MBA-02

Roll No.

2016 021 048

B. Tech.
ODD SEMESTER (V)
Minor Examination: 2018-19
Engineering and Managerial Economics

3:30

Time: 2 Hrs.

Max. Marks: 30

Note: Answer all questions.

Q. 1 Attempt any **Three** parts of the following. Q. **1 (a)** is compulsory.

(a) How does the study of managerial economics help a business manager in decision making? Illustrate your answer with examples from production and pricing issues. **(04)**

(b) Discuss the nature and scope of managerial economics. How is it related to other disciplines? **(03)**

(c) What is the purpose of demand forecasting? Give short term objectives of demand forecasting. Briefly explain any two methods of forecasting. **(03)**

(d) What are the determinants of demand? Explain. **(03)**

Q. 2 Attempt any **three** parts of the following. Q. **2 (a)** is compulsory.

(a) What are the operation issues in business management? How does microeconomics contribute to decision-making in the operational issues? **(04)**

(b) In what respects macro economics is different from micro economics? Discuss. **(03)**

(c) What are the major macroeconomic issues related directly to business decision making? What is their significance in business decision? **(03)**

(d) "The job a managerial economist concentrates on taking business decisions and formulating forward plans." Expand this statement. **(03)**

survey

Q. 3 Attempt any **Three** parts of the following. Q. **3 (a)** is compulsory.

(a) What are the possible consequences if a large-scale firm places its product in the market without having estimated the demand for its product? **(04)**

(b) What is the law of demand? Explain with the help of demand schedule and demand curve. What are the exceptions to this law? **(03)**

(c) Describe the impact of rise in income on normal goods and inferior goods. **(03)**

(d) What are the uses of the concept of elasticity of demand? Explain. **(03)**

BEC-42

Roll No. | | | | | | | | | | | |

B. Tech.
SEM-V/VII,ODD SEMESTER
Major Examination 2018 - 2019
Digital Signal Processing

Time: 3 Hrs. Max. Marks: 50

Note: Answer all questions. Each questions carry equal marks.

Q.1 Attempt any five parts of the following: (5 × 2=10)

(a). Draw the block diagram representation of the direct form I and II realizations of the system with following transfer function:

$$H(z)=\frac{0.28Z^2+0.319z+0.04}{0.5Z^3+0.3Z^2+0.17z+0.2}$$

(b). How will you develop a parallel structure with direct form II realization of a sixth order IIR transfer function?

(c). Given the system function

$$H(z)=\frac{2+8Z^{-1}+6Z^{-2}}{1+8Z^{-1}+12Z^{-2}}$$

Realize using ladder structure

(d). For analog transfer function:

$$H(s)=\frac{1}{(s+1)(s+2)}$$

Determine H(z) using impulse invariant technique. Assume T=1sec

(e). A digital filter with a 3 dB bandwidth of 0.25 π is to be designed from the analog filter whose system response is

$$H(s)=\frac{\Omega_c}{s+\Omega_c}$$

Using bilinear transformation obtain H(z).

(f). Determine the order and poles of low-pass Butterworth filter that has a 3 dB attenuation at 500 Hz and 40 dB attenuation at 1000 Hz.

(g). Discuss the method of determination of Chebyshev polynomials and their properties.

Q.2 Attempt any two parts of the following: (2 × 5=10)

(a). What are the effects of windowing? Name the different types of window function. What is a rectangular window function? Obtained its frequency- domain characteristics.

(b). A filter is to be designed with the following desired frequency response

$$H_d(e^{j\omega})=\begin{cases} 0, & -\frac{\pi}{4}\le\omega\le\frac{\pi}{4} \\ e^{-j2\omega}, & \frac{\pi}{4}<|\omega|<\pi \end{cases}$$

Determine the filter coefficients $h_d(n)$ if the window function is defined as

$$w(n)=\begin{cases} 1, & 0\le n\le 4 \\ 0, & otherwise \end{cases}$$

Also determine the frequency response $H(e^{j\omega})$ of designed filter.

(c). Compare the rectangular window with Hamming window. The desired response of a low pass filter is

$$H_d(e^{j\omega}) = \begin{cases} e^{-j3\omega}, & -\frac{3\pi}{4} \le \omega \le \frac{3\pi}{4} \\ 0, & \frac{3\pi}{4} < |\omega| \le \pi \end{cases}$$

Determine $H(e^{j\omega})$ for M=7 using Hamming window.

Q.3 Attempt any two parts of the following: **(2× 5=10)**

(a). What is a Hanning window function? Design a band-pass filter to pass frequencies in the range 1-2 rad using Hanning window M=5.

(b). What is a Kaiser window? In what way is it superior to other window functions? Explain the procedure for designing an FIR filter using Kaiser window.

(c). Give the comparison of different types of window functions.

Q.4 Attempt any two parts of the following: **(2 × 5=10)**

(a). What is difference between DTFT and DFT. Discuss the properties of DFT.

(b). Derive the DFT of the sample data sequence $x(n)=\{1,1,2,2,3,3\}$ and compute the corresponding amplitude and phase spectrum.

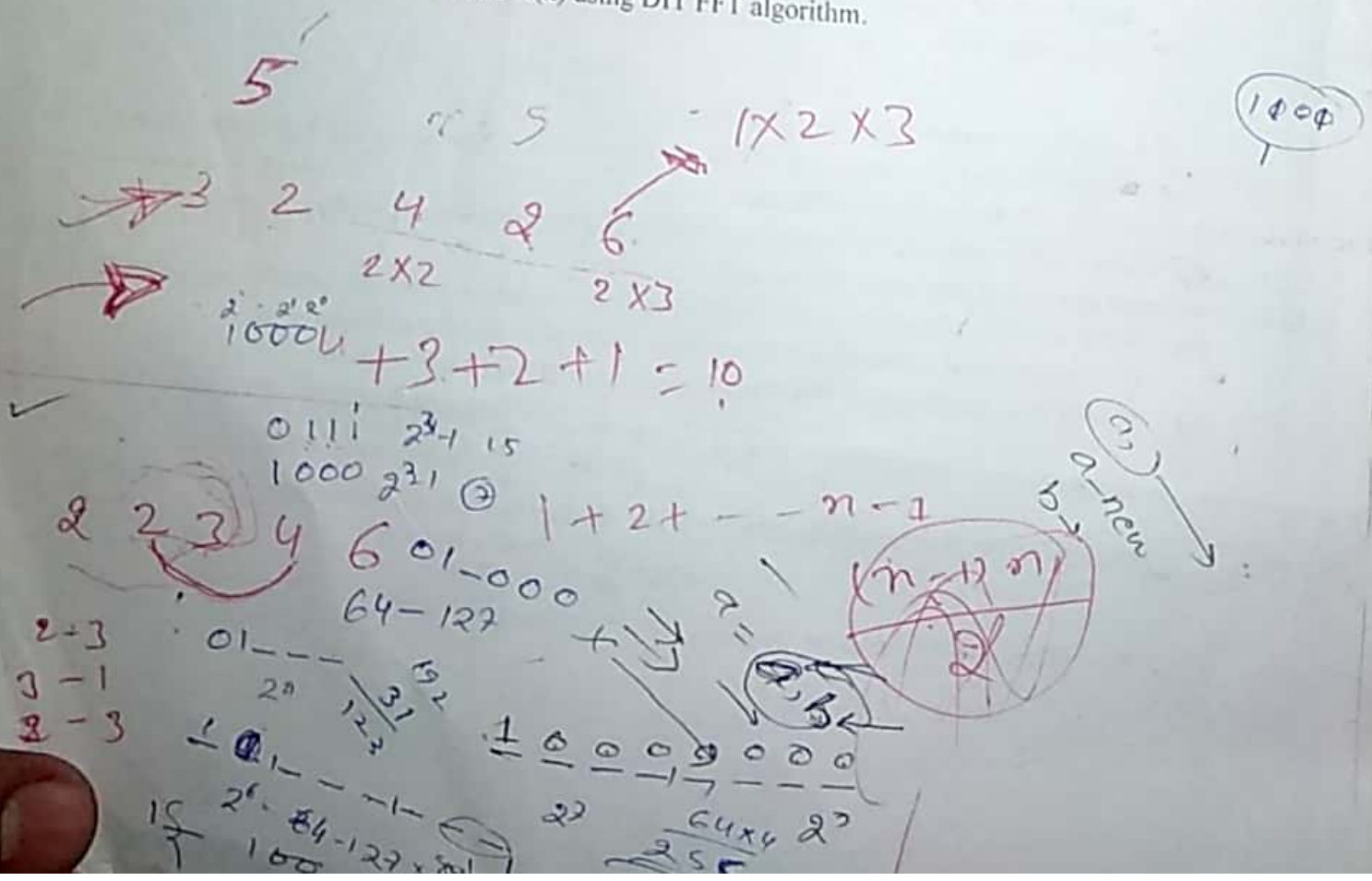
(c). Compute the IDFT of $X(k)=\{1,2,3,4\}$.

Q.5 Attempt any two parts of the following: **(2 × 5=10)**

(a). Distinguish between circular convolution and linear convolution. Perform the circular convolution of following sequences using DFT- IDFT method:
$x_1(n)=\{1,1,2,1\}$ and $x_2(n)=\{1,2,3,4\}$

(b). Explain different types of FFT algorithms along with its butterfly structure for N=8 point DFT calculation.

(c). Given $x(n)=2^n$ and N=8, find X(k) using DIT FFT algorithm.



BCS-28

Roll No. 2 0 1 6 0 2 1 0 5 5

B. TECH.
ODD SEMESTER
MINOR TEST 2018 – 2019

Design and Analysis of Algorithms

Time: 2 Hrs. Max. Marks: 20

Note: Answer all questions.

Q.1 Attempt any Three parts of the following. Q. 1(a) is compulsory.

(a) (i) Consider the following fragment of code, find its asymptotic time bound: 4

```
for i ← 1 to m
{
  for j ← 1 to i
  {
  set sum ← sum + A[i][j]
  }
}
```

(ii) Consider the following recurrence:

$T(n) = 4T(n/2) + n^3$

Find its asymptotic time bound using Master Method.

(b) Design an algorithm to find Min. and Max. elements from the given list of numbers simultaneously. You are also required to find the asymptotic time for the designed algorithm. 2

(c) A thief with knapsack can steal n items. Each item I_i has certain weight w_i and value v_i. Maximum capacity of knapsack is W. Design an efficient algorithm which fills the knapsack with maximum possible value. Find out the asymptotic time for the designed algorithm. Find the solution for the following Knapsack problem using your designed algorithm: 2

Item(I_i)	I_1	I_2	I_3
Weight(w_i)	80	30	40
Value(v_i)	20	15	10

(d) Design a Radix Sort algorithm to arrange the following sequence of numbers in ascending order:

Input: 478, 537, 9, 721, 3, 38, 123, 67

You are also required to analyse the designed algorithm.

Q.2 Attempt any ~~Three~~ Two parts of the following. Q. 2(a) is compulsory.

(a). Explain in brief the concept of Heapify with respect to max heap and also write the algorithm. 4

Consider the list

5	2	1	7	3	4

List--

Construct the Max-heap using bottom up construction of building Max-heap.

(b) Design and analyse Counting Sort algorithm. Consider the following sequence of numbers: 2

6, 5, 11, 4, 3, 7, 8, 10, 9, 1, 16, 15, 4, 2, 11, and 10.

Use designed algorithm to arrange the numbers in ascending order 2

(c). Explain and write Merge-Sort algorithm.

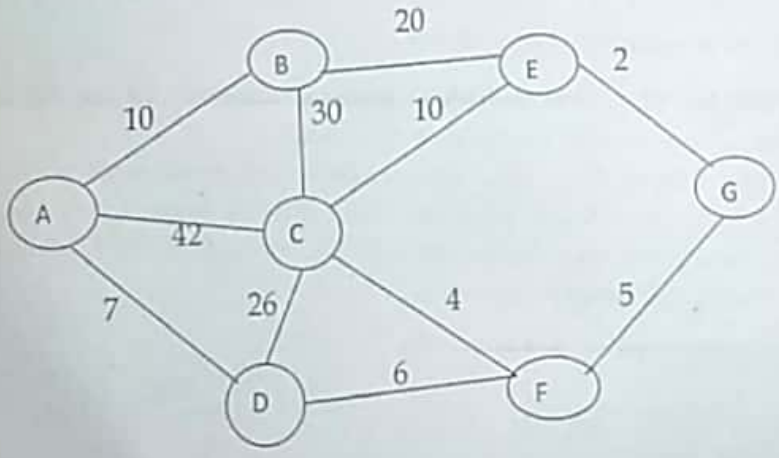
Consider the following sequence of input

5, 2, 4, 6, 1, 3, 2 ,6

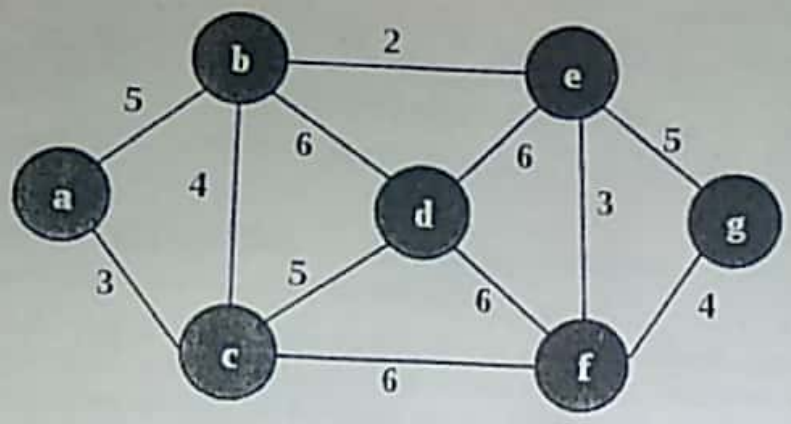
Arrange the input sequence in ascending order using Merge-Sort.

Q.3 Attempt any ~~Three~~ Two parts of the following. Q. 3(a) is compulsory.

(a) Define minimum cost spanning tree. Write Prim's algorithm to generate a minimum cost spanning tree for any given weighted graph. Generate minimum cost spanning tree for the following graph, using Prim's algorithm 4

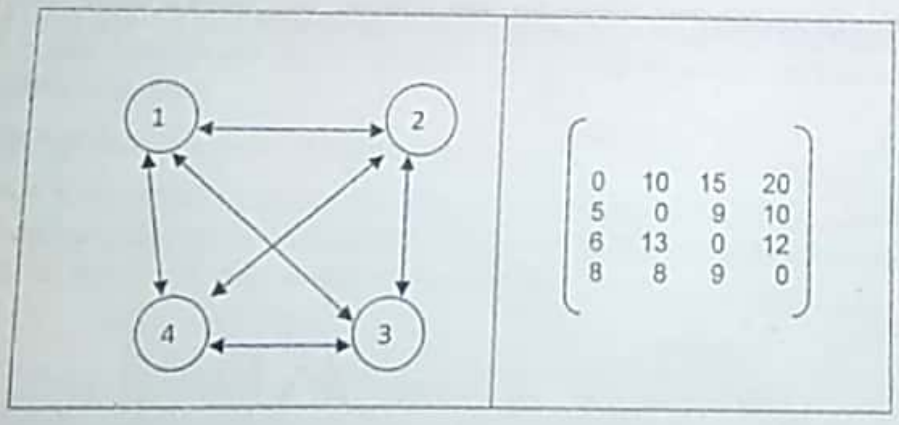


(b) 2



Design and analyse an Algorithm for finding shortest path from a fixed node to every other node. Find shortest path from node A to every other node for the graph of above figure using designed Algorithm.

(c) Let G=(V,E) be a directed graph with edge cost cij. The variable cij is defined such that cij>0 for all e and j, and cij= ∞ if (e,j) ε E. Let (V) n and assume n>1. A tour of G is a directed simple cycle that includes every vertex in V. The cost of tour is the sum of cost of the edges on thee tour. The traveling salesman problem is to find a tour of minimum cost. Let g(I,S) be the shortest path starting at vertex I going through all vertices in S and terminating at vertex 1. The function g(1, V-{1}) is the length of an optimal sales person tour. Formulate g(I,S) using dynamic programming solve it for the edge lengths given by matrix: 2



BCS-26

Roll No. 2016621048

B. Tech.
ODD SEMESTER
MAJOR EXAMINATION 2018 - 2019

PRINCIPLES OF OPERATING SYSTEMS

Time: 3 Hrs. Max. Marks: 50

Note: Attempt all questions. Each question carries equal marks.

1. Attempt any five parts of the following: (5× 2 = 10)

(a) Let the page fault service time be 10ms in a computer with average memory access time being 20ns. If one-page fault is generated for every 10^6 memory accesses, what is the effective access time for the memory?

(b) Consider a machine with 64 MB physical memory and a 32-bit virtual address space. If the page size is 4KB, what is the approximate size of the page table?

(c) Consider a virtual page reference string 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1 Suppose a demand paged virtual memory system running on a computer system such that the main memory has 3-page frames. Find the number of page faults using LRU page replacement algorithm.

(d) Briefly explain Belady's anomaly and aging.

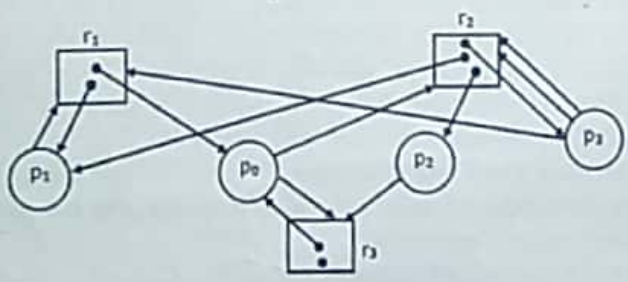
(e) Consider that an operating system does not support context switching. What will be the limitation and advantages of above-mentioned system?

(f) A process goes through various states during its lifetime. Write the state transitions which causes preemptive and non-preemptive CPU scheduling with brief explanation.

(g) List the advantages and limitations of layered structure over monolithic operating system structure.

2. Attempt any two parts of the following: (2× 5 = 10)

(a) What is deadlock? Explain the four characterises of deadlock. Consider the resource allocation graph given in the following figure and find whether the system is in deadlock state or not. If not, then find the safe sequence.



(b) Consider the following four processes with the arrival time and length of CPU burst given in milliseconds –

Find out average waiting time, response time, turnaround time and throughput using SRTF and Round Robin with time quantum 2ms CPU scheduling algorithm.

Process	Arrival Time	Burst Time
P1	0	8

P2	1	4
P3	2	9
P4	3	5

(c) What is Readers Writer problem? Write and Explain the solution of it using semaphore.

3. **Attempt any two parts of the following:** $(2\times 5 = 10)$

(a) Consider the following system snapshot using data structures in the Banker's algorithm with resources A, B, C, and D, and process P0 to P4

	Allocated	Maximum	Available
	A B C D	A B C D	A B C D
P0	4 0 0 1	6 0 1 2	3 2 1 1
P1	1 1 0 0	1 7 5 0	
P2	1 2 5 4	2 3 5 6	
P3	0 6 3 3	1 6 5 3	
P4	0 2 1 2	1 6 5 6	

Using Banker's algorithm, answer the following questions.

I. How many resources of type A, B, C, and D are there?
II. What are the contents of the Need matrix?
III. Is the system in a safe state? Why
IV. If a request from process P4 arrives for additional resources of (1,2,0,0,) can the Banker's algorithm grants the request immediately?

(b) Attempt the following questions-

I. Consider the methods used by processes P1 and P2 for accessing their critical sections whenever needed, as given below. The initial values of shared Boolean variables S1 and S2 are randomly assigned.

Method Used by P1

```
while (S1 == S2) ;
Critical Section
S1 = S2;
```

Method Used by P2

```
while (S1 != S2) ;
Critical Section
S2 = not(S1);
```

What is the various requisite of Critical Section problem fulfilled by above processes? Give the reason for each

II. A shared variable x, initialized to zero, is operated on by four concurrent processes W, X, Y, Z as follows. Each of the processes W and X reads x from memory, increments by one, stores it to memory, and then terminates. Each of the processes Y and Z reads x from memory, decrements by two, stores it to memory, and then terminates. Each process before reading x invokes the P operation (i.e., wait) on a counting semaphore S and invokes the V operation (i.e., signal) on the semaphore S after storing x to memory. Semaphore S is initialized to two. What is the possible value of x after all processes complete execution?

(c) Briefly explain the various advantages of Thread. Consider the following code and find out the output as well as process tree.

```
#include <stdio.h>
#include <unistd.h>
int main() {
    if (fork()) {
        if (!fork()) {
            fork();
            printf("1 ");
        }
        else {
            printf("2 ");
```

```
        }
    }
    else {
        printf("3 ");
    }
    printf("4 ");
    return 0;
}
```

4. **Attempt any two parts of the following:** **(2× 5 = 10)**

(a) Attempt the following questions-

I. Consider a hard disk with 16 recording surfaces (0-15) having 16384 cylinders (0-16383) and each cylinder contains 64 sectors (0-63). Data storage capacity in each sector is 512 bytes. Data are organized cylinder-wise, and the addressing format is: <*Cylinder, Surface, Sector*> A file of size 42797 KB is stored in the disk and the starting disk location of the file is <1200, 9, 40>. What is the cylinder number of the last sector of the file, if it is stored in a contiguous manner?

II. An application loads 100 libraries at start-up. Loading each library requires exactly one disk access. The seek time of the disk to a random location is given as 10 ms. Rotational speed of disk is 6000 rpm. If all 100 libraries are loaded from random locations on the disk, how long does it take to load all libraries? (The time to transfer data from the disk block once the head has been positioned at the start of the block may be neglected).

(b) There are 200 tracks on a disc platter and the pending requests have come in the order - 36, 69, 167, 76, 42, 51, 126, 12 and 199. Assume the arm is located at the 100 track and moving towards track 199. Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for FCFS, SSTF, SCAN, LOOK, C-SCAN, and C-LOOK.

(c) How Threat differs from attack? Briefly explain the various forms of security violation and ways to protect them.

5. **Attempt any two parts of the following:** **(2× 5 = 10)**

(a) Explain the various disk performance metrics. Consider a program repeatedly performs a three-step process: It reads in a 4-KB block of data from disk, does some processing on that data, and then writes out the result as another 4-KB block elsewhere on the disk. Each block is contiguous and randomly located on a single track on the disk. The disk drive rotates at 7200RPM, has an average seek time of 8ms, and has a transfer rate of 20MB/sec. The controller overhead is 2ms. No other program is using the disk or processor, and there is no overlapping of disk operation with processing. The processing step takes 20 million clock cycles, and the clock rate is 400MHz. What is the overall speed of the system in blocks processed per second assuming no other overhead?

(b) What is file? Explain various file allocation methods with their limitations and advantages.

(c) List the operations that can be performed on directory. Explain three types of directory organization with their benefits and limitations.

BCS-28

Roll No.

B TECH
ODD SEMESTER
MAJOR EXAMINATION 2018 - 2019
DESIGN AND ANALYSIS OF ALGORITHMS

Time: 3 Hrs. **Max. Marks: 50**

Note: Attempt all questions. Each question carries equal marks.

Q. No. | **Marks**

1. Attempt any **Five parts** of the following: 5*2=10

(a)
```
void DAA(n)
    {
      int i,j,k,x=0;
       for (i=1 ; i <=n ; i++)
         for (j=1 ; j <= i * i ; j++)
          {
              if ( j mod i == 0 )
              for ( k = 1 ; k <= j ; k++)
              x=x+10;
          }
    }
```
Find the time complexity of above code in terms of input size n.

(b) What do you mean by "Worst case-Efficiency" of an algorithm? Explain with suitable example.

(c) Consider the following recurrence:

$$T(n) = 4T(n/2) + n^3$$

Find its asymptotic time bound using Master Method.

(d) Find the maximum number of comparisons needed to sort 7 decimal numbers using radix sort (assume each number is of four digit).

(e) Design an O(log n)-time algorithm to find the minimum item from a given list.

(f) Consider a complete undirected graph with vertex set {0, 1, 2, 3, 4}. Entry Wij in the matrix W below is the weight of the edge {i, j}. What is the minimum possible weight of a spanning tree T in this graph such that vertex 0 is a leaf node in the tree T?

$$W = \begin{pmatrix} 0 & 1 & 8 & 1 & 4 \\ 1 & 0 & 12 & 4 & 9 \\ 8 & 12 & 0 & 7 & 3 \\ 1 & 4 & 7 & 0 & 2 \\ 4 & 9 & 3 & 2 & 0 \end{pmatrix}$$

(g) Which of the following standard algorithms is not Dynamic Programming based. You are also required to justify the answer.

(i) Bellman–Ford Algorithm for single source shortest path
(ii) Floyd Warshall Algorithm for all pairs shortest paths
(iii) 0-1 Knapsack problem
(iv) Prim's Minimum Spanning Tree

Q. No.

2. Attempt any **Two parts** of the following: **Marks** 2*5=10

(a) Given a set of cities and distance between every pair of cities(Fig.1), the problem is to find the shortest possible tour that visits every city exactly once and returns to the starting point using Branch and Bound method of algorithm design.

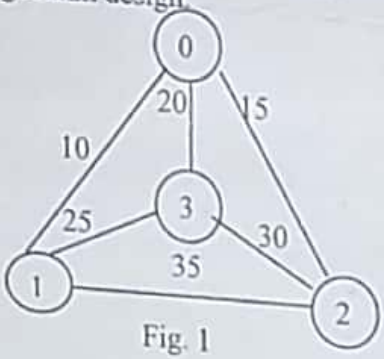


Fig. 1

(b) Consider the following graph:

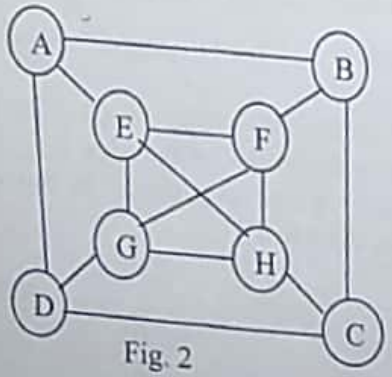


Fig. 2

Find the chromatic number of the graph of Fig. 2. You are also required to explain region colouring of a graph and colour the graph of Fig. 2 using region colouring concept of the graph.

(c) Write down all the properties of Binomial Trees and also give the proofs for each of the property.

Q. No. **Marks**

3. Attempt any **Two parts** of the following: 2*5=10

(a) Design an algorithm for finding Hamiltonian Cycle for a given graph using backtracking method. Use the designed algorithm to find Hamiltonian Cycle for the graph given in Fig. 3.

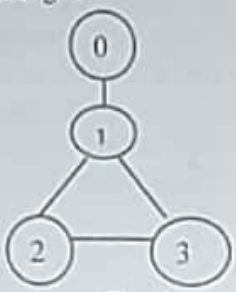


Fig. 3

(b) Write algorithm for union of two Fibonacci Heaps. Find out the time complexity of the algorithm.

(c) Explain and design an algorithm to solve the 8-queens problem. Since each queen must be placed on a different row of the chessboard (assume simple chessboard), hence each solution can be represented by the column position of each queen, i.e., an 8-tuple (x_1, x_2, x_3, ..., x_8) where each x_i is the column position of the queen i. The constraint of x_i is $1 \leq x_i \leq 8$.

Q. No. **Marks**

4. Attempt any **Two parts** of the following: 2*5=10

(a) Consider the following :
Pattern P = {10001}
Text T = { 0000100010010}
Use modified Naïve-String matching algorithm to find the pattern in the given text. You are also required to comment on time complexity of the modified Naïve String Matching algorithm.

(b) Consider the following sequence of numbers

4, 14, 8, 2, 10, 3, 13, 18, 7, 15, 1, 5, 12, 6, 11, 9

Map the above sequence of numbers onto a two dimensional mesh and then sort the numbers in ascending order. You are also required to

write the algorithm used and comment on the time complexity of the algorithm.

(c) Explain Rabin-Karp Algorithm for Pattern Searching.
Now consider Text T= AABAACAADAABAABA
Pattern P= AABA
Find number of occurrences of Pattern in the given text using above algorithm.

Q. No.		Marks
5.	Attempt any **Two parts** of the following:	2*5=10
(a)	Explain the concept of approximation algorithms using Vertex Cover problem which is an NP-complete problem.	
(b)	Show the red-black tree those results after inserting the keys 41, 38, 31, 12, 19, and 8 into and initially empty red-black tree.	
(c)	A single server (such as processor, a cashier in a bank, etc) has n customers to serve. The service time required by each customer is known in advance. Customer i will require t_i time units ($1 \leq i \leq n$). Devise an algorithm to minimize the average time a customer spends in the system.	

BCS-205

Roll No. | | | | | | | | | | | |

B. TECH.
ODD SEMESTER
MINOR TEST 2018 – 2019

Design and Analysis of Algorithms

Time: 2 Hrs. Max. Marks: 20

Note: Answer all questions.

Q.1 Attempt any Three parts of the following. Q. 1(a) is compulsory.

(a). (i) Consider the following fragment of code, find its asymptotic time bound: 4

```
for i ← 1 to m
{
  for j ← 1 to i
    {
    set sum ← sum + A[i][j]
    }
}
```

(ii) Consider the following recurrence:

$T(n) = 4T(n/2) + n^3$

Find its asymptotic time bound using Master Method.

(b). Design an algorithm to find Min. and Max. elements from the given list of numbers simultaneously. You are also required to find the asymptotic time for the designed algorithm. 2

(c). A thief with knapsack can steal n items. Each item I_i has certain weight w_i and value v_i. Maximum capacity of knapsack is W. Design an efficient algorithm which fills the knapsack with maximum possible value. Find out the asymptotic time for the designed algorithm. Find the solution for the following Knapsack problem using your designed algorithm: 2

Item(I_i)	I_1	I_2	I_3
Weight(w_i)	80	30	40
Value(v_i)	20	15	10

(d) Design a Radix Sort algorithm to arrange the following sequence of numbers in ascending order:

Input: 478, 537, 9, 721, 3, 38, 123, 67

You are also required to analyse the designed algorithm.

Q.2 Attempt any ~~Three~~ Two parts of the following. Q. 2(a) is compulsory.

(a) Explain in brief the concept of Heapify with respect to max heap and also write the algorithm. 4

Consider the list

5	2	1	7	3	4

List--

Construct the Max-heap using bottom up construction of building Max-heap.

(b) Design and analyse Counting Sort algorithm. Consider the following sequence of numbers: 2

6, 5, 11, 4, 3, 7, 8, 10, 9, 1, 16, 15, 4, 2, 11, and 10.

Use designed algorithm to arrange the numbers in ascending order

(c) Explain and write Merge-Sort algorithm. 2

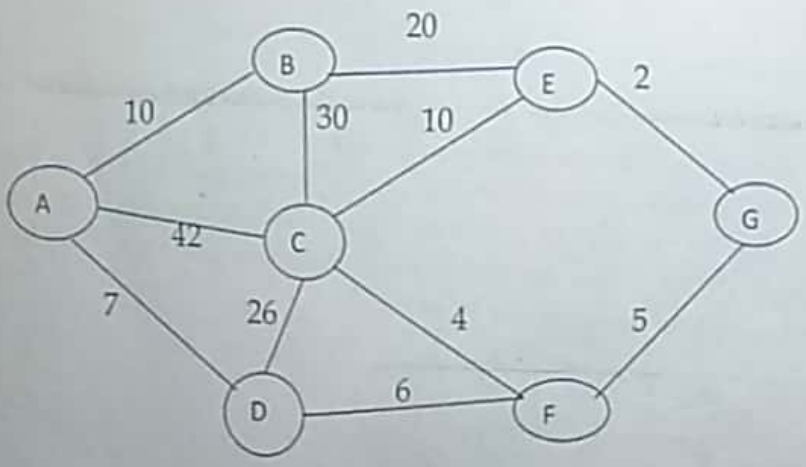
Consider the following sequence of input

5, 2, 4, 6, 1, 3, 2 ,6

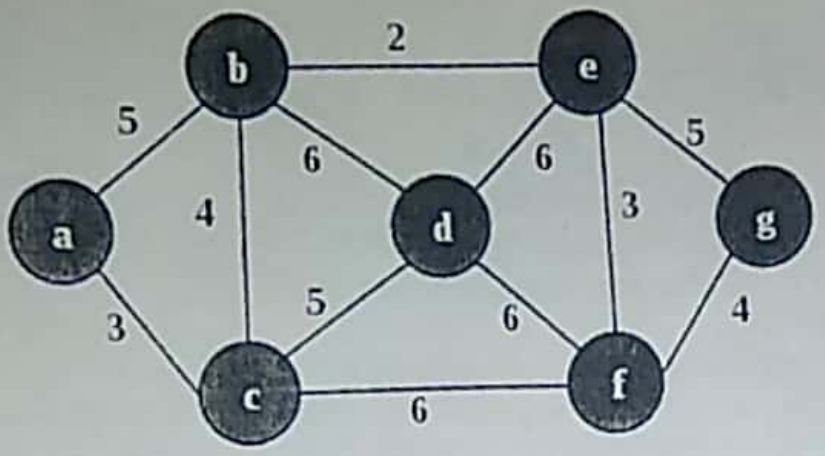
Arrange the input sequence in ascending order using Merge-Sort.

Q.3 Attempt any ~~Three~~ Two parts of the following. Q. 3(a) is compulsory.

(a) Define minimum cost spanning tree. Write Prim's algorithm to generate a minimum cost spanning tree for any given weighted graph. Generate minimum cost spanning tree for the following graph, using Prim's algorithm 4

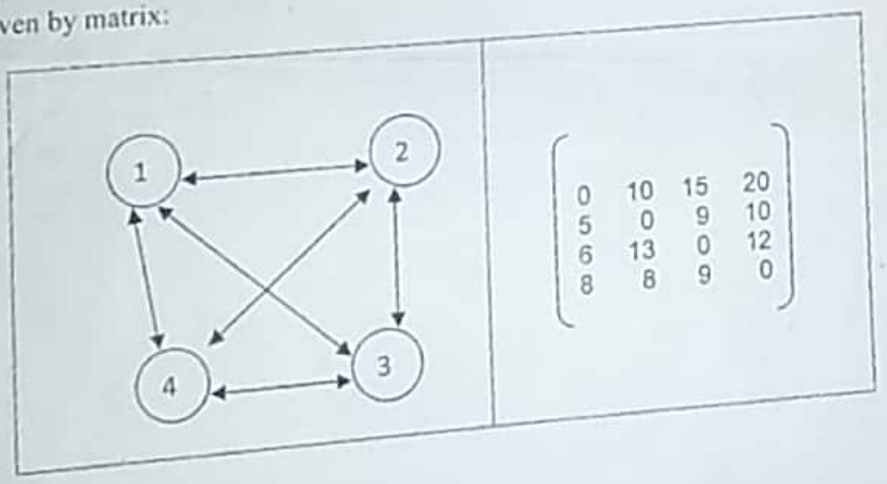


(b) 2



Design and analyse an Algorithm for finding shortest path from a fixed node to every other node. Find shortest path from node A to every other node for the graph of above figure using designed Algorithm.

(c). Let G=(V,E) be a directed graph with edge cost cij. The variable cij is defined such that cij>0 for all e 2
and j, and cij= ∞ if (c,j) ε E. Let (V) n and assume n>1. A tour of G is a directed simple cycle that includes every vertex in V. The cost of tour is the sum of cost of the edges on thee tour. The traveling salesman problem is to find a tour of minimum cost. Let g(I,S) be the shortest path starting at vertex I going through all vertices in S and terminating at vertex 1. The function g(1, V-{1}) is the length of an optimal sales person tour. Formulate g(I,S) using dynamic programming solve it for the edge lengths given by matrix:



Roll No. 2016027048

B.Tech.

Semester: ODD (6th)

Minor Examination, 2018-19

Computer Graphics (Code: BCS-27)

Time: 2.00 Hrs

Maximum Marks: 20

1. Attempt any three parts of the following. Question number 1(a) is compulsory.
   (a) Compare DVST with Shadow Mask CRT in terms of theirconstruction and functioning. Comment on their relative performance with justifications. (4)
   (b) How are picture actually stored and displayed on a raster scan display device? (2)
   (c) What are advantages of concatenation of 2D transformations? Prove that concatenation of 2D transformations is not commutative. (2)
   (d) Write notes on positioning techniques. (2)
2. Attempt any two parts of the following. Question number 2(a) is compulsory.
   (a) Explain with suitable example the principle of Bresenham's circle generating algorithm. (4)
   (b) Describe construction and functioning of Light-Pen. (2)
   (c) Write Symmetrical DDA for line drawing. Use it to compute the co-ordinates of points to be plotted to draw a line AB where A(1,3), B(3,7) (2)
3. Attempt any two Parts of the following. Question number 3(a) is compulsory.
   (a) What is event handling? Describe the role of polling task and event queue in the process of event handling. (4)
   (b) Write midpoint subdivision line clipping algorithm and explain it with an example that is suitable enough to cover all the cases of line clipping (2)
   (c) Explain Polygon clipping algorithm with an example of a concave polygon. Show all intermediate polygons. (2)

Subject Code: BCS-26

Roll No. | | | | | | | | | | |

B. Tech.
ODD SEMESTER
MINOR TEST 2018 - 2019

Subject Name: Principles of Operating Systems

Max. Marks: 20

Time: 2 Hrs.

Note: Answer all questions.

Q.1 Attempt any Three parts of the following. Q. 1(a) is compulsory.

(a). Consider a program consists of five segments: S0 = 600, S1 = 14 KB, S2= 100KB, S3 =580 KB, and S4 = 96 KB. Assume at that time, the available free space partitions of memory are 1200–1805, 50 –150, 220-234, and 2500-3180. Answer the following questions: 4

I. Draw logical to physical maps and segment table.
II. Allocate space for each segment in memory
III. Calculate the external fragmentation and the internal fragmentation
IV. What are the addresses in physical memory for the following logical addresses:
   i. 0,580
   ii. 1,17
   iii. 2,66
   iv. 3,82
   v. 4,20

(b). After an interrupt occurs, hardware needs to save its current state (content of registers etc.) before starting the interrupt service routine. One issue is where to save this information. Here are two options- 2

I. Put them in some special purpose internal registers which are exclusively used by interrupt service routine.
II. Put them on the stack of the interrupted process.

Briefly discuss the problems with above two options.

(c). The address sequence generated by tracing a particular program executing in a pure demand paging system with 100 bytes per page is- 2

0100, 0200, 0430, 0499, 0510, 0530, 0560, 0120, 0220, 0240, 0260, 0320, 0410.

Suppose that only two frames were allocated to that program and all were empty initially. Find out the number of page faults using LRU and Optimal page replacement algorithms.

(d) Define the following terms in brief 2

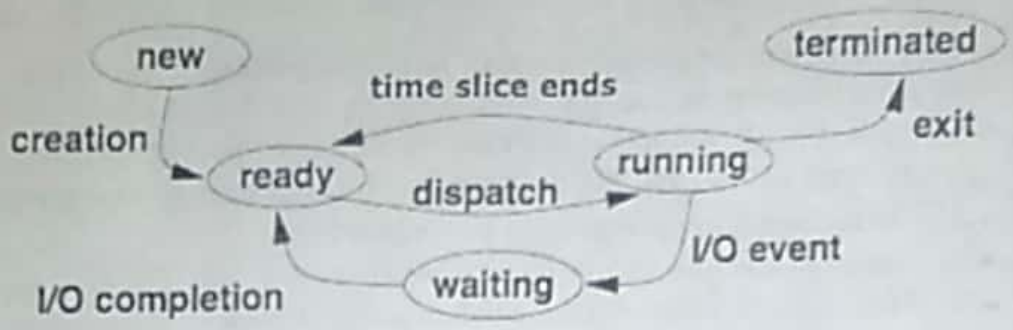
I. Multiprogramming System
II. Multiprocessing System
III. Multitasking System
IV. Realtime System

Q.2 Attempt any Two parts of the following. Q. 2(a) is compulsory.

(a). Define monolithic kernel and microkernel in brief. Which of these types of OS structure better satisfies the following requirements? If both are equally as good write both. Justify your answers.

- Convenient access to operating system data structures
- Addition of new operating system components.
- Modification of operating system components.
- Security and reliability

(b). Processes go through the following states in their lifetime. 2



Consider the following events and answer the questions that follow. Assume there are 5 processes, all either in the read or running states initially. Assume the processes are using a single processor.

- At time 5: P1 executes a command to read from disk 3.
- At time 15: P3's time slice ends.
- At time 18: P4 executes a command to write to disk 3.
- At time 20: P2 executes a command to read from disk 2.
- At time 24: P3 executes a command to join with P5.
- At time 33: An interrupt occurs indicating that P2's read is complete.
- At time 36: An interrupt occurs indicating that P1's read is complete.
- At time 38: P5 terminates.
- At time 48: An interrupt occurs indicating that P4's write is complete.

For each time 22, 37 and 47, identify which state each process is in. If it is waiting, indicate what it is waiting for?

(c). What is an Operating System? Justify the statement "Operating System can be viewed as a government, resource allocator and a control program". 2

Q.3 Attempt any Two parts of the following. Q. 3(a) is compulsory.

(a). Attempt the following questions- 4

I. Consider a new page replacement algorithm in virtual memory with working strategy as following-

- Each page in memory maintains a count which is incremented if the page is referred and no page fault occurs.

- If a page fault occurs, the physical page with zero count or smallest count is replaced by new page and if more than one page with zero count or smallest count then it uses FIFO strategy to replace the page.

Find the number of page faults using above algorithm for the following reference string with Three and Four Frames (assume initially all physical frames are free)
Reference String: A B C D A B E A B C D E B A D .

II. Consider the following two-dimensional array:

int X [64] [64];

Suppose that a system has four-page frames and each frame is 128 words (an integer occupies one word). Programs that manipulate the X array fit into exactly one page and always occupy page 0. The data are swapped in and out of the other three frames. The X array is stored in row-major order (i.e., X [0][1] follows X [0][0] in memory). Which of the two code fragments shown below will generate the lowest number of page faults using LRU? Explain and compute the total number of page faults.

```
Fragment A
for (int j=0; j<64; j++)
        for (int i=0; i<64; i++)
                X[i][j] =0;
```

```
Fragment B
for (int i=0; i<64; i++)
        for (int j=0; j<64; j++)
                X[i][j] =0;
```

I.

(b). The total access time is 1 nanosecond for a read operation with a TLB hit, 5 nanoseconds for a read operation with a TLB miss, 2 nanoseconds for a write operation with a TLB hit and 10 nanoseconds for a write operation with a TLB miss. Execution of a sequence of instructions involves 100 instruction fetch operations, 60 memory operand read operations and 40 memory operands write operations. The TLB hit-ratio is 0.9. Find out the average memory access time (in nanoseconds) in executing the sequence of instructions. 2

(c). A Computer system implements 8KB pages and a 32-bit physical address space. Each page table entry contains a valid/invalid bit, a dirty bit and three permission bits, and the translation. If the maximum size of the page table of a process is 24 megabytes. Find out the length of the virtual address supported by the system in bits. 2

Roll No.

B.Tech (Computer Sc & Engineering) VI Semester

Minor Test 2018-2019

ne: 2 Hrs. **Subject: BCS-29 (Advanced Computer Architecture)**

ote: Attempt ALL questions. Each question carries equal marks Max Marks: 30

Q1. Attempt any **Three** of the following. Q.1(a) is compulsory.

a) Discuss the Classification of Instruction Set Architectures. Give the code to compute the function f=(a-b)/(c-d*e) through various Instruction Set Architectures. 4+3+3

b) Explain how instruction set, compiler technology, memory hierarchy affect the CPU performance and justify the effects in terms of program length, clock rate and effective CPI.

c) Give various architectural classification schemes for parallel computer. Also discuss the Sima's classification in detail.

d) Consider the execution of an object code with 200,000 instructions on a 40 MHz processor. The program instruction mix is as follows:

Instruction Type	CPI	Instruction mix
Arithmetic and logic	1	60%
Load/Store with cache hit	2	18%
Branch	4	12%
Memory reference with cache miss	8	10%

a. Calculate the average CPI when program is executed on uniprocessor with the above trace result.

b. Calculate the corresponding MIPS rate based in the CPI obtained.

Q2. Attempt any Three of the following. Q.2(a) is compulsory. 4+2+2

a) Consider the following instruction sequence:

S1: A = B + C
S2: C = D + E
S3: F = G + E
S4: C = A + F
S5: M = G + C
S6: A = L + C
S7: A = E + A

a. Analyze the given instruction sequence for parallelism and draw the dependence graph.

b. Identify the degree of parallelism available and give the Data Flow for parallel execution considering two functional units for memory operation and two functional unit for arithmetic operation.

b) Discuss the mismatch between software parallelism and hardware parallelism with the help of suitable example.

c) Explain various types of hazards in implementation of instruction pipeline. Also comment on the techniques to resolve the such hazards.

Q3. Attempt any Three of the following. Q.3(a) is compulsory. 4+2+2

a) Discuss the synchronous and asynchronous models of linear pipeline, its Clocking and Timing Control. Also derive formula to compute the Speedup, Efficiency, and Throughput of linear pipeline.

b) Consider the following reservation table for a four-stage pipeline with a clock cycle $\tau = 20$ ns.

	1	2	3	4	5	6
S1	X					X
S2		X		X		
S3			X			
S4				X	X	

$S_k = \frac{nk\tau}{[k+(n-1)]\tau}$

$S_k \cdot \frac{n}{k+(n-1)}$ if $(k+(n-1)$

I. What are the forbidden latencies and the initial collision vector?

II. Draw the state transition diagram for scheduling the pipeline.

III. Determine the Minimum Average Latency(MAL) associated with the shortest greedy cycle.

c) Design a binary integer multiply pipelines with five stages is for partial product generation. The last stage is a 36-bitr carry-lookahead adder. The middle three stages are made of 16 carry-save adders of appropriate lengths.

I. Prepare a schematic design of the five stage multiply pipeline. All lines widths and inter-stages must be shown.

II. Determine the maximal clock rate of the pipeline if the stage delays are $\tau 1 = \tau 2 = \tau 3 = \tau 4 = 90$ ns, $\tau 5 = 45$ ns, and the latch delay is 20 ns.

Write through

Roll No. | | | | | | | | | | |

B.Tech

ODD SEMESTER

Major Examination 2018-2019

Computer Graphics

Time: 3 Hrs. Max. Marks: 50

Note: Answer all questions. Each question carries equal marks.

Q.1 Attempt any five parts of the following: (5x2=10)

(a) Describe construction and explain functioning of Direct View Storage Tube.
(b) Differentiate between Beam Penetration CRT & Shadow Mask CRT for their (i) Construction, (ii) Functioning.
(c) Describe the construction and explain the functioning of Light Pen as a pointing device.
(d) Write Bresenham's generalized algorithm for line drawing.
(e) Explain Mid-Point Subdivision line clipping algorithm with suitable examples.
(f) Why line clipping algorithm will not do for polygon clipping? Write Sutherland Hodgman algorithm for polygon clipping.
(g) Differentiate between Pointing & Positioning and discuss modular constraints and rubber band techniques for positioning.

Q.2 Attempt any two parts of the following. (2x5=10)

(a) Briefly explain how to achieve realism in displaying a 3D objects.
(b) Explain modelling 3D objects if you are given a cube with dimensions 2x2x2, centred at the origin.
(c) Given a set of n+1 Control Points P0, P1, P2, ..., Pn, obtain the expression for Cubic Bazier curve and discuss properties of Bazier Curves.

Q.3 Attempt any two parts of the following. (2x5=10)

(a) Discuss the properties that curve representations must have.
(b) Explain parametric functions for representation of curves. Obtain blending functions using Lagrange interpolation to approximate a curve whose four sample points are given as (x_1,y_1,z_1), ..., (x_4,y_4,z_4).
(c) What are Splines? Differentiate between interpolated Splines and approximated Splines with suitable examples.

Q.4 Attempt any two parts of the following. (2x5=10)

(a) Write (YX) algorithm for scan converting polygon and explain it with a suitable example.
(b) Discuss (YX) algorithm singularity and write singularity algorithm to explain it with a suitable example.
(c) What are homogeneous coordinates systems? Discuss how to transform a 3D representation of an object to scale, rotate and translate in homogeneous coordinate system.

Q.5 Attempt any two parts of the following. (2x5=10)

(a) Explain depth buffer algorithm for hidden surface removal.
(b) Explain Area -coherence algorithm for hidden surface removal.
(c) Explain any one of the Priority Algorithms for hidden surface removal.