) 1
   c) 4
   b) 2
   d) 5
4. The interrupt with the lowest priority
   a) External interrupt 0 (IE0)
   c) Reset
   b) Timer interrupt 1 (TF1)
   d) Serial port Interrupt
5. The serial communication is used for _____
   a) Short distance communication
   b) Long distance communication
   c) Short and long distance communication
   d) Communication for a certain range of distance
6. _____ is the correct order of interrupt priority that is set after a controller gets reset.
   a) TxD/RxD > T1 > T0 >EX1 > EX0
   c) EX0 > T0 > EX1 >T1> TxD/RxD
   b) TxD/RxD < T1 < T0<EX1 < EX0
   d) EX0 < T0 < EX1 < T1 < TxD/RxD
7. EA bit of 8051 Microcontroller is used to _____
   a) enable or disable external interrupts
   c) enable or disable all the interrupts
   b) enable or disable internal interrupts
   d) none of the mentioned
8. Choose a correct statement. Unsigned Float var = 3.5 + 4.5
   a) var = 8.0
   c) var = 7
   b) var = 8
   d) var = 0.0
9. The loop which is guaranteed to execute at least one time
   a) for
   c) do while
   b) while
   d) None of the above
10. The bit must be set in TMOD register in order to use Timer / Counter as counter is __
   a) C / T
   c) M1
   b) Gate
   d) M0

11. To enable / disable interrupts _____ register is to control
a) IE c) TMOD
b) IP d) TCON

12. Which of the following are header files?
a) **#include** c) struct()
b) file d) proc()

13. Which is the standard C compiler used for the UNIX systems?
a) simulator c) **cc**
b) compiler d) sc

14. Which of the following is also known as loader?
a) locater c) assembler
b) **linker** d) compiler

15. Which command takes the object file and searches library files to find the routine calls?
a) simulator c) debugger
b) emulator **d) linker**

16. What is the counting rate of a machine cycle in correlation to the oscillator frequency for timers?
a) 1 / 10 c) 1 / 15
b) **1 / 12** d) 1 / 20

17. Which special function register play a vital role in the timer/counter mode selection process by allocating the bits in it?
a) **TMOD** c) SCON
b) TCON d) PCON

18. How many machine cycle/s is / are executed by the counters in 8051 in order to detect '1' to '0' transition at the external pin?
a) One c) Four
b) **Two** d) Eight

19. Which bit must be set in TCON register in order to start the 'Timer 0' while operating in 'Mode 0'?
a) **TR0** c) IT0
b) TF0 d) IE0

20. Who controls the timer1 especially when it is configured as a timer in mode'0',where gate and TR1 bits are attributed to be '1" in TMOD register ?
a) TR1 c) TF1
b) **External input at (INT1)** d) All of the above

21. Which timer mode exhibit the necessity to generate the interrupt by setting EA bit in

IE enhancing the program counter to jump to another vector location ?

a) Mode 0
b) **Mode 1**
c) Mode 2
d) Mode 3

22. What is the clock source for the timers?

a) some external crystal applied to the micro-controller for executing the timer
b) **from the crystal applied to the micro-controller**
c) through the software
d) through programming

23. What is the frequency of the clock that is being used as the clock source for the timer?

a) some externally applied frequency f
b) controller's crystal frequency f
c) **controller's crystal frequency /12**
d) externally applied frequency/12

24. What is the function of the TMOD register?

a) **TMOD register is used to set various operation modes of timer/counter**
b) TMOD register is used to load the count of the timer
c) Is the destination or the final register where the result is obtained after the operation of the timer
d) Is used to interrupt the timer

25. What is the maximum delay that can be generated with the crystal frequency of 22 MHz?

a) 2978.9 sec
b) 0.011 msec
c) 11.63 sec
d) 2.97 msec

26. Auto reload mode is allowed in which mode of the timer?

a) Mode 0
b) Mode 1
c) **Mode 2**
d) Mode 3

27. Find out the roll over value for the timer in Mode 0, Mode 1 and Mode 2?

a) 00FFH,0FFFH,FFFFH
b) 1FFFH,0FFFH,FFFFH
c) **1FFFH,FFFFH,00FFH**
d) 1FFFH,00FFH,FFFFH

28. If Timer 0 is to be used as a counter, then at what particular pin clock pulse need to be applied?

a) P3.3
b) **P3.4**
c) P3.5
d) P3.6

29. In the instruction "MOV TH1,#-3", what is the value that is being loaded in the TH1 register?

a) 0xFCH
b) 0xFBH
c) **0xFDH**
d) 0xFEH

30. TF1, TR1, TF0, TR0 bits are of which register?

a) TMOD
c) **TCON**
b) SCON
d) SMOD

31. Which of the following helps in the generation of waveforms?
a) timer
c) outputs
b) inputs
d) memory

32. Which bit size determines the slowest frequency?
a) counter size
c) counter
b) pre-scalar value
d) timer

33. Which bit size determines the maximum value of the counter-derived period?
a) counter size
c) bit size
b) pre-scalar value
d) byte size

34. Which of the following is mode 0 in 8253?
a) interrupt on start count
c) interrupt on terminal count
b) interrupt for wait statement
d) no interrupt

35. 6. Which determines the mode 1 in the Intel 8253?
a) interrupt on terminal count
c) rate generator
b) programmable one-shot
d) square wave rate generator

37. Which mode of 8253 can provide pulse width modulation?
a) programmable one-shot
c) software triggered strobe
b) square wave rate generator
d) hardware triggered strobe

38. Which of the following can be used for long distance communication?
a) I2C
c) SPI
b) Parallel port
d) RS232

39. Which of the following can affect the long distance communication?
a) clock
c) inductor
b) resistor
d) capacitor

40. Which are the serial ports of the IBM PC?
a) COM1
c) COM1 and COM2
b) COM4 and COM1
d) COM3

41. Which of the following have an asynchronous data transmission?
a) SPI
c) Parallel port
b) RS232
d) I2C

42. In 8051 which interrupt has highest priority?
a) IE1
c) IE0
b) TF0
d) TF1

43. If the __ pin is ___ , then we have the option of using the ____ ROM or EPROM together with _____ memory and devices.

a) EA, high, internal, external
c) EA, high, external, internal
b) EA, low, internal, external
d) EA, low, external, internal

44. The function of watchdog timer?

a) The watchdog Timer is an external timer that resets the system if the software fails to operate properly

b) The watchdog Timer is an internal timer that sets the system if the software fails to operate properly.

c) The watchdog Timer is an internal timer that resets the system if the software fails to operate properly.

d) None of them

45. Serial port interrupt is generated, if ____ bits are set

a) IE
c) IP, TI
b) RI, IE
d) RI, TI

46. Which of the following is of bit operation?

a) SP
c) TMOD
b) P2
d) SBUF

3. Communication Standards & Protocols

Position in Question Paper Total Marks-21

Q.1. f) 2-Marks.
Q.1. e) 2-Marks.
Q.2. a) 4-Marks.
Q.3. c) 4-Marks.
Q.4. d) 4-Marks.
Q.5. e) 6-Marks.

Descriptive Question

1. Difference between synchronous & asynchronous data transmission.
2. Draw pin diagram of RS 232& state function of each pin.
3. Draw the format if I2C protocol & explain.
4. State features of USB.
5. State the features of Zigbee.
6. Differentiate between IR & Bluetooth.
7. State the features of PCI.
8. Describe format of CAN bus.

MCQ Question

(Total number of Question=Marks*3=12*3=36)

Note: Correct answer is marked with **bold.**

1. The loop which is guaranteed to execute at least one time
   a) for
   c) do while
   b) while
   d) None of the above
2. The bit must be set in TMOD register in order to use Timer / Counter as counter is _____.
   a) C / T
   c) M1
   b) Gate
   d) M0
3. To enable / disable interrupts _____ register is to control.
   a) IE
   c) TMOD
   b) IP
   d) TCON
4. _____ communication is faster among following.
   a) Asynchronous Serial
   c) Parallel
   b) Synchronous Serial
   d) None of above
5. In RS-232 standard, DB-9 connector has _____ pins.
   a) 7
   c) 9
   b) 8
   d) 10
6. Converting CMOS level to TTTL level and vice versa which IC is used?
   a) RS 232
   c) L293D
   b) Max 232
   d) ULN 2008
7. Start bit and Stop bits are added in which of following communication protocol?
   a) Synchronous Serial
   c) Parallel
   b) Asynchronous Serial
   d) None of above
8. Line used to receive data from modem to computer is _____.
   a) Data Set Ready
   c) Clear To Send
   b) Signal Ground
   d) Receive Data
9. The serial communication is
   a) cheaper communication
   c) slow process of communication
   b) requires less number of conductors
   d) all of the mentioned
10. The serial communication is used for
   a) short distance communication
   b) long distance communication
   c) short and long distance communication
   d) communication for a certain range of distance

11. The number of bits transmitted or received per second is defined as
a) Transmission rate
c) transceiver rate
b) reception rate
d) baud rate

12. The task of converting the byte into serial form and transmitting it bit by bit along with start, stop and parity bits is carried out by
a) reception unit
c) transmission unit
b) serial communication unit
d) all of the mentioned

13. What does SPI stand for?
a) serial parallel interface
c) sequential peripheral interface
b) serial peripheral interface
d) sequential port interface

14. Which allows the full duplex synchronous communication between the master and the slave?
a) SPI
c) I2C
b) serial port
d) parallel port

15. If two interrupts, of higher priority and lower priority occur simultaneously, then the service provided is for
a) interrupt of lower priority
c) both the interrupts
b) interrupt of higher priority
d) none of the mentioned

16. Two wire interface is also called as _____
a) UART
c) I2C
b) SPI
d) USART

17. SDA is having a _____transition when the clock line SCL is high.
a) high to low
c) low to low
b) low to high
d) high to high

18. Inter Integrated Circuit is a _____
a) Single master, single slave
c) Single master, multi slave
b) Multi master, single slave
d) Multi master, multi slave

19. What is the speed of I2C bus?
a) 100 kbits/s
c) 75 kbits/s
b) 10 kbits/s
d) 100 kbits/s and 10 kbits/s

20. Master transmits means _____
a) Master node is sending data to a slave
b) Master node is receiving data from slave
c) Slave node is transmitting data to master
d) Slave node is sending data to master

21. Who sends the start bit?
a) Master receive
b) Master transmit

c) Slave transmit
d) Slave receive

22. What is the speed for fast mode of I2C?
a) 100 kbit/s
c) 150 kbit/s
b) 400 kbit/s
d) 200 kbit/s

23. Which company developed I2C?
a) Intel
c) Phillips
b) Motorola
d) IBM

24. Which of the following is the most known simple interface?
a) I2C
c) Parallel port
b) Serial port
d) SPI

25. Which are the two lines used in the I2C?
a) SDA and SPDR
c) SDA and SCL
b) SPDR and SCL
d) SCL and status line

26. Which pin provides the reference clock for the transfer of data?
a) SDA
c) SPDR
b) SCL
d) Interrupt pin

27. The transfer rate, when the USB is operating in low-speed of operation is _____
a) 5 Mb/s
c) 2.5 Mb/s
b) 12 Mb/s
d) 1.5 Mb/s

28. The USB device follows _____ structure.
a) List
c) Hash
b) Huffman
d) Tree

29. A USB pipe is a _____ channel.
a) Simplex
c) Full-Duplex
b) Half-Duplex
d) Both Simplex and Full-Duplex

30. The type/s of packets sent by the USB is/are _____
a) Data
c) Control
b) Address
d) Both Data and Control

31. Bluetooth is the wireless technology for _____
a) Local area network
c) metropolitan area network
b) personal area network
d) wide area network

32. Bluetooth uses _____
a) frequency hopping spread spectrum
b) orthogonal frequency division multiplexing
c) time division multiplexing
d) channel division multiplexing

33. Unauthorised access of information from a wireless device through a bluetooth connection is called _____

a) bluemaking
c) bluestring
b) bluesnarfing
d) bluescoping

34. Bluetooth transceiver devices operate in _____ band.

a) 2.4 GHz ISM
c) 2.6 GHz ISM
b) 2.5 GHz ISM
d) 2.7 GHz ISM

35. Bluetooth supports _____

a) point-to-point connections
b) point-to-multipoint connection
c) both point-to-point connections and point-to-multipoint connection
d) multipoint to point connection

36. Which of the following specifies a set of media access control (MAC) and physical layer specifications for implementing WLANs?

a) IEEE 802.16
c) IEEE 802.11
b) IEEE 802.3
d) IEEE 802.15

4. Interfacing Input & Output Devices

Position in Question Paper **Total Marks-18**

Q.1. e) 2-Marks.
Q.1. d) 2-Marks.
Q.2. d) 4-Marks.
Q.4. a) 4-Marks.
Q.6. d) 6-Marks.

Descriptive Question

1. Draw the interfacing diagram of LED with 8051.
2. Write a C program to make bulb ON/OFF using relay. Also draw interfacing diagram.
3. Draw the interfacing diagram of 7 segment display with 8051.
4. Draw the interfacing diagram of stepper motor with 8051 and also write C program to rotate motor clockwise.
5. Draw interfacing diagram of 4*4 keypad with 8051. Also write the program to display pressed key on LCD.
6. Draw the interfacing diagram of DAC with 8051. Also write C program to generate triangular wave using DAC.

MCQ Question

(Total number of Question=Marks*3=18*3=54)

Note: Correct answer is marked with **bold.**

1. Each port line of a port can individually source a current of upto
   a) 0.2 mA
   c) 0.5 mA
   b) 0.25 mA
   d) 0.75 mA

2. The number of TTL inputs that can be sinked by the port 0 when a logic 0 is sent to a port line as an output port is
   a) 2
   c) 6
   b) 4
   d) 8

3. The open drain bidirectional (input or output) port with internal pullups is
   a) Port 0
   c) Port 2
   b) Port 1
   d) Port 3

4. If the EA(active low) signal is grounded then the execution
   a) Directly start from main memory
   b) directly start from 16 bit address in main memory
   c) directly start from 16 bit address in program memory
   d) directly start from RAM

5. When the port lines of a port are to be used as input lines then the value that must be written to the port address is
   a) F0H
   c) FFH
   b) 0FH
   d) 00H

6. Port 1 lines are used during programming of
   a) external EPROM and EEPROM
   c) internal ROM and RAM
   b) external ROM and RAM
   d) internal EPROM and EEPROM

7. How many rows and columns are present in a 16*2 alphanumeric LCD?
   a) rows=2, columns=32
   c) rows=16, columns=16
   b) rows=16, columns=2
   d) rows=2, columns=16

8. How many data lines are there in a 16*2 alphanumeric LCD?
   a) 16
   c) 1
   b) 8
   d) 0

9. Which pin of the LCD is used for adjusting its contrast?
   a) pin no 1
   c) pin no 3
   b) pin no 2
   d) pin no 4

10. For writing commands on an LCD, RS bit is
   a) set
   b) reset

c) set & reset
d) none of the mentioned

11. Which command of an LCD is used to shift the entire display to the right?

a) 0x1C
c) 0x05
b) 0x18
d) 0x07

12. Which command is used to select the 2 lines and 5*7 matrix of an LCD?

a) 0x01
c) 0x0e
b) 0x06
d) 0x38

13. Which of the following step/s is/are correct for sending data to an LCD?

a) set the R/W bit
c) set the RS bit
b) set the E bit
d) all of the mentioned

14. Which of the following step/s is/are correct to perform reading operation from an LCD?

a) low to high pulse at E pin
b) R/W pin is set high
c) low to high pulse at E pin & R/W pin is set high
d) none of the mentioned

15. Which instruction is used to select the first row first column of an LCD?

a) 0x08
c) 0x80
b) 0x0c
d) 0xc0

16. The RS pin is _____ for an LCD.

a) input
c) input & output
b) output
d) none of the mentioned

17. Which of the following steps detects the key in a 4*4 keyboard matrix about the key that is being pressed?

a) masking of bits
b) ensuring that initially, all keys are open
c) checking that whether the key is actually pressed or not
d) all of the mentioned

18. What is described by this command: CJNE A,#00001111b, ROW1

a) it masks the bit and then jumps to the label where ROW1 is written
b) it makes the value of the accumulator 0FH and then jumps at the address where ROW1 label is written
c) it compares the value of the accumulator with 0FH and jumps to the location where ROW1 label is there if the value becomes equal
d) it compares the value of the accumulator with 0FH and jumps to the location where ROW1 label is there if the value is not equal

19. To detect that in which column, the key is placed?

a) we can mask the bits and then check it
b) we can rotate the bits and then check that particular bit which is set or reset(according to the particular condition)
c) none of the mentioned
d) all of the mentioned

20. In reading the columns of a matrix, if no key is pressed we should get all in binary notation

a) 0
b) 1
c) F
d) 7

21. If we need to operate a key of a keyboard in an interrupt mode, then it will generate what kind of interrupt?

a) ES
b) EX0/EX1
c) T0/T1
d) RESET

22. To identify that which key is being pressed, we need to:

a) ground all the pins of the port at a time
b) ground pins of the port one at a time
c) connect all the pins of the port to the main supply at a time
d) none of the mentioned

23. Key press detection and Key identification are:

a) the same processes
b) two different works are done in Keyboard Interfacing
c) none of the mentioned
d) any of the mentioned

24. The LCD operates in two main modes, it can be in 8 bit or 4 bit data.

a) true
b) false
c) depends on the situation
d) can't be said

25. What can be the sequence of commands that may be used for initializing an LCD?

a) 0x06, 0x0e, 0x01
b) 0x0e, 0x01, 0x80
c) 0x38, 0x0e, 0x01
d) all of the mentioned

26. When the LCD operates in the 4 bit mode, then what more commands are added to it?

a) 33
b) 32
c) 28
d) all of the mentioned

27. What is the main function of the LPM instruction used in LCD?

a) for initializing the LCD in the read mode
b) for initializing the LCD in the write mode
c) for sending a long string of characters to the LCD
d) all of the mentioned

2**8.** The RS pin acts as an

a) input pin
b) output pin
c) any of the mentioned depending on the conditions
d) none of the mentioned

29. To latch in information at the data pins of the LCD, we send

a) H-L pulse at the E pin
b) L-H pulse at the E pin
c) A constant H pulse at the E pin
d) A constant L pulse at the E pin

30. What is the function of the 0x06 command?

a) to clear the LCD
c) to shift the cursor to the right
b) to blink the cursor
d) for selecting the matrix

31. What is the address of the second column and the second row of the 2*20 LCD?

a) 0x80
c) 0xc0
b) 0x81
d) 0xc1

32. Which of the following commands takes more than 100 microseconds to run?

a) shift cursor left
c) set address location of the DDRAM
b) shift cursor right
d) clear screen

33. For selecting the data pins in an LCD, RS pin should be

a) 1
c) F
b) 0
d) 10

34. Why two pins for ground are available in ADC0804?

a) for controlling the ADCON0 and ADCON1 register of the controller
b) for controlling the analog and the digital pins of the controller
c) for both parts of the chip respectively
d) for isolate analog and digital signal

35. What is the function of the WR pin?

a) its active high input used to inform ADC0804 to the end of conversion
b) its active low input used to inform ADC0804 to the end of conversion
c) its active low input used to inform ADC0804 to the start of conversion
d) its active high input used to inform ADC0804 to the start of conversion

3**6.** State which of the following statements are false?

a) CLK IN pin used for External Clock Input or Internal Clock with external RC element
b) INTR pin tells about the end of the conversion
c) ADC0804 IC is an 8 bit parallel ADC in the family of the ADC0800 series
d) None of the mentioned

3**7.** While programming the ADC0808/0809 IC what steps are followed?

a) select the analog channel, start the conversion, monitor the conversion, display the digital results

b) select the analog channel, activate the ALE signal (L to H pulse), start the conversion, monitor the conversion, read the digital results

c) select the analog channel, activate the ALE signal (H to L pulse), start the conversion, monitor the conversion, read the digital results

d) select the channel, start the conversion, end the conversion

3**8.** In ADC0808/0809 IC which pin is used to select Step Size?

a) Vref
c) Vref/2 & Vin
b) Vin
d) None of the mentioned

39. What is the difference between ADC0804 and MAX1112?

a) ADC0804 has 8 bits and MAX1112 has 1 bit for data output

b) ADC0804 is used for adc and dac conversions whereas MAX1112 is used for serial data transmissions

c) ADC0804 has 32 bits and MAX1112 has 3 bit for data output

d) None of the mentioned

40. Which of the following statements are true about DAC0808?

a) parallel digital data to analog data conversion

b) it has current as an output

c) all of the mentioned

d) none of the mentioned

41. 8 input DAC has _____

a) 8 discrete voltage levels
c) 124 discrete voltage levels
b) 64 discrete voltage levels
d) 256 discrete voltage levels

42. INTR, WR signal is an input/output signal pin?

a) both are output

b) both are input

c) one is input and the other is output

d) none of the mentioned

4**3.** What is the function of the SCLK pin in MAX1112?

a) It is used to bring data in

b) It is used to bring data out and send in the control byte, one at a time

c) It is used to get output clock

d) It is used to get serial output

44. What is the difference between LM 34 and LM 35 sensors?

a) one is a sensor and the other is a transducer

b) one's output voltage corresponds to the Fahrenheit temperature and the

other corresponds to the Celsius temperature

c) one is of low precision and the other is of higher precision

d) one requires external calibration and the other doesn't require it

45. An electronic device which converts physical quantity or energy from one form to another is called _____

a) Sensor

c) Transducer

b) Transistor

d) Thyristor

46. What is signal conditioning?

a) to analyze any signal

b) conversion or modification is referred to as conditioning

c) conversion from analog to digital is signal conditioning

d) conversion from digital to analog is signal conditioning

47. What steps have to be followed for interfacing a sensor to a microcontroller 8051?

a) make the appropriate connections with the controller, ADC conversion, analyse the results

b) interface sensor with ADC and ADC with 8051

c) interface sensor with the MAX232, send now to microcontroller, analyse the results

d) none of the mentioned

48. LM35 has how many pins?

a) 2

c) 3

b) 1

d) 4

49. Why Vref is set of ADC0848 to 2.56 V if analog input is connected to the LM35?

a) to set the step size of the sampled input

b) to set the ground for the chip

c) to provide supply to the chip

d) all of the mentioned

50. What is the principle on which electromagnetic relays operate?

a) electromagnetic induction

c) switching

b) motor control

d) none of the mentioned

51. What are DPDT relays?

a) Single pole, single throw

c) Double pole, double throw

b) Single pole, double throw

d) None of the mentioned

52. Why do we need a ULN2803 in driving a relay?

a) for switching a motor

d) for switching the voltage

b) for increasing the current

c) for increasing the power

53. Why are solid-state relays advantageous over electromechanical relays?
    a) they need zero voltage circuit
    b) they need less current to be energised
    c) they need less voltage to be energised
    d) none of the mentioned
54. What are optoisolators?
    a) it is a driver
    b) it is a thing isolated from the entire world
    c) it is a device that can be used as an electromagnetic relay without a driver
    d) none of the mentioned
55. How can we control the speed of a stepper motor?
    a) by controlling its switching rate
    b) by controlling its torque
    c) by controlling its wave drive 4 step sequence
    d) can’t be controlled

5. Real Time Operating System

Position in Question Paper **Total Marks-18**

Q.1. a) 2-Marks.
Q.1. c) 2-Marks.
Q.2. d) 4-Marks.
Q.4. b) 4-Marks.
Q.5. d) 4-Marks.
Q.6. c) 6-Marks.

Descriptive Question

1. Differentiate between general OS and RTOS.
2. Draw architecture of RTOS.
3. Explain the following characteristics of RTOS- scalability, Predictability, Reliability, Consistency
4. Explain what is watchdog timer and semaphore?
5. Explain the concept of deadlock.
6. Explain various task scheduling algorithms in RTOS.
7. Differentiate between preemptive and non-preemptive scheduling.

MCQ Question

(Total number of Question=Marks*3=18*3=54)
Note: Correct answer is marked with **bold.**

1. In real time operating system _____
   a) all processes have the same priority
   b) a task must be serviced by its deadline period
   c) process scheduling can be done only once
   d) kernel is not required
2. Hard real time operating system has _____ jitter than a soft real time

operating system.

a) less c) equal
b) more d) none of the mentioned

3. For real time operating systems, interrupt latency should be _____

a) minimal c) zero
b) maximum d) dependent on the scheduling

3. In rate monotonic scheduling _____

a) shorter duration job has higher priority
b) longer duration job has higher priority
c) priority does not depend on the duration of the job
d) none of the mentioned

4. In which scheduling certain amount of CPU time is allocated to each process?

a) earliest deadline first scheduling c) equal share scheduling
b) proportional share scheduling d) none of the mentioned

5. The problem of priority inversion can be solved by _____

a) priority inheritance protocol
b) priority inversion protocol
c) both priority inheritance and inversion protocol
d) none of the mentioned

6. Time duration required for scheduling dispatcher to stop one process and start another is known as _____

a) process latency c) execution latency
b) dispatch latency d) interrupt latency

7. Time required to synchronous switch from the context of one thread to the context of another thread is called?

a) threads fly-back time **c) context switch time**
b) jitter d) none of the mentioned

8. Which one of the following is a real time operating system?

a) RTLinux c) Windows CE
b) VxWorks **d) All of the mentioned**

9. VxWorks is centered around _____

a) wind microkernel c) unix kernel
b) linux kernel d) none of the mentioned

10. Which of the following allows the reuse of the software and the hardware components?

a) platform based design c) peripheral design
b) memory design d) input design

11. Which of the following is the design in which both the hardware and software are considered during the design?

a) platform based design
c) software/hardware codesign
b) memory based design
d) peripheral design

12. What does API stand for?

a) address programming interface
b) application programming interface
c) accessing peripheral through interface
d) address programming interface

13. Which activity is concerned with identifying the task at the final embedded systems?

a) high-level transformation
c) scheduling
b) compilation
d) task-level concurrency

14. In which design activity, the loops are interchangeable?

a) compilation
c) high-level transformation
b) scheduling
d) hardware/software partitioning

15. Which design activity helps in the transformation of the floating point arithmetic to fixed point arithmetic?

a) high-level transformation
c) compilation
b) scheduling
d) task-level concurrency

16. Which design activity is in charge of mapping operations to hardware?

a) scheduling
c) hardware/software partitioning
b) high-level transformation
d) compilation

17. Which of the following is approximated during hardware/software partitioning, during task-level concurrency management?

a) Scheduling
c) task-level concurrency mgnt
b) compilation
d) high-level transformation

18. Which of the following is a process of analyzing the set of possible designs?

a) design space exploration
c) compilation
b) scheduling
d) hardware/software partitioning

19. Which of the following is a meet-in-the-middle approach?

a) peripheral based design
c) memory based design
b) platform based design
d) processor design

20. **What are the essential tight constraint/s related to the design metrics of an embedded system?**

a) Ability to fit on a single chip
b) Low power consumption
c) Fast data processing for real-time operations

d) All of the above

21. Which abstraction level undergo the compilation process by converting a sequential program into finite-state machine and register transfers while designing an embedded system?

a) System
c) RT
b) Behaviour
d) Logic

22. Which characteristics of an embedded system exhibit the responsiveness to the assortments or variations in system's environment by computing specific results for real-time applications without any kind of postponement?

a) Single-functioned Char.
c) Reactive & Real time Char.
b) Tightly-constraint Char.
d) All of the above

23. What does RMS stand for?

a) rate monotonic scheduling
c) rate monotonic software
b) rate machine scheduling
d) rate machine software

24. What is a reusable resource?

a) that can be used by one process at a time and is not depleted by that use
b) that can be used by more than one process at a time
c) that can be shared between various threads
d) none of the mentioned

25. 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

26. A system is in the safe state if _____

a) the system can allocate resources to each process in some order and still avoid a deadlock
b) there exist a safe sequence
c) all of the mentioned
d) none of the mentioned

27. The circular wait condition can be prevented by _____

a) linear ordering of resource
c) using pipes
b) using thread
d) all of the mentioned

28. Which one of the following is the deadlock avoidance algorithm?

a) banker's algorithm
b) round-robin algorithm

c) elevator algorithm
d) karn's algorithm

29. A problem encountered in multitasking when a process is perpetually denied necessary resources is called _____
a) deadlock
c) inversion
b) starvation
d) aging

30. To avoid deadlock _____
a) there must be a fixed number of resources to allocate
b) resource allocation must be done only once
c) all deadlocked processes must be aborted
d) inversion technique can be used

31. The wait-for graph is a deadlock detection algorithm that is applicable when _____
a) all resources have a single instance
b) all resources have multiple instances
c) all resources have a single 7 multiple instances
d) all of the mentioned

32. The wait-for graph is a deadlock detection algorithm that is applicable when ____
a) all resources have a single instance
b) all resources have multiple instances
c) all resources have a single 7 multiple instances
d) all of the mentioned

33. If deadlocks occur frequently, the detection algorithm must be invoked _____
a) rarely
c) rarely & frequently
b) frequently
d) none of the mentioned

34. In real time operating system _____
a) all processes have the same priority
b) a task must be serviced by its deadline period
c) process scheduling can be done only once
d) kernel is not required

35. Hard real time operating system has _____ jitter than a soft real time operating system.
a) less
c) equal
b) more
d) none of the mentioned

36. For real time operating systems, interrupt latency should be _____
a) minimal
c) zero
b) maximum
d) dependent on the scheduling