

PURBANCHAL UNIVERSITY

2022

B.E. (Computer/Electronics & Comm.)/Fifth Semester/*Final*

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG370CO: Numerical Methods (New Course)

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Group A

Answer SIX questions.

$6 \times 10 = 60$

- 1(a) Define and explain different types of errors. 5
- (b) For the nonlinear equation $f(x) = 3x + \sin(x) - e^x = 0$, find the solution by bisection method. Take $\epsilon = 0.0001$. 5
- 2(a) Prove that the order of convergence of Secant method is superlinear. 5
- (b) Estimate $e^{1.5}$ using Newton interpolation for the following sets of data: 5

X	0	1	2	3
$f(x) = e^x - 2$	-1	0.7183	5.3891	18.09

3. Fit the following set of data into the form $y = ae^{bx}$. Also find the value of a and b: 10

x	2	4	6	8
y	4.077	11.084	30.128	81.892

4. Solve the following set of linear equations by Gauss Seidal method. Also correct the result up to three decimal places. 10

$$x + y + z = 9$$

~~$$2x - 3y + 4z = 13$$~~

$$3x + 4y + 5z = 40$$

~~$$2x - 3y + 4z = 13$$~~

Contd. ...

(2)

5(a) Find R_{22} using Romberg integration of the given integral:

5

$$I = \int_0^{10} \exp\left(\frac{-1}{1+x^2}\right) dx$$

(b) Estimate the following integrals by Simpson's 1/3 rule. Take $n=5$. 5

$$\int_0^{\pi/2} \sqrt{\sin x} dx$$

98.2642

6. Using 4th RK method, find an approximate value of y when $x=2$ given that $dy/dx=x^2+y^2$ and $y=0$ when $x=0$. Take $h = 0.5$. 10
7. Solve the Poisson equation $\nabla^2 f = 2x^2y^2$ over the square domain $0 \leq x \leq 3$ and $0 \leq y \leq 3$ with $f = 0$ on the boundary and $h = 1$. 10

Group B

Answer TWO questions.

2×10=20

8. Write a program to find the solution of a nonlinear equation using NR method 10
9. Write an algorithm to find the solution of a linear equations using Gauss elimination method. 10
10. Write a program to find the integral of a function using Trapezoidal rule. 10

PURBANCHAL UNIVERSITY
2022

B.E. (Computer) / Fifth Semester / Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG373CO: Operating System (New Course)

Candidates are required to give their answers in their own words as far as practicable. Necessary tables may be used,

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer EIGHT questions.

8×10=80

1. Define operating system with its function. Differentiate process and thread. 5+5
2. Explain the 5-state process model. How can we solve the problem of mutual exclusion with busy waiting? Explain any one of them. 3+7
3. Define Inter-process communication and race condition. Consider set of process with their burst time and arrival time as shown below: 3+7

Process	Arrival Time	Burst Time
P1	0	15
P2	1	7
P3	2	2
P4	3	8
P5	4	6
P6	6	3

Assume quantum time = 2 sec. Find the better scheduling using shortest job first, round robin and first come first served scheduling

4. Explain sleeping barber problem. What do you mean by Dining philosophers problem, explain the solution with example 4+6
5. Explain about resource allocation graph with suitable example. Write an algorithm for Resource-request Algorithm and Safety Algorithm. 5+5

Contd. ...

(2)

6. Define first fit, next fit, quick fit and buddy system? Consider the following page reference string. 5+2.5×2

1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 8, 3, 2, 1, 2, 3

How many page fault occur in

(a) LRU:

(b) FIFO?

7. Describe distributed OS with suitable diagram. 10

8. Compare Android OS and iOS with their characteristic features.
Describe real time OS(RTOS) with its types. 10

9. Write short notes on any TWO: 5+5

(a) Principle of I/O hardware

(b) Paging and segmentation

(c) Message Passing

PURBANCHAL UNIVERSITY

2022

B.E. (Computer)/Fifth Semester/Final

Time: 01:30 hrs.

Full Marks: 40 /Pass Marks: 16

BEG396MS: Research Methodology (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

$5 \times 8 = 40$

1. What do you understand by scientific research? Briefly explain the meaning and role of literature review in research. 2+6
2. How you differentiate the reliability and validity in research, also briefly explain the methods of Reliability Scale in research. 2+6
3. Write the meaning of research Proposal. Critically analysis the type of research proposal used in engineering research. 2+6
4. Define questionnaire method of data collection. Write the advantages and disadvantages of this method. 4+4
5. Critically analysis the research hypothesis and mention the quality of good research hypothesis. 4+4
6. Write short notes on any TWO:
(a) Standard Deviation and its importance of it in research
(b) Need and importance of sampling in research
(c) Basic and Applied Research
(d) Research Report and its use in significance

PURBANCHAL UNIVERSITY
2022

B.E. (Computer)/Fifth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG372CO: Computer Graphics (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer EIGHT questions.

8×10=80

- 1(a) Define Computer Graphics. How can computer graphics be used in simulation and education? Explain with examples. Also list out advantages of flat panel display over CRT display. 2+3+2
(b) Differentiate between DDA and Bresenham's Algorithm. 3
- 2(a) Write down the algorithm for Bresenham's line drawing algorithm. 5
(b) Explain 2D rotation and reflection in detail with necessary diagrams. 5
- 3(a) Explain the Raster scan architecture with necessary diagrams in detail. 5
(b) Explain the operation of video controller. 5
4. What do you mean by illumination models? Explain the illumination methods with Diffuse and Specular reflection. 2+4+4
- 5(a) Explain various type of file format you know. 6
(b) Explain scan-line visible surface detection method in detail. 4
6. Explain the Gouraud and Phong Shading methods in detail. 5+5
- 7(a) Explain detail on Polygon Tables. 4
(b) How window to viewport transformation is carried out? Show steps with matrix form. 6
- 8(a) Rotate the triangle A(20, 45), B(50, 80), C(80, 45) with $\theta=45^\circ$ by showing the accurate diagram, and what will be the final coordinates of an object? 4
(b) Explain Cohen Sutherland line clipping algorithm in detail. 6

(2)

5+5

* 9. Write short note on any TWO:

- (a) Touch panel
- (b) Open GL
- (c) Virtual Reality

PURBANCHAL UNIVERSITY

2021

B.E. (Computer) / Fifth Semester / Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG373CO: Operating System (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer EIGHT questions.

1(a) Explain Objectives and Functions of Operating System. $8 \times 10 = 80$

(b) Explain Serial Processing and Simple Batch System in Operating System. 7

2. Consider the following set of processes with the length of CPU burst given in millisecond. 3

10

Process	Arrival time	Burst time	priority
A	0	3	3
B	1	6	5
C	2	1	2
D	3	4	1
E	4	2	4

Compute Average Waiting and Average Turn Around Time for following scheduling algorithm.

(a) RR($q=2$)

(b) Priority preemptive

(c) Preemptive SJF

3. Differentiate between Program and Process. What is Race Condition? How Mutual Exclusion is achieved through mechanism of Busy Waiting. $2+2+6$

Contd. ...

4. Using Banker's algorithm, answer the following questions:- 10

Process	Allocation			Maximum			Available		
	A, B, C			A, B, C			A	B	C
P1	0	1	0	7	5	3	3	3	2
P2	2	0	0	3	2	2			
P3	3	0	2	9	0	2			
P4	2	1	1	2	2	2			
P5	0	0	2	4	3	3			

- (i) How many resources of type A, B, C are there? ii) What are the contents of need matrix?
 (iii) Find if the system is in safe state? If it is find the safe sequence.

5. Use FIFO, LRU and Optimal page replacement algorithm in the following reference string having four frames and calculate the no of page fault. 10

7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,1

6. Explain Real Time Operating System with example. How is paging used in virtual memory management? 5+5

7. Explain how file is implemented, Shared and protected in file system. 10

8. Explain about clock and terminal. Define best fit, worse fit, quick fit and buddy system in memory management. 10

9. Write short notes on any TWO:
 (a) Android OS
 (b) Distributed system
 (c) Preemptive and non preemptive scheduling

PURBANCHAL UNIVERSITY
Time-bound Home Exam 2020

B.E. (Computer) / Fifth Semester / Final
Time: 03:00 hrs. (+2 Hrs. for Submission)

Full Marks: 80 / Pass Marks: 32

BEG373CO: Operating System (New Course)

Instructions:

Dear Students!

- This model of examination is for you as the end of your current semester. This examination allows you to write answer from your own place of residence. Follow the following instructions without fail.
- Do not write your name in the answer-sheet(s).
- All the answer-sheets should be sent to college through your approved email in which you have received your question paper.
- Do not write questions in the answer-sheet but mention clearly the question number.
- All the scan/photos of answer-sheets should be clearly visible. Any blur scan/photo will not be considered for evaluation. Responsibility lies with the students to make sure that scan/photos of the answer-sheet are of readable quality.
- Leave 1 inch margin on each side of the answer-sheet.
- Clearly mention your Roll no, subject, program, semester, page number at the right-top of each page as instructed by the Office of the Examination Management.
- Make sure that you send your answer-sheets within the given time. Any email received after the given time will not be acceptable.
- You are strictly advised to write with your own handwriting and that you are not using any unfair means to answer the questions.
- Do not consult during the examination period to any other person in answering the questions.
- Do not post any pictures of taking examination or your answer-sheets in any social-media. Found that may be taken action from University.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

8×10=80

Answer EIGHT questions.

1. Explain operating system as an extended machine and resource manager.
2. What is inter-process communication? Explain Producer consumer problem with semaphore.
3. What are preemptive and non-preemptive scheduling? Explain FCFS and SJF scheduling methods with example.
4. Why memory management is required? Explain Optimal and LRU page replacement algorithm with example.
5. What are operating system securities? Explain different operations on directory.
6. What is disk? List all the disk scheduling algorithm and explain FCFS with example.
7. Explain different conditions of deadlock. Explain any one method of deadlock detection and recovery.
8. Explain different types of real time system with example.

9. Write short notes on any TWO:

5+5

- (a) Paging
- (b) Deadlock avoidance
- (c) Classical IPC problems



PURBANCHAL UNIVERSITY
2019

B.E. (Computer)/Fifth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG373CO: Operating System (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer EIGHT questions.

$8 \times 10 = 80$

1. What is an operating system? Discuss the evolution of operating system. 2+8
2. What is critical section? Why mutual exclusion is required? How mutual exclusion can be achieved? Describe any one of them. 2+2+2+4
3. Define process and its different states. What are the various operation on a semaphore? How message passing is useful for IPC? 2+4+4
4. Compute average waiting times and average turnaround times using FCFS, SJF, Priority (lowest no represents highest priority) and Round-Robin (quantum= 3ms) scheduling algorithm for the following set of processes. Assume that all processes have arrived at time 0 in the order P1, P2, P3, P4 and P5. 10

Process	Burst Time(ms)	Priority
P1	2	1
P2	2	1
P3	4	3
P4	2	4
P5	3	2

5. Define the term Deadlock. What are the necessary conditions for a deadlock? Explain the deadlock avoidance algorithm. 2+4+4

Contd. ...

(2)

4+6

6. Consider the following snapshot of a system.

Process	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	0	0	1	2	0	0	1	2	1	5	2	0
P1	1	0	0	0	1	7	5	0				
P2	1	3	5	4	2	3	5	6				
P3	0	6	3	2	0	6	5	2				
P4	0	0	1	4	0	6	5	6				

Answer the following questions using Banker's algorithm:-

- (a) What is the content of the matrix need?

- (b) Is the system in a safe state?

- (c) If a request from process P1 arrives for (0,4,2,0), can the request be granted immediately?

7. Explain the static and dynamic memory allocation techniques with examples. Use FIFO page replacement algorithm in the following reference string having 4 frames and calculate the no. of page faults. 5+5

0 1 2 3 0 1 2 3 0 1 2 3 4 5 6 7

8. Suppose that the head of a moving head disk with 200 tracks, numbered 0 to 199, is currently serving a request at track 143 and has just finished a request at track 125. The Queue of requests is kept in the FIFO order-- 86, 147, 91, 177, 94, 150, and 102, 175, 130. What is the total number of head movements needed to satisfy these requests using FCFS, C- SCAN, SSTF and LOOK disk- scheduling algorithms? 10

9. Write short notes on any TWO:

- (a) preemptive and non-preemptive scheduling algorithm
 (b) RTOS
 (c) File System

5+5



PURBANCHAL UNIVERSITY

2018

B.E. (Computer)/Fifth Semester/Final
Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG373CO: Operating System (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer EIGHT questions.

$8 \times 10 = 80$

1(a) Explain multiprogramming system and time sharing system with their advantages and disadvantages. 6

(b) Discuss strict alternation method in providing mutual exclusion with its drawback. 4

2. What is thread? Differentiate between user level and kernel level thread. Find the average waiting time, turnaround time and response time from following information using SJF algorithm.

2+3+5

Process	P1	P2	P3	P4	P5
Arrival time	1	3	4	5	7
CPU burst time	9	7	5	4	2

3. Define race condition and critical section. How does semaphore provide software solution to producer consumer problem? Explain. 4+6

4(a) Explain best fit and worst fit methods with a suitable example. 4

(b) Consider the page reference string: 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6. How many page faults would occur for each of the following page replacement algorithms assuming 4 page frames? 6

- (i) LRU
- (ii) FIFO
- (iii) Optimal

(2)

5. What are the condition for deadlock to occur? A system that uses the banker's algorithm deadlock avoidance has five process and four type of resources. There are multiple resources of each type. Determine whether the state sequence $\langle p_1, P_5, P_3, P_2, P_4 \rangle$ is safe or not. If it is safe show how the process can complete. If not, show how they are in deadlock.

4+6

Process	Current allocation				Maximum needed				Available resource			
	A	B	C	D	A	B	C	D	A	B	C	D
P1	1	0	2	0	2	2	2	2	3	4	0	1
P2	0	3	1	2	3	2	0	0				
P3	2	4	5	1	0	3	2	4				
P4	3	0	0	6	2	5	0	2				
P5	4	2	1	3	2	0	0	1				

6. What are the advantage and disadvantage of distributed system?
How does communication take place in distributed system? 5+5
7. Define device controller and clock. Explain the working mechanism of DMA. 4+6
8. What are the importance of file? Explain different properties of file. How we can protect the file in multiuser system. 2+2+6
9. Write short notes on any TWO:
(a) Real time operating system
(b) Fragmentation
(c) Mac OS

5+5

PURBANCHAL UNIVERSITY

2015

B.E. (Computer)/Fifth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG373CO: Operating System (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer EIGHT questions.

$$8 \times 10 = 80$$

1. Explain the functions of operating system. Discuss operating system as a resource manager. 5+5
2. Define busy-waiting in IPC. How can we solve the problem of mutual exclusion with busy waiting? Explain a Peterson solution. 2+3+5
3. Compare preemptive and non-preemptive scheduling. Consider set of process with their burst time and arrival time as shown below

Process	Arrival Time	Burst Time
P1	0	4
P2	1	5
P3	2	2
P4	3	1
P5	4	6
P6	6	3

Assume quantum time=2 sec. Find the better scheduling using shortest job first, round robin and first come first served scheduling. 3+7

4. Define semaphore with example. What do you mean by reader/writer problem? Explain with example. 4+6
5. Define deadlock with its principles. Explain Banker's algorithm for multiple resources with example. 4+6
6. Discuss memory management in multiprogramming. Explain paging. 5+5

Contd. ...

(2)

7. Define real time operating system with example. Explain different operations on file.
- 8(a) How is process different from thread? Why do we need to create threads?
- (b) Discuss monitors in IPC.
9. Write short notes on any TWO:
- (a) IPC
 - (b) Disk
 - (c) Segmentation

PURBANCHAL UNIVERSITY

2013

B.E. (Computer) / Fifth Semester / Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG373CO: Operating System (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer EIGHT questions.

1. Explain operating system as a resource manager. What are multi-programming and multi-processing systems? 4+1
- 2(a) What do you mean by PCB and context switch?
- (b) What is critical section problem? How does busy-waiting solve this problem? Explain any one method. 2+4
3. Explain memory management with linked list and demonstrate first-fit, best-fit, next-fit, and worst-fit with suitable example. 10
4. Compute average waiting time and average turnaround time using FCFS, SJF, and Round Robin (1 time Slice=2 ms) scheduling algorithms for the following processes:

Process	Burst Time (in ms)
P ₁	16
P ₂	6
P ₃	13
P ₄	5

5. What are directories? Explain directory operational? Discuss some file allocation methods. 4+6

6. Compute the number of page faults using FIFO, Optimal, and LRU page replacement algorithms for the given reference string. (Assume, Number of memory frames = 4). Reference string: 5 2 4 2 3 4 7 1 2 7 5 3 1 2 5

- 7(a) Define distributed processing. Explain RPC in distributed systems.

5

Contd. ..

(2)

(b) What is RTOS? Distinguish between soft real time and hard real time. 5

(a) Why information need to be stored on disks? 2

(b) Assume a disk with 50 cylinders, numbered from 0 to 49. The current disk request is to read a block on cylinder 16, and other new disk requests come in to the disk driver for cylinders 5, 22, 8, 12, 42, 11, 19, 33, and 37, in that order. Compute the total number of disk arm movements using closest Cylinder Next algorithm and Elevator algorithm (initially moving upward). 8

(a) Explain deadlock recovery. 4

(b) Using Banker's algorithm, determine whether the following system is safe or not. Also determine the safe sequence, if it's safe state. 6

No. of Processes = 5 <P₁, P₂, P₃, P₄, P₅>

No. of Resources = 3 <A, B, C>

Total Resources = <8, 6, 7>

Process	Allocation			Max		
	A	B	C	A	B	C
P ₁	0	2	0	6	2	3
P ₂	3	0	0	3	2	2
P ₃	0	0	2	7	1	5
P ₄	2	1	1	4	2	2
P ₅	1	1	2	2	1	2

10. Write short notes on any TWO: 2×5=10

(a) Terminals

(b) Paging *

(c) File sharing

DEPARTMENT OF COMPUTER SCIENCE

ROLE

B.E. (C: Computer) / Fifth Semester / Final

Time: 03:00 hrs.

Full Marks: 60 / Pass Marks: 32

REG37300: Operating System

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer EIGHT questions.

1. Explain in detail about Operating system as a users/computer interface and as a resource manager? 5+5

2(a) Describe briefly on states of a process model and the transition possible among the processes. 7

2(b) Differentiate between a program and a process. 3

3. Calculate the average waiting time for FIFO and Round Robin scheduling algorithm. Assume Quantum=4 msec. 5+5

Process	Arrival Time (ms)	Burst Time (ms)
A	0	8
B	1	1
C	3	2
D	4	1
E	2	5

4(a) Define Deadlock. Explain the four conditions that lead to a deadlock. 2+4

4(b) Explain the deadlock prevention methods. 4

5(a) What is critical-section and race-condition? 4

5(b) Describe the operations on a file. 6

6. The disk requests come in to the disk driver for cylinders 10, 20, 22, 2, 40, 6 and 30, in the order. A seek takes 6 msec/cylinder moved. How much seek time is needed for? 10

(a) FCFS

(b) Shortest Seek First 5.67

(c) Elevator algorithm 5.67

In all cases, assume the arm head is initially at cylinder 20. Contd ...

CREW
DELCR
SEND

TYPE IN
6.00

(2)

7. Consider a system with five processes P0 through P4 and three resources types A, B, C. Resource type A has 10 instances, type B has 5 instances and type C has 7 instances. Suppose the following snapshot of the system has been taken.

Process	Allocation	Max	Available
	ABC		
P0	010	763	332
P1	200	322	
P2	302	902	
P3	211	222	
P4	002	433	

(a) What will be the content of the need Matrix?

(b) Is the system in safe state? If yes, then what is the sequence?

8. ✓ What is Virtual Memory? Differentiate between Paging and Segmentation with suitable demonstration of example.

9. ✓ What is Page Fault? Consider the following page reference string 0, 2, 1, 6, 4, 0, 1, 0, 3, 1, 2, 1

10 How many page faults would occur for the following page replacement algorithms, assuming an allocation of 3 frames? 1+2

- (a) LRU
(b) FIFO
(c) Optimal ✓

10. ✓ Write short notes on any TWO:

(a) Interprocess communication

(b) Direct Memory Access (DMA)

(c) Preemptive Vs Non-Preemptive scheduling algorithms

5+5

30 80/80

**PURBANCHAL UNIVERSITY
2021**

B.E. (Computer) / Fifth Semester / Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG372CO: Computer Graphics (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer EIGHT questions.

$$8 \times 10 = 80$$

- 1(a) What is computer Graphics? Explain the different applications of computer graphics. 2+8

2. What is raster scan display? Explain in detail the architecture of raster scan display with display processor. 2+8

3. What are the drawbacks of Digital Differential Analyzer (DDA) line drawing algorithm? Explain in detail the mid - point circle drawing algorithm. 2+8

4. A mirror is placed vertically such that it passes through the points (10,0) and (0, 10). Find the reflected triangle ABC with vertices A (5, 50), B (20, 40), C (10, 70). 10

5. Define window and viewport. Explain in detail the window to viewport coordinate transformation with mathematical calculation. 2+8

6. Discuss cohen Sutherland line drawing algorithm in detail. 10

7. Why projection is needed? Discuss its type in detail. 10

8. What is visible surface detection technique? Why it is needed? Also explain any image spaced visible surface detection method. 2+2+6

9. Explain the need of surface rendering in computer graphics. Discuss phong shading model for surface rendering in detail. 10

10. Write short note on any TWO: 5+5

(a) Touch panel (b) GKS and PHIGS

(c) Diffuse and Specular reflection



Time-bound Home Exam 2020

B.E. (Computer)/Fifth Semester/Final

Time: 03.00 hrs. (+2 Hrs. for Submission)

Full Marks: 80 /Pass Marks: 32

BEG372CO: Computer Graphics (New Course)

Instructions:

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- Leave 1 inch margin on each side of the answer-sheet.
- Clearly mention your Roll no, subject, program, semester, page number at the right-top of each page as instructed by the Office of the Examination Management.
- Make sure that you send your answer-sheets within the given time. Any email received after the given time will not be acceptable.
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$8 \times 10 = 80$

Answer EIGHT questions.

- 1(a) Differentiate between Image Processing and Computer Graphics. Describe how can you make effective use of Computer Graphics in the field of Visualization. 2+4
- (b) Explain two different types of digitizers with its working principle. 4
- 2(a) Differentiate between Raster and Vector display System. What is the aspect ratio of the raster system using 8×10 inches screen and 100 pixel/ inch? 3+2
- (b) Explain the basic video controller refresh operations of raster display system with suitable block diagram. 5
3. Explain the need for shading in engineering data visualization. Discuss phong shading model in brief. 4+6
4. Explain Bresenham's line drawing algorithm with example. 10
5. Suppose there is a Line whose coordinates are A(1, 1), B(4, 1) and the window co-ordinates are (2, 2), (5, 2), (5, 5), (2, 5) and the given viewport location is (0.5, 0), (1, 0), (1, 0.5), (0.5, 0.5). Calculate the viewport coordinates of a given line? Explain Sutherland-Hodgeman polygon clipping algorithm with clear illustration and example. 4+6
- 6(a) Explain 2D viewing transformation pipeline. 4
- (b) Distinguish between Vanishing point and Center of Projection. Derive the transformation matrix for producing any parallel projection on to X_v, Y_v plane. 6
7. Deduce the composite transformation matrix for Scaling a 3D object keeping one of its vertex (x_i, y_i, z_i) fixed using homogeneous coordinate. Explain 3D rotation about an axis which is parallel to Z-axis (Deduce the final transformation matrix). 4+6
- 8(a) Describe Scan line method with suitable example and its advantages. 5
- (b) Describe Specular reflection and its significance in Computer Graphics. 5
- 9(a) What are the advantages of Gouraud Shading over Constant Intensity shading. 5
- (b) Describe Graphical Kernel System (GKS) in detail. 5

Contd. ...

10. Write short note on any TWO:

- (a) Needs of Machine Independent Graphical Language
- (b) Open GL
- (c) BMP and PNG File format



PURBANCHAL UNIVERSITY

2019

B.E. (Computer)/Fifth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG372CO: Computer Graphics (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer EIGHT questions.

- 1(a) Define Computer Graphics. Explain any four applications of Computer Graphics briefly in real world with examples. $8 \times 10 = 80$
- (b) Write four advantages of flat panel display over CRT display. 4
2. Derive the required expression for the Bresenham's line drawing algorithm for $|m| > 1$ in detail. Also summarize the algorithm. 10
3. Explain Raster and Random Scan architecture with its differences in detail. 10
4. Explain the Sutherland-Hodgeman algorithm (Polygon Clipping) in detail with expressions and diagrams. 10
- 5(a) Define Window and Viewport with examples. 10
- (b) Explain 2D window to viewport coordinate transformation in detail. 3
- 6(a) Why do we need the machine independent graphical language. 7
- (b) Explain various type of file format in Computer Graphics. 4
- 7(a) Explain Phong method in detail. 6
- (b) Explain the scan-line method of visible surface detection method in detail. 5
- 8(a) Digitize an ellipse with major axis $rx=6$ and minor axis $ry=9$ centered at origin. 5
- (b) Use Cohen Sutherland line clipping algorithm to clip a line with end points A(40,90) and B(60,85) against a clip window with its lower left corner at L(50,80) and upper right corner at (90,120). 5

Contd. ...

(2)

9. Write short note on any TWO:

5+5

- (a) Cubic-spline method of generating non-planar surface
- (b) Open GL
- (c) Diffuse and specular reflection



PURBANCHAL UNIVERSITY

2018

B.E. (Computer)/Fifth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG372CO: Computer Graphics (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer EIGHT questions.

$8 \times 10 = 80$

1. What is computer graphics? Explain how computer graphics is used in education training and entertainment? 2+8
2. Explain raster and vector display architecture. List out its advantages and disadvantages. 8+2
- 3(a) Explain the working mechanism of beam and shadow masking method to produce color CRT. 3+3
- (b) Explain the use of look-up table to increase the intensity level values with suitable diagram. 4
4. List out the disadvantages of DDA algorithm for drawing lines. Explain Bresenham's line drawing algorithm with example. 2+8
5. What is 3d-transformation? Explain 3d-rotation with example and necessary derivatives. 2+8
6. What do you understand by clipping? Explain Cohen-Sutherland line clipping algorithm. 2+8
- 7(a) Explain ambient light, diffuse and specular reflection. 6
- (b) Discuss about Open GL. 4
8. Why hidden line and hidden surface removal techniques are needed? Explain any one. 4+6
9. Write short note on any TWO:
(a) Perspective Projection
(b) Mechanical and optical mouse
(c) Phong shading models 5+5



PURBANCHAL UNIVERSITY

2016

B.E. (Computer)/Fifth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

WEG372CO: Computer Graphics (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer EIGHT questions.

$$8 \times 10 = 80$$

- (a) Define Computer Graphics, pixel and resolution. How can computer graphics be used in simulation and education? (5) 3+3
- (b) Explain different types of touch panels in brief. 4
- (c) Write down advantages of Bresenham algorithm over DDA algorithm. (3) 3
- (d) Explain on Raster Scan Architectures. How is the limitation of Random Scan Architecture overcome by Raster Scan Architecture? (3) 5+2
- (e) Explain two-dimensional rotation and translation with example. (6) 10
- (f) Derive the midpoint circle generating algorithm with proper illustration. 10
- (g)(a) Explain 2D window to viewport coordinate transformation. (4) 4
- (g)(b) Explain the Sutherland-Hodgeman polygon clipping algorithm with diagrams. (5) 6
- (h)(a) Explain various type of file format in Computer Graphics. (4) 6
- (h)(b) Explain Specular Reflection Method in detail. (2) 4
- (i)(a) Explain the Gouraud method in detail. (2) 6
- (i)(b) What do you mean by illumination models? Why Phong Method is better than Gouraud Method? (2) 2+2

Contd. ...

(2)

- 8* Explain Polygon Tables in detail.
9. Why do we need clipping? Explain Cohen Sutherland
clipping algorithm with proper diagram. 6
10. Write short note on any TWO:
(a) Cubic-spline method of generating non-planar surfaces
(b) Open GL
(c) 3D Transformation 4

PURBANCHAL UNIVERSITY

2016

B.E. (Computer/Electronics & Comm.)/Fifth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 3

BEG370CO: Numerical Methods (New Course)

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Group A

Answer SIX questions.

$6 \times 10 = 60$

1. Define error, relative error, absolute error and percentage error. If the calculated value of root of a non-linear equation $x^3 - 125 = 0$ is 5.005, then calculate error, absolute error, relative error, absolute error and percentage error. 4+5

2. Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Simpson's 1/3 rule and find appropriate value of π take $n=6$ 3

3. Solve the following set of equations using Gauss Jordan Elimination Method: 3

$$X+Y+Z=3$$

$$2X-Y+2Z=3$$

$$X+2Y-2Z=1$$

4. Solve the differential equation $dy/dx = 4y/x$ and find $y(2)$ using Runge-Kutta Method of 4th order with $y(0)=1$. Take $h=1$. 3

5. Find an equation in the form of $y=a+bx$ and find y at $x=2.5$ using Least Square Method. 3

X	1	2	3	4
y	4	5	6	8

6. Consider a steel plate of size 30cm×30cm. If two of sides are held at 500°C and the other two sides are held at 0°C. What are the steady state temperatures at interior points assuming a grid size of 10cm×10cm? 3

Contd...

(2)

Solve the following equation using Gauss Jacobi iteration

10

Method"

$$12X - 3Y + Z = 10$$

$$2X + 11Y - 4Z = 9$$

$$4X - 3Y + 13Z = 14$$

3. Prove that the order of convergence for Secant Method is
superlinear.

10

Group B

Answer TWO questions.

$2 \times 10 = 20$

9. Write an algorithm and program for Bisection Method. 10

10. Write a program in any High Level Language to evaluate the value of a function at specified point using Lagrange Interpolation Polynomial Method. 10

11. Write a flowchart and program in a High Level Language for Trapezoidal rule. 10



PURBANCHAL UNIVERSITY

2015

B.E. (Computer) / Fifth Semester / Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG372CO: Computer Graphics (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer EIGHT questions.

$8 \times 10 = 80$

- 1(a) Define resolution. Discuss important of computer graphics. 1+4
- 1(b) Briefly explain light pen and touch screen. 5
- 2(a) Define frame buffer. Why is it required? 2+2
- 2(b) Discuss any color manipulation technique. 6
3. Differentiate between vector and raster display architecture. Explain advanced raster graphic architecture. 4+6
4. Explain Bresenham's midpoint ellipse drawing algorithm. 10
5. What is scaling? Discuss two-dimensional fixed point scaling. 2+8
6. What is clipping? Discuss Sutherland Hodgman polygon clipping algorithm with an example 2+8
7. What is projection? Explain parallel and prospective projection. 2+8
8. What are different surface removal technique? Explain z-buffer method. 2+8
9. Explain gouraud shading method with example. 10
10. Write short notes on any TWO: 5+5
- (a) Open GL
- (b) Graphical file format
- (c) Bezier Curve



PURBANCHAL UNIVERSITY

2013

B.E. (Computer/Electronics & Comm)/Sixth Semester/Final

Time: 03.00 hrs

Full Marks: 80 / Pass Marks: 32

BEG375CO: Computer Graphics

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer EIGHT questions.

1. What is Computer Graphics? Explain the uses of Computer Graphics in various real world applications. 2+8
2. Consider two raster systems with resolution of 640x480 and 1280x 1024. How many pixels could be accessed per second in each of these systems by a display controller that refreshes the screen at a rate of 60 frames per second? What is the access time per pixel in each system? 10
3. Explain the Vector and raster scan architectures. How is the limitation of random scan architecture overcome by raster scan architecture? 8+2
4. Digitize the intermediate pixels in the first quadrant of a circle having radius =7 with center at (50, 50). How can we get full circle though we sample only in one octants? 8+2
5. How window to view port transformation is carried out? Show steps with matrix form. 10
6. What do you mean by visible surface detection methods? Explain the depth buffer method of visible surface detection method. 2+8
7. Describe how normal vector interpolation technique can be used in rendering a realistic 3D object. Compare the performance of this method with intensity interpolation method. What are the assumptions that should be valid for an accurate rendering using flat shading method? 10

Contd. ...

Identifying
anticlockwise
order

for frame = 640x480 pixel

1 sec. for frame

60x60 pixels

(2)

8. What are the various phases of software project development Explain. 10
9. Write short notes any TWO: 10
(a) Fluorescence and phosphorescence
(b) Perspective projection
(c) Open Graphics Library

PURBANCHAL UNIVERSITY

2012

B.E. (Computer/Electronics & Comm.)/Sixth Semester/Choice

Time 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG375CO: Computer Graphics

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer EIGHT questions.

$8 \times 10 = 80$

1. ✓ Explain the general Bresenham's line drawing algorithm with its advantages.
2. ✓ Describe the concept of Cohen-Sutherland line clipping algorithm briefly.
3. ✓ How limitation of Random scan architecture is overcome by raster scan architecture. Describe color manipulation technique in raster scan display.
4. ✓ Explain the different application area of computer graphics.
5. ✓ Why machine independent languages are needed for graphics?
✓ Explain the different file formats of computer graphics.
6. Describe Project management and planning technique in brief.
7. ✓ Why shading is needed for data visualization? Explain Specular reflection and Gouraud shading model with proper derivations.
8. ✓ The coordinate of a point of a 3D object is (40, 50, 60). Obtain the resultant matrix after scaling of this point taking (S_x, S_y, S_z) as (2, 2, 3).
9. ✓ Explain Scan Line method of detecting hidden line and hidden surface with example.
10. Explain three basic 2-D transformations in detail.

PURBANCHAL UNIVERSITY
2011

B.E. (Computer / Electronics & Comm.) / Sixth Semester / Choice
Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 42

BEG375CO: Computer Graphics

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer EIGHT questions.

1. Discuss the application of computer graphics in brief. Explain the working mechanism of beam and shadow masking method to produce color CRT. 5+5
2. Define frame buffer. Differentiate between raster and vector display architecture. 3+7
3. Explain the mechanism of window to view port transformation.
Q Why do we often apply clipping against world-coordinate rather than the view-coordinate? 6+4
4. List out the problem of DDA. Draw the line (-5, 5) to (2, 1) using Bresenham's line drawing algorithm. 2+8
5. Explain different types of three dimensional transformations. Explain with examples. 10
6. Explain the program debugging techniques. Write an algorithm to generate the circle by using Bresenham's line drawing algorithm. 4+6
7. What are the different hidden line and hidden surface removal technique. Explain any two of them in brief. 2+8
8. Discuss different polygon rendering methods. Explain constant shading model for rendering three dimensional objects. 5+5
9. Write short notes on any TWO:
(a) Ambient and diffuse reflection
(b) Need for machine independent graphical language scaling.
(c) Optical and mechanical mouse

≡

33

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer EIGHT questions.

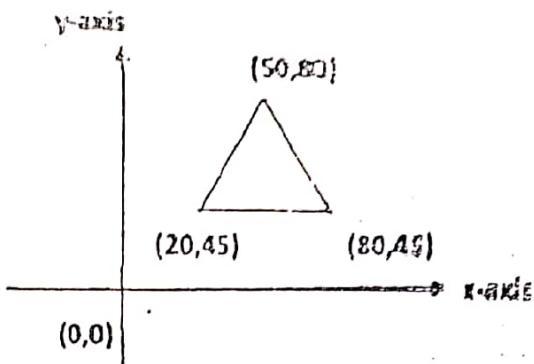
- 1(a) Define the term Pixel and Resolution. How Computer Graphics is applied in Modern era of science and technology? 2+4
- (b) Explain any two hardware components used as an input in computer graphics. 4
- 2(a) What are the advantages of flat panel display over CRT display? Write down the detail working principle of Shadow mask CRT display. 2+4
- (b) Differentiate between Raster-Scan display technology and Vector Scan display technology. 4
- 3(a) Derive the mid point ellipse drawing algorithm with necessary expression. 6
- (b) Digitize an ellipse for $(x^2/81 + y^2/36) = 1$. 4
- 4(a) What do you mean by Clipping? Explain Cohen Sutherland Line Clipping Algorithm in details. 2+4
- (b) Digitize the line with end points (1,3) and (7,9) using Bresenham's line drawing algorithm. 4
- 5(a) Explain ambient light, diffuse and specular reflections. 6
- (b) Why do we need machine independent graphical language? 4
- 6(a) What do you mean by Hidden Surface Removal Technique? Explain scan-line method of visible Surface detection. 2+4

Contd. ...

(2.)

- (b) Rotate the following triangle with $\theta=45^\circ$ by showing the accurate diagram, and final matrix.

$$\begin{aligned} \begin{bmatrix} x' \\ y' \end{bmatrix} &= \begin{bmatrix} \cos 45^\circ & -\sin 45^\circ \\ \sin 45^\circ & \cos 45^\circ \end{bmatrix} \begin{bmatrix} 50 \\ 80 \end{bmatrix} \\ &= \begin{bmatrix} \cos 45^\circ \times 50 + (-\sin 45^\circ) \times 80 \\ \sin 45^\circ \times 50 + \cos 45^\circ \times 80 \end{bmatrix} \\ &= \begin{bmatrix} 25 - 40 \\ 25 + 40 \end{bmatrix} \\ &= \begin{bmatrix} -15 \\ 65 \end{bmatrix} \end{aligned}$$



- 7(a) Explain about Project Management technique. 7
 (b) What do you mean by Virtual Reality? 3
 8(a) What do you mean by Projection System? Explain its types. 6
 (b) Translate 2-dimensional transforms into 3-dimension for translation, rotation and reflection. 4
 9. Write short notes on any FOUR: $4 \times 2.5 = 10$
 (a) Phong Shading
 (b) File Format
 (c) Polygon Table
 (d) GUI (Graphical User Interface)
 (e) Light Pen

5 seconds
2.7 milliseconds

1024x768
65536 \Rightarrow 2¹⁶ possible
for each pixel " 16 bit requires
1024x768 " $= 16 + 1024 \times 768$ bits
" 1024x768 " $= 1024 \times 8$
" 1024x768 " KB
" 1.5 MB

PURBANCHAL UNIVERSITY
2021

B.E. (Computer)/Fifth Semester

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG371CO: Algorithm Analysis & Design (New Course)

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

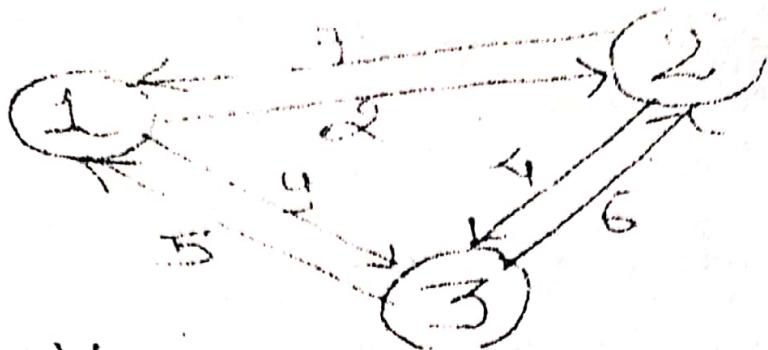
Answer EIGHT questions.

$8 \times 10 = 80$

- 1(a) What are the major characteristics of good algorithm? Describe different cases used to analyze the quality of an algorithm. 3+3
- (b) Define Recurrence relation. Using substitution method solve the following recurrence relation. $T(n)=4T(n/2)+n^2$, $n>1$. 1+3
2. Using the Divide and Conquer strategy, design an algorithm for Merge-sort and analyze its time complexity. Compare Merge sort with quick sort in terms of time and space complexity. 6+4
3. Explain the concept of space and time complexity with appropriate example. Describe the concept of volker matrix multiplication method with its benefits. 5+5
4. Write any two characteristics of Greedy Algorithms. Write an algorithm for solving fractional Knapsack problem and also use it find the optimal solution to the Knapsack instance, $n= 4$, $m=5$ $(w_1, w_2, W_3, w_4) = (2, 1, 3, 2)$ and $(P_1, P_2, P_3, P_4) = (12, 10, 10, 15)$. 2+8
5. Define planar graph. Explain the concept of Convex Hull in 2D. Describe dijkstra's algorithm with example. 1+4+5
6. Defien shortest path and tree. Explain and analyse travelling salesperson problem of the given graph; 1+1+8

Contd. ...

(2)



7. Compare the iterative and recursive algorithm for Backtracking method. Write algorithm, to place 8-queen's in non-attacking position on 8×8 chess-board. Also draw its state space search tree. 3+7
8. What is Branch and Bound Method, how is it different from Backtracking? Explain, with the help of an example, how 0/1 Knapsack problem can be solved using Branch and Bound technique. 3+7
9. Explain about class P, class NP, NP-Hard and NP complete with suitable examples. Discuss about The Satisfiability Problem for chromatic number. 7+3



Time-bound Home Exam 2020

B.E. (Computer)/Fifth Semester

Time: 03:00 hrs. (+2 Hrs. for Submission)

Full Marks: 80 / Pass Marks: 32

BEG371CO: Algorithm Analysis & Design (New Course)

Instructions:

Dear Students!

- This model of examination is for you as the end of your current semester. This examination allows you to write answer from your own place of residence. Follow the following instructions without fail.
- Do not write your name in the answer-sheet(s).
- All the answer-sheets should be sent to college through your approved email in which you have received your question paper.
- Do not write questions in the answer-sheet but mention clearly the question number.
- All the scan/photos of answer-sheets should be clearly visible. Any blur scan/photo will not be considered for evaluation. Responsibility lies with the students to make sure that scan/photos of the answer-sheet are of readable quality.
- Leave 1 inch margin on each side of the answer-sheet.
- Clearly mention your Roll no, subject, program, semester, page number at the right-top of each page as instructed by the Office of the Examination Management.
- Make sure that you send your answer-sheets within the given time. Any email received after the given time will not be acceptable.
- You are strictly advised to write with your own handwriting and that you are not using any unfair means to answer the questions.
- Do not consult during the examination period to any other person in answering the questions.
- Do not post any pictures of taking examination or your answer-sheets in any social-media. Found that may be taken action from University.

The figures in the margin indicate full marks.

$8 \times 10 = 80$

Answer EIGHT questions.

1. What are algorithms? Why it is necessary? Explain asymptotic notations with their use.
2. What is convex hull? Explain the process of generating convex hull with given set of point with analysis.
3. What is dynamic programming? Explain all pairs shortest path problem with solution and analysis.
4. What are the recursive algorithm? Explain properties of recursive algorithms with suitable example.
5. What is greedy method? Why it is important? Explain Prim's algorithm to generate MST and analyze it.
6. What is left turn and right turn? Discuss "Class P", "Class NP" and "NP completeness".
7. What is divide and conquer technique? Using this technique, write an algorithm of quick sort, then analyze it.
8. What is Backtracking? With the help of an algorithm, explain how 8-queen problem is solved.
9. Write short notes on any TWO:
(a) Travelling Salesperson Problem
(b) 0/1 knapsack
(c) Multi-stage graph



**PURBANCHAL UNIVERSITY
2019**

B.E. (Computer)/Fifth Semester

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG371CO: Algorithm Analysis & Design (New Course)

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

$$8 \times 10 = 80$$

Answer EIGHT questions.

1(a) Define worst case, best case and average case of algorithm analysis. 3

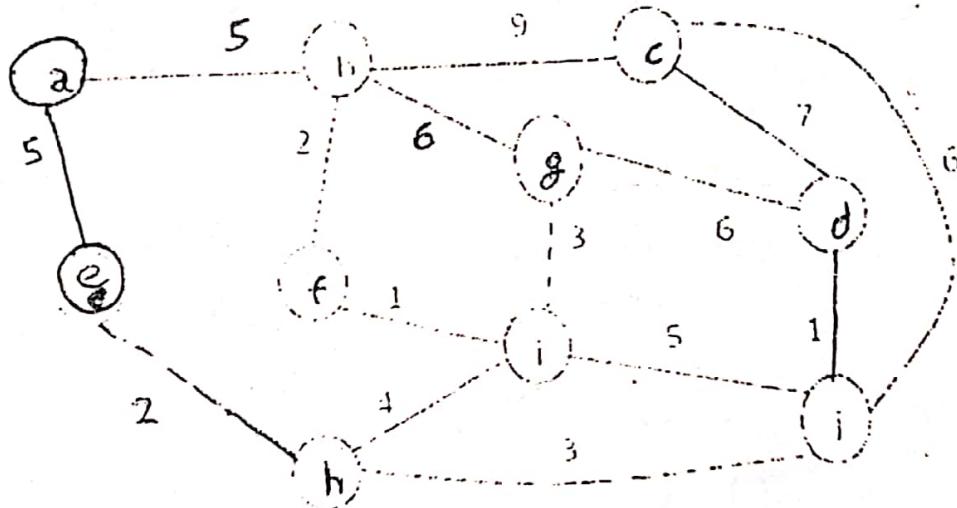
(b) Make a tight big-O analysis of following code 7

```
void main()
{
    int m, n, i, j, a[], b[], c[];
    printf ('Enter value of m and n');
    scanf("%d%d", &m, &n);
    for(i=0; i<n; i++)
    {
        a[i] = i;
        b[i] = i * i;
        c[i] = -i;
    }
    for (i=0; j<m; j++)
    {
        printf("%d it %d it %d in", a(j), c(j));
    }
}
```

Contd. ...

(2)

2. What is minimum spanning tree? Write the execution trace of following graph to construct minimum panning tree by Prim's algorithm. 3+7



3. Define approximation algorithm. Explain Graham's Scan algorithm to compute convex hull. 2+8

4. What is divide and conquer technique? Using this technique. Write an algorithm of quick sort then analyse it. 3+7

5. What is left turn and right turn? Discuss "class P", "Class NP", and "NP completeness". 2+8

- 6(a) What do you mean by recurrence relation? 2

- (b) Give the jobs sequencing algorithm with deadlines. You have given 5 jobs with profit p_i and deadlines d_i as

$$\text{job } i = \{1, 2, 3, 4, 5\}$$

$$p_i = \{20, 10, 5, 15, 1\}$$

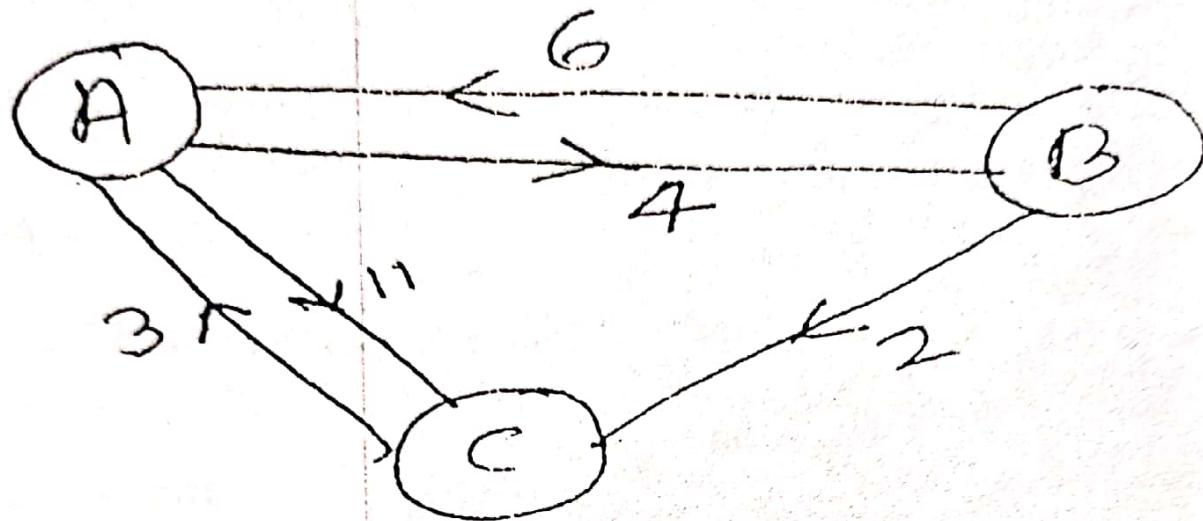
$$d_i = \{2, 1, 3, 2, 3\}$$

Find the optimal job list that can be executed in sequence with their deadlines so as to maximize the profits. 8

Contd. ...

7. Explain and analyse the Floyd's Warshall algorithm for all pair shortest path problem. Trace the algorithm for the following graphs.

5+5



8. What is Backtracking? With the help of an algorithm, explain how 8-queen problem is solved?

2+3

9. Define branch and bound. Explain multi-stage graph with example.

3+7

PURBANCHAL UNIVERSITY
2018

B.E. (Computer) / Fifth Semester

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG371CO: Algorithm Analysis & Design (New Course)

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer EIGHT questions.

$8 \times 10 = 80$

1. Compare optimization problems and decision problems.
Elaborate on Asymptotic Notations with examples. 4+6
2. Using the step count method analyze the time complexity when two $m \times n$ matrices are added. Derive Big Oh notation for given relation: $T(n)=2T(n/2)+3n^2$, $T(1)=11$ and $n=2^k$ 4+6
3. How divide and conquer method is used to solve a problem?
Explain convex hull problem using Divide and Conquer method. 4+6
4. Write down general method of greedy technique. Find optimal schedules for following tasks with given deadlines and penalties in terms of weight. 4+6

Task	1	2	3	4	5	6
W_i	20	15	25	10	5	30
d_i	2	4	3	1	5	6

5. Differentiate between Divide and conquer method and Dynamic Programming method. Explain a multistage graph problem based on dynamic programming with example. 4+6
6. What is all pair shortest path problem? Solve TSP problem to find optimal path using Dynamic Programming method for a graph with cost matrix as follow: 4+6

Contd. ...

(2)

$$\begin{bmatrix} 0 & 20 & 15 & 10 \\ 6 & 0 & 2 & 6 \\ 5 & 12 & 0 & 15 \\ 7 & 10 & 9 & 0 \end{bmatrix}$$

7. Write down solution state space tree for 4 queen problem with explicit and implicit constraints to solve using backtracking method. 4+6
8. Define NP hard and NP complete. Show that CLIQUE is NP complete. 5+5
9. Write down steps of least cost search method to solve TSP problem. Solve O/I Knapsack problem using Branch and Bounding method for item: $\langle 11, 12, 13 \rangle$, $\langle w_1, w_2, w_3 \rangle : \langle 5, 4, 3 \rangle$ and $\langle v_1, v_2, v_3 \rangle : \langle 6, 5, 4 \rangle$ 4+6

PURBANCHAL UNIVERSITY
2016

B. (Computer)/Fifth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

EG373CO: Operating System (New Course)

Answers are required to give their answers in their own words as far as practicable.

7 questions carry equal marks. The marks allotted for each sub-question specified along its side.

Answer EIGHT questions.

$8 \times 10 = 80$

What is an operating system? Discuss briefly about the evolution of operating system. A 2+8

Define process and its different states. What are the various operations on a semaphore? Solve the produce-consumer problem using semaphore. V 2+4+4

Compute average waiting times using FCFS, Priority (lowest no. represents highest priority) and Round Robin (quantum= 1ms) scheduling algorithm for the following set of processes. Assume that all processes have arrived at time 0 in the order P1, P2, P3, P4 and P5. C 3+3+4

Process	Burst Time(ms)	Priority
P1	10	3
P2	1	1
P3	2	3
P4	1	4
P5	5	2

What are the necessary conditions for a deadlock? Briefly explain "Banker's Algorithm". C 4+6

Consider that there are total 10 magnetic tapes. There are four processes in the system, in which process p1 may need maximum of 4-tapes, p2 may need maximum of 3, p3 may need maximum of 5 and p4 may need maximum of 7 tape drives. The matrix is as follows:

10

(2)

Process	Max. Need	Allocated
P1	4	2
P2	3	2
P3	5	3
P4	7	1

2

Find the safe sequence if the system is in safe state

4+5

6. What are the advantages of dynamic memory partitioning over fixed memory partitioning. Use LRU page replacement algorithm in the following reference string having three frames and calculate the no. of page faults: 5+5

0 1 2 3 0 1 2 3 0 1 2 3 4 5 6 7

8

10

7. Discuss disk scheduling algorithm in brief.

- 8(a) Define soft real time and firm real time

9

4

- (b) Why is Android Operating System popular? Discuss.

9. Write short notes on any TWO:

(a) Classical IPC Problem-Dining Philosopher

1

5+5

(b) DMA

1

6

(c) Process Control Block (PBC)

m

PURBANCHAL UNIVERSITY

2016

B.E. (Computer)/Fifth Semester
Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 40

BEG371CO: Algorithm Analysis & Design (New Course)

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer EIGHT questions.

1. What do you mean by asymptotic notation? Define and explain the notation Big Oh, theta and omega notation. Find the best case, worst case and average case running time for Binary Search algorithm. 2+10=12

2. Define multistage graph. Explain knapsack problem in context of Backtracking. 1+5=6

3. Define greedy paradigm. Explain the concept of job sequencing with illustration. You have given 5 jobs with profit "pi" and deadline "di" as:

$$\text{job } = \{1, 2, 3, 4, 5\}$$

$$pi = \{20, 10, 5, 15, 1\}$$

$$di = \{2, 1, 3, 2, 3\}$$

(4)

(4)

2+

(8) ✓

Find the optimal job list that can be executed in sequence with their deadlines so as to maximize the profits. 2+8

4. Discuss algorithm analysis. Explain time complexity and space complexity. 3+7

(2)

5. What is graph? Explain shortest path algorithm and its application with Dijkstra's Algorithm. 4

(4)

2+8

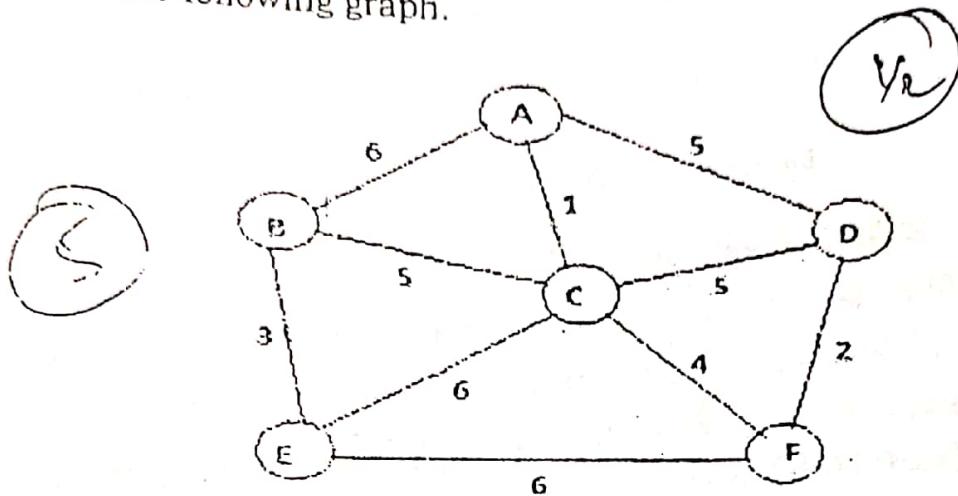
6. What is Divide and Conquer technique? Using this technique, write an algorithm of quick sort and then analyze it. 3+7

(3)

(2)

Sketch the Prim's algorithm for computing Minimum Spanning Tree (MST) of a graph and analyze its complexity. Find the MST for the following graph.

10



8. Explain about Class P, Class NP and NP complete with suitable example.

10

9. What is the concept of dynamic Programming? Find the longest common subsequence (LCS) between "XMJYAUZ" and "MZJAWXU".

3+7

10. Write short notes on:

5+5

- (a) Travelling Salesman problem
- (b) Convex Hull

4

3

PURBANCHAL UNIVERSITY

2015

B.E. (Computer) / Fifth Semester / Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG371CO: Algorithm Analysis & Design (New Course)

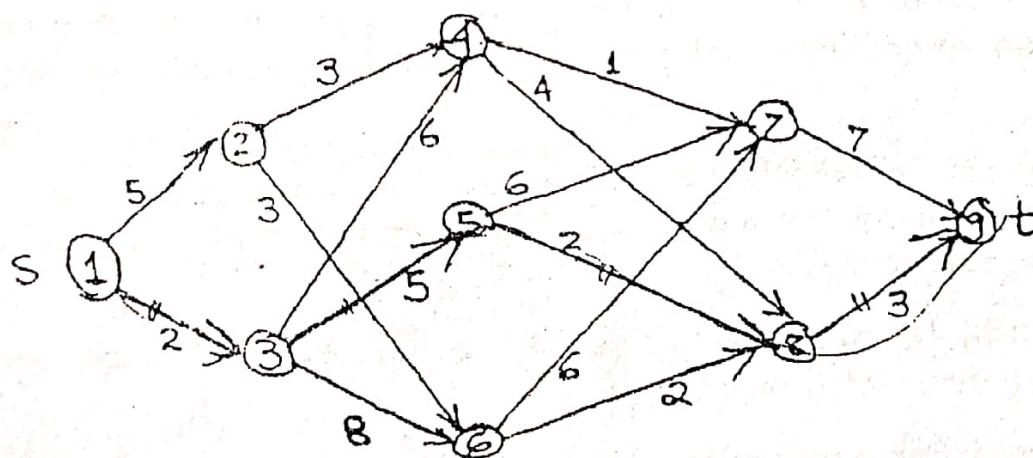
Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer EIGHT questions.

$8 \times 10 = 80$

- 1(a) Describe briefly how the divide-and-conquer strategy is used for designing efficient algorithms. 4
- (b) Using divide-and conquer strategy, design an algorithm for binary search and compute its time complexity for the worst case. 6
- 2(a) What is dynamic programming? How does it differ from greedy strategy? 2+2
- (b) Find minimum-cost path from s to t in the given multistage graph using either forward or backward approach. 6



- 3(a) Give the algorithm for greedy strategies for the Knapsack problem. 4
- (b) Using greedy strategy, find an optimal solution to the knapsack instance $n=7$, $m=15$, $(p_1, p_2, \dots, p_7) = (10, 5, 15, 7, 6, 18, 3)$, and $(w_1, w_2, \dots, w_7) = (2, 3, 5, 7, 1, 4, 1)$, where n represents the number of objects, m the knapsack capacity, p_i the profit per unit weight of object i , and w_i the weight of object i . 6

Contd. ...

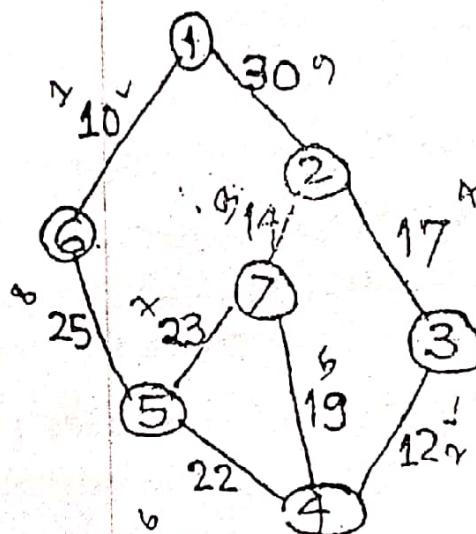
(2)

4. Define algorithm. Express the asymptotic notation using big O of $f(n)$ defined as follows:
 $f(n) = 10n^2 + 4n + 4$

2+8

- 5(a) Using Kruskal's algorithm, find the minimum-cost spanning tree for the given graph. Show all stages in the algorithm.

6



Q6

- (b) Discuss about graph coloring problem.

4

What is 8-Queens problem? What algorithm design strategy would you adopt to solve this problem? Develop an algorithm for it.

3+1+6

7. Describe briefly the branch-and-bound strategy of algorithm design. Mention a few types of problems that can be solved by using this strategy.

6+4

8. Describe NP-complete problems in detail. Why is it important to know about such problems?

7+3

- 9(a) Using divide-and-conquer design strategy, develop an algorithm to sort a list of numbers with the help of quick sort sorting technique.

5

- (b) Discuss about travelling sales person problem and its solution in the light of dynamic programming.

5

10. Write short notes on:

5+5

- (a) Space complexity
(b) Ω asymptotic notation

PURBANCHAL UNIVERSITY

2014

B.E. (Computer) / Fifth Semester

Date: 03:00 hrs.

ST0071CO: Algorithm Analysis & Design (New Course)

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.

Answer FIVE questions.

$$5 \times 16 = 80$$

(a) Define Algorithm. Explain recursive algorithm to compute factorial of an integer.

8

(b) What do you mean by asymptotic notation? Define and explain the notion Big O with example. Explain divide and conquer technique.

4+4

(c) Obtain a recurrence relation to calculate computing time of quick sort. For the following set of numbers search the no. 14 using binary search algorithm and show all the steps: 5, 9, 12, 14, 18, 61, 101, 106.

4+4

(d) Write and explain the concept of Merge sort and calculate the time complexity of this.

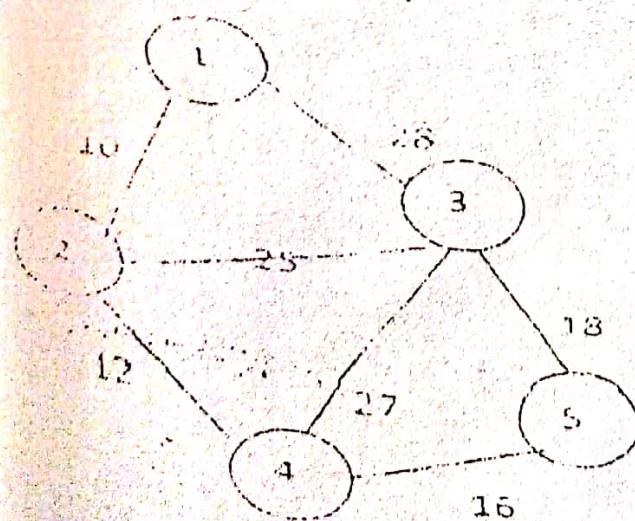
8

(e) Explain the general concept of greedy method, with its control abstraction.

8

(f) Identify the difference between Prim's and Kruskal's algorithm. Obtain a minimum cost spanning tree using prim's algorithm from the following graph.

2+6



Contd. ...

- 4(a) What do you mean by dynamic programming? Obtain multistage graph for 3 resources and 2 projects. 2+
- (b) Write and explain the concept of all pairs shortest path approach. What do you mean by backtracking? Explain its general concept. 4+
- 5(a) Define and explain the concept of State space tree. Obtain a state space tree for 4-queens problem. 8
- (b) Explain the difference between depth first and breadth search technique with example. 8
- 6(a) What do you mean by NP-Hard and NP complete problems? Explain their difference. 8
- (b) Define and explain decision algorithm, optimization problem and optimization algorithm. 8

PURBANGLA UNIVERSITY

2013

B.E. (Computer) / Fifth Semester / Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG371CO: Algorithm Analysis & Design (New Course)

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks

Group A

$2 \times 12 = 24$

Answer TWO questions.

1(a) ✓ What is time complexity? Develop an efficient algorithm for finding the sum of n numbers. Draw step table for this algorithm and find out its time complexity using big O asymptotic notation.

$2+2+2+2$

(b) Define algorithm. What are the criteria that all algorithms must satisfy?

$1+3$

2(a) ✓ Describe in brief how the divide-and-conquer strategy is used for designing efficient algorithms.

4

(b) Using divide-and-conquer strategy, design an algorithm for merge sort sorting technique. Compute its time complexity.

$6+2$

3(a) Give the algorithm for greedy strategies for the Knapsack Problem.

5

(b) Using greedy strategy, find an optimal solution to the Knapsack instance $n=3$, $m=20$, $(p_1, p_2, p_3)=(25, 24, 15)$ and $(w_1, w_2, w_3)=18, 15, 10$, where n represents the number of objects, m the Knapsack capacity, p_i the profit per unit weight of object i , and w_i the weight of object i .

7

Group B

$8 \times 7 = 56$

Answer EIGHT questions.

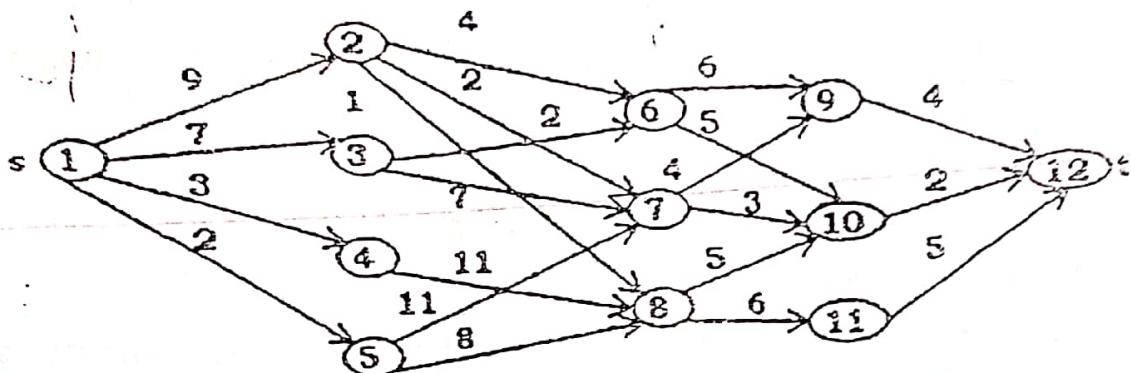
3. What is dynamic programming? How does it differ from greedy strategy?

$4+3$

Contd. ...

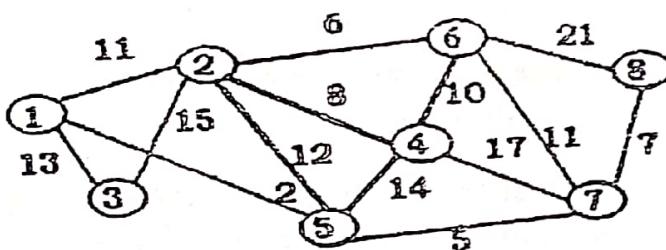
(2)

5. Find a minimum-cost path from s to t in the given multistage graph using either forward or backward approach: 7



6. Express the asymptotic notations using big O and Ω of $f(n)$ defined as follows: $f(n) = 100n+6$. 4+3

7. Using the Prism's algorithm, find the minimum-cost spanning tree for the given graph. Show all stages of the algorithm. 7



8. What is backtracking algorithm design techniques? Give a backtrack solution to the 8-queens problem. 3+4

9. Describe briefly the branch-and-bound strategy of algorithm design. Mention a few types of problems that can be solved using this strategy. Knapsack 4 Traveling Salesperson A+3

10. What are NP-hard and NP-complete problems? Discuss. 7

11. Using divide-and-conquer design strategy, develop an algorithm to sort a list of numbers with the help of selection sort sorting technique. 7

10. Write short note on any TWO: 2x3.5=7
(a) Dijkstra's algorithm
(b) Graph colouring
(c) Performance measurement

PURBANCHAL UNIVERSITY

2021

B.E. (Computer)/Fifth Semester/Final

Time: 01.30 hrs.

Full Marks: 40 /Pass Marks: 16

BEG396MS: Research Methodology (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer ALL questions.

$5 \times 8 = 40$

1. What is meant by scientific research? Describe the importance of rigor and relevance in research. **4+4**

Or

What are the benefits of sampling? Why do we need to test validity and reliability during research? **4+4**

2. What is the role of research design in a research? How a research proposal is prepared? **4+4**

3. Describe the advantage and disadvantage of secondary data? How the data are presented in a report? **4+4**

4. What do you understand by primary data? Discuss the various methods of collecting primary data.

5. What do you understand by the following terminologies? Give your clear views on them any FOUR: **4×2=8**

- (a) Theoretical framework
- (b) Field work
- (c) Hypothesis
- (d) Format of Report
- (e) Bibliography
- (f) Case study

Time-bound Home Exam

B.E. (Computer)/Fifth Semester/Final

Time: 01:30 hrs. (+2 Hrs. for Submission)

BEG396MS: Research Methodology (New Course)

Full Marks: 40 / Pass Marks: 16

Instructions:

Dear Students!

- This model of examination is for you as the end of your current semester. This examination allows you to write answer from your own place of residence. Follow the following instructions without fail.
- Do not write your name in the answer-sheet(s).
- All the answer-sheets should be sent to college through your approved email in which you have received your question paper.
- Do not write questions in the answer-sheet but mention clearly the question number.
- All the scan/photos of answer-sheets should be clearly visible. Any blur scan/photo will not be considered for evaluation. Responsibility lies with the students to make sure that scan/photos of the answer-sheet are of readable quality.
- Leave 1 inch margin on each side of the answer-sheet.
- Clearly mention your Roll no, subject, program, semester, page number at the right-top of each page as instructed by the Office of the Examination Management.
- Make sure that you send your answer-sheets within the given time. Any email received after the given time will not be acceptable.
- You are strictly advised to write with your own handwriting and that you are not using any unfair means to answer the questions.
- Do not consult during the examination period to any other person in answering the questions.
- Do not post any pictures of taking examination or your answer-sheets in any social-media. Found that may be taken action from University..

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

5×8=40**Answer FIVE questions.**

1. What is meant by scientific research? How can we identify the research topic?
2. Why sampling method is preferred over census method in many researches? Describe the methods of testing reliability of any research.
3. What is sampling? Describe simple random, statistical and systematic sampling with example.
4. Why Report is prepared after completion of any research? List down the basic contents of an academic research.
5. What are the factors that should be considered during presentation? How nervousness can be dealt.
6. **What do you understand by the following terminologies? Give your clear views on them. (Any FOUR):**

4×2=8

- (a) Theoretical framework
- (b) Scaling
- (c) Hypothesis
- (d) Format of Report
- (e) Literature review



**PURBANCHAL UNIVERSITY
2019**

B.E. (Computer)/Fifth Semester/Final

Time: 01:30 hrs.

Full Marks: 40 /Pass Marks: 16

BEG396MS: Research Methodology (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

$5 \times 8 = 40$

1. Explain Research Hypothesis. Describe characteristics of Hypothesis and explain different methods of Hypothesis formulation.
2. Write differences between Sample & Census and discuss the Probability and Non Probability Sample in detail.
3. What is Research Proposal? Describe all the nine steps in preparing a research proposal.
4. What do you understand by a Research Report? Explain the general procedures to be followed while preparing a research report.
5. What is social research? Distinguish between basic and applied research.
6. Write short notes on any FOUR:
(a) Observation method of data collection
(b) Reliability
(c) Questionnaire
(d) Standard deviation
(e) Literature review

$4 \times 2 = 8$



PURBANCHAL UNIVERSITY

2018

B.E. (Computer)/Fifth Semester/Final

Time: 01:30 hrs.

Full Marks: 40 /Pass Marks: 16

BEG396MS: Research Methodology (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

$5 \times 8 = 40$

1. Define social research. What are the different phases of social research? 3+5
2. What is report writing? Discuss the elements of report writing. 2+6
3. What are the different roles of research in engineering field?
Differentiate between basic and applied research. 4+4
4. Explain the statement "Hypothesis is taken as most important instrument in research process". 8
5. What is a research problem? Explain about the different steps taken while formulating the research problems. 2+6
6. Write short notes on:
(a) Reliability and validity
(b) Literature review
(c) Case study research
(d) Sampling 4×2=8



PURBANCHAL UNIVERSITY
2016

B.E (Computer) / Fifth Semester / Final

Time: 11:30 hrs.

SEG396MS: Research Methodology (New Course)

Full Marks: 40 / Pass Marks: 16

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

$5 \times 8 = 40$

What is research? What are its objectives and significance?

What is sampling? What is quota sampling and its limitations?

Give the meaning and importance of data collection. Describe the sources of secondary data.

What is interviewing? What are the requirements of a successful interview?

What is research design? Write down the descriptive research design.

How is a Likert Type of scale developed?

What is research report? Describe the layout or format of a research report.

PURBANCHAL UNIVERSITY

2014

B.E. (Computer)/Fifth Semester/Final

Time: 01:30 hrs.

Full Marks: 40 / Pass Marks: 16

BEG396MS: Research Methodology (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

$$5 \times 8 = 40$$

Answer FIVE questions.

1. Define the term 'Research'. What are the steps followed in a research process explain in brief. 2+6
2. Explain the nature and functions of a hypothesis in a research process. 8
3. Define survey method of data collection. Write short note on types of surveys. 2+6
4. What is research proposal? What are the major elements of research proposal? 4+4
5. What do you know about research report? Briefly explain the general format to be followed in preparing a research report. 4+4
6. Write short notes on any TWO:
 - (a) Basic and applied research
 - (b) Standard deviation and C. V.
 - (c) Validity and reliability

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PURBANCHAL UNIVERSITY

2013

B.E. (Computer) / Fifth Semester / Final

Time: 01:30 hrs.

Full Marks: 40 / Pass Marks: 16

BEG396MS: Research Methodology (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks.

Answer FIVE questions.

1. What is Research? What are the Phases of social Research?  
Discuss about Fundamental and Applied Research.
2. What is research design? What are its various steps?
3. Write down the requirements of a good questionnaire and mention the process of its presentation.
4. What is sampling? Write down its characteristics and types.
5. What is Research Report? Describe in brief the general format of Research Report.
6. Write short notes on any THREE:  
(a) Bibliography  
(b) Reliability  
(c) Standard Deviation  
(d) Selection of Research Topics



All questions carry equal marks. The marks allotted for each sub-question is specified along its side.  $5 \times 8 = 40$

**Answer FIVE questions.**

1. Define applied research? Why academicians generally prefer fundamental research than applied research?  $2+6$

Or,

What is meant by literature review? What are the steps to be followed in a research?  $4+4$

2. What is sampling? Discuss the type of sampling in brief  $4+4$

3. If you have to carry out a research on "Working physical environment within a carpet industry", then, which technique would you prefer to collect the information (data)? Justify your selection of data collection technique.  $2+6$

4. What is the role of research report to an engineer? Give a format of a report, which is generally used, in Universities.  $2+6$

Or,

What is executive summary? Differentiate between reference and Bibliography.  $4+4$

5. What do you understand by the following terminologies? Give your clear views on them. (any FOUR):  $4 \times 2 = 8$

- (a) Sampling  
(c) Appendix  
(e) Methodology

- (b) Validity  
(d) Reliability  
(f) Literature review  
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PURBANCHAL UNIVERSITY

2012

B.E.(Civil/Computer/Electronics & Comm.)/Sixth Semester/Chance

Time: 01:30 hrs.

Full Marks: 40/Pass Marks: 16

**BEG396MS: Research Methodology**

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

**Answer any FIVE questions.**

$5 \times 8 = 40$

1. Define applied research? Why academicians generally adopt fundamental research than applied research?
2. Define hypothesis. What are the steps to be followed in a research?
3. What are the characteristics of a scientific Research? Describe any four of them.
4. If you have to carry out a research on "Working physical environment within a Garment Industry", then, which technique would you prefer to collect the information (data)? Justify our selection of data collection technique.
5. What is sampling? What are the advantages and disadvantages of sampling? Describe the key points that must be considered in field work.
6. Write short notes on any FOUR:
  - (a) Bibliography
  - (b) Validity
  - (c) Appendix
  - (d) Report
  - (e) Standard Deviation
  - (f) Literature Review

PURBANGLA UNIVERSITY

2012

B.E (Civil/Computer/Electronics & Comm.)/Sixth Semester/Final  
Time: 01.30 hrs. Full Marks 40/Pass Marks 16

BEG396MS: Research Methodology

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

$$5 \times 8 = 40$$

Answer FIVE questions.

1. What are the quality of a good research and explain briefly about the steps which are required to carry out for any research work.
2. Explain the different types of sampling method and write some precaution which should be taken before carry out the sampling.
3. What is research proposal? Write the elements of research proposal and also explain the procedure while selecting research topic.
4. Write different technique for primary data collection and also compare the method of interview and questionnaire for collecting data according to their merits and demerits with appropriate examples.
5. Write the source of data and also explain, with example, the necessary caution while collecting and using secondary data for research.
6. How can you process and analyze the data? List the methods of presentation of data.
7. Write short notes on any TWO:  
(a) Research Report  
(b) Hypothesis  
(c) Case Study

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# PURBANCHAL UNIVERSITY

2011

B.E.(Civil/Computer/Electronics & Comm.)/Sixth Semester/Choice

Time: 01:30 hrs.

Full Marks: 40/Pass Marks: 16

## **BEG396MS: Research Methodology**

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

$$5 \times 8 = 40$$

**Answer any FIVE questions.**

1. What is Research? What are steps of Social Research?
2. Describe in brief the terms validity and Reliability.
3. Distinguish between primary & secondary data.
4. What is Survey? How survey method is used in Research?
5. What are salient features of a Report?
6. Write short notes on:
  - (a) Questionnaire
  - (b) Standard Deviation

**PURBANCHAL UNIVERSITY**

**2021**

B.E. (Computer/Electronics & Comm.)/Fifth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

**BEG370CO: Numerical Methods (New Course)**

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

**Group A**

**Answer SIX questions.**

**$6 \times 10 = 60$**

- 1(a) Define absolute and relative errors. The thermometer measures to the nearest 2 degree. The temperature was measured as 40 °C. Find absolute and relative errors. 2+3
- (b) Solve the equation  $x^2 + \tan x + e^x = 0$  using Bisection Method correct up to four decimal places. 5
2. Prove that the Newton Raphson Method is quadratically convergent. 10
3. The Following table gives the population of a town during the last six census. Estimate using Newton's Interpolation formula the increase in population during period 1946 and 1948. 10

| Year                         | 1911 | 1921 | 1931 | 1941 | 1951 | 1961 |
|------------------------------|------|------|------|------|------|------|
| Population<br>(in thousands) | 12   | 13   | 20   | 27   | 39   | 52   |
|                              |      |      |      |      |      |      |

4. A rocket is launched from the ground. Its acceleration measured every 5 seconds is tabulated below. Find the velocity of the rocket at  $t=40$  secs. Use Trapezoidal as well as Simpson's rules. Compare the answers. 10

| $t$    | 0  | 5     | 10    | 15    | 20    | 25    | 30   | 35   | 40   |
|--------|----|-------|-------|-------|-------|-------|------|------|------|
| $a(t)$ | 40 | 45.25 | 48.50 | 51.25 | 54.35 | 59.48 | 61.5 | 64.3 | 68.7 |

5. Solve the following system of equations using Gauss Jocobi method.

**Contd. ...**

(2)

$$20x + 2y + 6z = 28$$

$$x + 20y + 9z = 23$$

$$2x - 7y + 2z = 57$$

6. Solve the differential equation  $dy/dx = x^2 + y^2$ ,  $y(0) = 0.5$  using fourth order Runge-Kutta method. Find the solution for  $y(0.4)$ . Take  $h=0.2$ . 10
7. Solve the poisson's equation.  $\nabla^2 U = -10(x^2 + y^2 + 10)$  over the square with sides  $x=0=y$ ,  $x=3=y$  with  $U=0$  on the boundary and mesh length=1. 10

Group B

$2 \times 10 = 20$

**Answer TWO questions.**

8. Write a program in any high level language to find the solution of non-linear equation using secant method.
9. Write an algorithm and program to fit the linear curve for the set of given data points.
10. Write a program to solve the differential equation using Eluer's method.

Instructions:

Dear Students!

- This model of examination is for you as the end of your current semester. This examination allows you to write answer from your own place of residence. Follow the following instructions without fail.
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- All the answer-sheets should be sent to college through your approved email in which you have received your question paper.
- Do not write questions in the answer-sheet but mention clearly the question number.
- All the scan/photos of answer-sheets should be clearly visible. Any blur scan/photo will not be considered for evaluation. Responsibility lies with the students to make sure that scan/photos of the answer-sheet are of readable quality.
- Leave 1 inch margin on each side of the answer-sheet.
- Clearly mention your Roll no, subject, program, semester, page number at the right-top of each page as instructed by the Office of the Examination Management.
- Make sure that you send your answer-sheets within the given time. Any email received after the given time will not be acceptable.
- You are strictly advised to write with your own handwriting and that you are not using any unfair means to answer the questions.
- Do not consult during the examination period to any other person in answering the questions.
- Do not post any pictures of taking examination or your answer-sheets in any social-media. Found that may be taken action from University.

The figures in the margin indicate full marks.

Group A

**Answer SIX questions.**

$6 \times 10 = 60$

1. Factorize the given matrix A using Dolittle LU Decomposition Method.

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 2 \\ 3 & 2 & 1 \end{bmatrix}$$

2. Solve for  $y(1)$  from the given differential equation  $\frac{dy}{dx} = 3x^2 y, y(0) = 1$  using Euler's Method. Take  $h=0.2$ .
3. Find the root of the equation  $x^2 - 5x - 16 = 0$  using Newton Raphson Methods correcting upto 3 decimal places.
4. Solve the following system of equation by Gauss Siedel method.

$$15x - y - z = 10$$

$$x + 20y - 3z = 32$$

$$x - 5y + 15z = 36$$

Contd. ...

| From following table using appropriate formula. |   |       |       |       |       |       |       |
|-------------------------------------------------|---|-------|-------|-------|-------|-------|-------|
| X                                               | 0 | 5     | 10    | 15    | 20    | 25    | 30    |
| Y=f(x)                                          | 1 | 0.996 | 0.984 | 0.965 | 0.939 | 0.906 | 0.866 |

6. Evaluate  $\int_0^1 \frac{1}{1+x} dx$  by Simpson's 1/3 rule. Also calculate the error and the value of  $\ln 2$ .
7. Fit a curve in the form  $y=ax^b$  with the help of the following data and find the value of y at  $x=2.6$ .

|   |       |      |      |      |      |      |
|---|-------|------|------|------|------|------|
| x | 1     | 1.2  | 1.4  | 1.6  | 1.8  | 2    |
| y | 2.718 | 3.32 | 4.05 | 4.95 | 6.04 | 7.38 |

### Group B

**Answer TWO questions.**

**2×10=20**

8. Write a algorithm and program in C for the straight line.
9. Write a program to solve the non-linear equations by bisection method.
10. Write a program for Gauss elimination method.



**PURBANCHAL UNIVERSITY**

**2019**

B.E. (Computer/Electronics & Comm.)/ Fifth Semester / Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

**BEG370CO: Numerical Methods (New Course)**

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

**Group A**

**$6 \times 10 = 60$**

**Answer SIX questions.**

1. Define absolute and relative and errors. Mention the significance of relative error as compared to absolute error 2+3
- (b) Solve the equation  $e^x + \cos(x) - 1.2 = 0$  using Newton-Raphson Method. 5
2. Prove that the Secant Method is superlinear convergent. 10
3. Fit a curve of the form  $y = ae^{bx}$  to the following data: 10

|     |      |      |      |      |
|-----|------|------|------|------|
| $x$ | 0    | 1    | 2    | 3    |
| $y$ | 1.05 | 2.10 | 3.85 | 8.30 |

4. A rocket is launched from the ground. Its acceleration measured every 5 seconds is tabulated below. Find the velocity of the rocket at  $t=40$  secs. Use Trapezoidal as well as Simpson's rules Compare the answers. 10

|        |    |       |       |       |       |       |      |      |      |
|--------|----|-------|-------|-------|-------|-------|------|------|------|
| $t$    | 0  | 5     | 10    | 15    | 20    | 25    | 30   | 35   | 40   |
| $a(t)$ | 40 | 45.25 | 48.50 | 51.25 | 54.35 | 59.48 | 61.5 | 64.3 | 68.7 |

**Contd. ...**

(2)

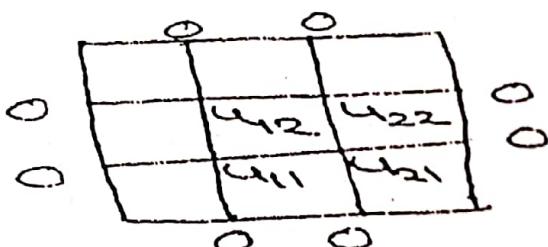
5. Solve the following system of equations using Gauss-Seidal Method correcting upto 4 decimal digits. 10

$$10x_1 + 10x_2 + x_3 = 9$$

$$2x_1 + 20x_2 - 2x_3 = -44$$

$$-2x_1 + 3x_2 + 10x_3 = 22$$

6. Solve the following equation  $dy/dx = x^2 + y^2$ ,  $y(0) = 0.5$  using forth order Range-Kutta method. Find the solution for  $0 \leq x \leq 1$  given  $y(0)=0$  and  $y'(0)=1$ . Take  $h=0.25$ . 10
7. Solve the possion's equation  $4_{xx} + 4_{yy} = -8x^2y^2$  for given mesh taking  $h=1$ . 10



Group B

$2 \times 10 = 20$

Answer TWO questions.

8. Write a program in C/C++ to find the solution of non-linear equation using Bisection Method. 10
9. Write an algorithm to solve simultaneous equations using Gauss Jordan method. 10.
10. Write algorithm and program to solve differential equation using Euler's method. 10

# PURBANCHAL UNIVERSITY

2018

B.E. (Computer/Electronics & Comm.)/Fifth Semester/Final  
Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

**BEG370CO: Numerical Methods (New Course)**

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

## Group A

Answer SIX questions.

$6 \times 10 = 60$

1(a) What do you mean by error? What are the types of errors?  
Explain in brief. 5

1(b) Find a root of the equation  $x^2=4x-10$  using Newton-Raphson method.  $\text{Newton's } x^2 - 4x + 10 = 0$  5

2. Estimate  $e^{1.5}$  using Interpolation polynomial for the Newton following sets of data: 10

|              |   |        |        |         |
|--------------|---|--------|--------|---------|
| X            | 0 | 1      | 2      | 3       |
| $f(x)=e^x-1$ | 0 | 1.7183 | 6.3891 | 19.0855 |

3. Fit the following set of data into the form  $y=ae^{bx}$ . Also find the value of a and b: 10

|   |       |        |        |        |         |
|---|-------|--------|--------|--------|---------|
| x | 2     | 4      | 6      | 8      | 10      |
| y | 4.077 | 11.084 | 30.128 | 81.892 | 222.620 |

4. Solve the following set of equation using Gauss Seidel iteration method upto four digit accuracy: 10

$$20x+y-2z=17$$

$$3x+20y-z=-18$$

$$2x-3y+20z=25$$

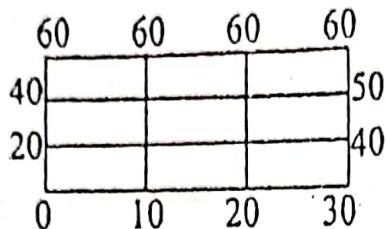
5. Evaluate  $\int_0^1 \frac{dx}{1+x^2}$  using Simpson's  $\frac{3}{8}$  rule and hence estimate the value of  $\pi$ . Also calculate error. 10

6. Using Fourth order R. K. Method find an approximate value of y when  $x=1$  given that  $dy/dx=x+y$  and  $y=1$  when  $x=0$ . Take  $h=0.5$ . 10

Contd. ...

(2)

7. Solve the Laplace's equation  $U_{xx} + U_{yy} = 0$  in the domain of figure given below: 10



Group B

$2 \times 10 = 20$

Answer TWO questions.

8. Write a program to fit the straight line for the given data points. 10
9. Write down a program to compute the interpolation value at a specified point for a given set of data points using Lagrange's Interpolation method. 10
10. Write down the algorithm and program to find a root of linear equation using Gauss elimination method. 10

# PURBANCHAL UNIVERSITY

2015

B.E. (Computer/Electronics & Comm.)/Fifth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

EGG370CO: Numerical Methods (New Course)

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

## Group A

Answer SIX questions.

$6 \times 10 = 60$

- What do you mean by numerical computing process? Explain new trends in numerical computing. Find the round off error in storing the number 752.6835 using a four digit mantissa. 2+4+4
- Find out the convergence of secant method. Find the square root of 5 using the fixed point method. 5+5
- Explain why interpolation is important for engineers. Find the Newton interpolation polynomial which agrees to the following data. 3+7

|            |   |        |        |        |
|------------|---|--------|--------|--------|
| i          | 0 | 1      | 2      | 3      |
| $x_i$      | 1 | 2      | 3      | 4      |
| $\log x_i$ | 0 | 0.3010 | 0.4771 | 0.6021 |

Use the polynomial obtained to estimate the value of  $\log 2.5$ .

- Use Simpson's 3/8 rule and Boole's 5 point formula to compute  $\int_0^{\pi} \sin(x) dx$ . 5+5

- Give the solution for the following set of linear equation by using Gauss Jordan: 10

$$x + 2y - 3z = -4$$

$$x + 3y + z = 10$$

$$2x + 4y - 2z = -12$$

Contd. ...

(2)

6. Use the classical R-K method to estimate  $y(0.4)$  when  $y'(x) = x^2 + y$  with  $y(0)=0$  assume  $h=0.05$ . 10

7. Solve the equation: 10

$$2f_{xx}(x, t) = f_t(x, t), \quad 0 < t < 1.5 \text{ and } 0 < x < 4$$

with the following initial conditions

$$f(x, 0) = 50(4-x), \quad 0 <= x <= 4.$$

Group B

**Answer TWO questions.**

$2 \times 10 = 20$

Write algorithm and program in any high level language to solve the following problems.

8. Write a program to find the roots of a non linear equation using Newton-Raphson method along with its algorithm. 7+3

9. Give the algorithm as well as program code to fit a transcendental equation. 7+3

10. Write the algorithm and program code to solve an integral function using composite trapezoidal method. 7+3

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S.Chy.

# PURBANCHAL UNIVERSITY

2014

B.E. (Computer/Electronics & Comm.)/Fifth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

**BEG370CO: Numerical Methods (New Course)**

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

## Group A

**Answer SIX questions.**

$6 \times 10 = 6$

1.  Discuss truncation, absolute, relative and percentage errors with example.
2.  Find the root of the equation  $f(x) = e^x - x$ ; using Newton Raphson method, correct up to 4 decimal places. 3+
3.  The square roots of different integers are tabulated below. Calculate the square root of 7 using Lagrange Interpolation.

|                |       |   |   |    |
|----------------|-------|---|---|----|
| x              | 2     | 4 | 9 | 16 |
| $y = \sqrt{x}$ | 1.414 | 2 | 3 | 4  |

4.  Use Romberg's method to compute  $\int_0^1 \frac{dx}{1+x^2}$  correct to 4 decimal place.
5.  By the method of least square, fit a curve of the form  $y = ae^{bx}$  to the following data:

|    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|
| x: | 5  | 15 | 20 | 30 | 35 | 40 |
| y: | 10 | 14 | 25 | 40 | 50 | 62 |

6. Solve the following system of linear equations using Gauss Jacobi Iteration method. 1+

$$2x_1 - x_2 + x_3 = 2$$

$$x_1 + 2x_2 - 3x_3 = 0$$

$$2x_1 - 3x_2 + x_3 = 0$$

Contd. ...

(2)

7. Solve following differential equation for  $y(0.2)$ .

10

$$10y'' + (y')^2 + 6x = 0$$

$y(0) = 0, y'(0) = 0$ . using Heun's Method. Take  $h=0.1$ .

Group B

Answer TWO questions.

$2 \times 10 = 20$

Write algorithm and program in any high level language to solve the following problems.

8. Write a program that compute a root of a non-linear equation by Newton-Raphson method.
9. Write a program to find the integration of the given function using Simpson, Trapezoidal rule.
10. Write a program to fit a straight line  $y=a+bx$  from given set of data points.

10

10



~~2nd cut~~

# PURBANCHAL UNIVERSITY

2013

B.E. (Computer/Electronics & Comm.)/Fifth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 35

**BEG370CO: Numerical Methods (New Course)**

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

## Group A

**Answer SIX questions.**

~~6x10=60~~

1(a) What is error? Explain general formula to calculate different errors.

(b) Explain different characteristics of numerical computation.

2(a) Find the real root of the equation  $x^3 - 4x - 9 = 0$  correct to two decimal places by using bisection method.

(b) Using Newton Raphson method, find the root correct to two decimal places, given the initial root as 0.5 of the equation  $x^3 - 6x + 4 = 0$ .

3(a) Using the principle of least squares, fit an equation of the form  $y = ae^{bx}$  to the following data.

|   |      |      |      |      |
|---|------|------|------|------|
| x | 1    | 2    | 3    | 4    |
| y | 1.65 | 2.70 | 4.50 | 7.35 |

(b) The following data gives the melting point of an alloy of lead and zinc, where t is the temperature in degree °C and p is the percentage of lead in the alloy.

|   |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|
| p | 40  | 50  | 60  | 70  | 80  | 90  |
| t | 184 | 204 | 226 | 250 | 276 | 304 |

Using Newton's Interpolation formula, find the melting point of the alloy containing 84 percent of the lead.

4(a) Divide the range into 10 equal parts, find the approximate value of  $\int_0^{\pi} \sin x dx$  by Simpson's rule.

(b) Compute the integral

$$\int_{-2}^2 e^{-x^2} dx$$
 using Gaussian two-point formula.

5(a) Find the eigen values and eigen vectors of the following matrices.

$$\begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}$$

$x = \frac{1}{2}$   
 $y = \frac{1}{2}$   
 $z = -\frac{1}{2}$

(b) Solve the following system of equations using Gauss-Jordon method.

$$x+2y+z=3; 4x+4y-3z=10; 3x-y+2z=2$$

6(a) Using Euler's method, solve numerically the equation,  $y' = x + y$ ,  $y(0) = 1$ , for  $x=1$ .

(b) Find  $y(0.1)$ ,  $z(0.1)$  from the system of equations,  
 $\frac{dy}{dx} = x + z$ ,  $\frac{dz}{dx} = x - y^2$  given  $y(0)=2$ ,  $z(0)=1$  using Heun's method.

7(a) Solve the Poisson equation

$$\nabla^2 f = 2x^2 y^2$$

Over the square domain  $0 \leq x \leq 3$  and  $0 \leq y \leq 3$  with  $f=0$  on the boundary and  $h=1$ .

(b) Solve numerically the wave equation,

$$f_t(x, t) = 2 f_{xx}(x, t) \quad 0 < t < 1.5 \text{ and } 0 < x < 4$$

with the boundary conditions

$$f(0, t) = 0 \text{ and } f(4, t) = 0 \quad 0 \leq t \leq 1.5$$

and initial values.

$$f(x, 0) = 50(4-x) \quad 0 < x < 4$$

(3)  
Group B

Answer TWO questions.

Write algorithm and program in any high level language to solve  
the following problems.

1. To solve a non linear equation using secant Method.
2. To solve system of equation using Gauss Elimination.
3. To solve differential equations using Runge Kutta Method.

**PURBANJAL UNIVERSITY**

**2010**

**B.E. (Civil)/Fifth Semester/Chanc**

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

**GEG375CO: Numerical Methods**

Candidates are required to give their answers in their own words as far as practicable.

Figures in the margin indicate full marks.

**Group A**

Answer SIX questions.

$$6 \times 10 = 60$$

(a) What is roundoff error? Find the roundoff error in storing the number 752.6835 using four digit mantissa. 5

(b) Evaluate  $\sqrt[3]{10}$  using Newton Raphson method with initial value of  $x_0 = 2$ . 5

Prove that the order of convergence of Secant method is 1.618. 10

The velocity distribution of a fluid near a flat surface is given below:

|   |      |      |      |      |      |
|---|------|------|------|------|------|
| x | 0.1  | 0.3  | 0.5  | 0.7  | 0.9  |
| v | 0.72 | 1.81 | 2.73 | 3.47 | 3.98 |

Where x is the distance from the surface (cm) and v is velocity (cm/s). Using a suitable interpolation formula obtain the velocity at  $x = 0.2, 0.4, 0.6$  and  $0.8$ . 10

(c) Use Romberg integration to evaluate. 10

$$\int_{0}^{1} \frac{1}{1+x^2} dx$$

(d) Solve the following system of equations using Jacobi iteration method; 10

Contd. ...

(2)

$$2x_1 + x_2 + x_3 = 5$$

$$3x_1 + 5x_2 + 2x_3 = 15$$

$$2x_1 + x_2 + 4x_3 = 8$$

6. Find the largest Eigen value and the corresponding Eigen vector of the following matrix, using power methods.

$$\begin{bmatrix} 1 & 2 & 0 \\ 2 & 1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$$

7. Give the equation  $dy/dx = 3x^2 + 1$  with  $y(1) = 2$ . Estimate  $y(2)$  by Euler's method using (i)  $h = 0.5$  and (ii)  $h = 0.25$ .
8. Solve the differential equation  $dy/dx = 2xy$ ,  $y(0) = 0.5$  from  $x = 0$  to  $x = 1$  using the fourth order Runge-Kutta method.

### Group B

Answer TWO questions.

2×10=20

9. Write a program in any high level language to find the solution of non-linear equation using Secant Methods.
10. Write a program to find the root using Lagrange's Interpolation polynomial.
11. Write an algorithm to find the solution of linear system of equation using Gauss Seidal method.

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# PURBANCHAL UNIVERSITY

2012

B.E. (Computer/Electronics & Comm.)/Fifth Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 40

**SEG370CO: Numerical Methods**

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

## Group A

Answer SIX questions.

6x10= 60

- 1(a) Find a real root of the equation  $f(x) = x^3 - x - 1 = 0$  by bisection method.
- (b) Solve the equation  $\log x = \cos x$  to five decimal places by Newton-Raphson method.
- 2(a) Fit the least square geometric curve  $y = ax^b$  to the following data:

|    |     |   |     |   |      |
|----|-----|---|-----|---|------|
| x: | 1   | 2 | 3   | 4 | 5    |
| Y: | 0.5 | 2 | 4.5 | 8 | 12.5 |

(b) Given that  $\sqrt{12500} = 111.8034$ ,  $\sqrt{12510} = 111.8431$ ,

$\sqrt{12530} = 111.9375$ . Find the value of  $\sqrt{12516}$ .

3. Solve the following equations by Gauss-seidel method. Correct upto three decimal places.

$$2x - 7y - 10z = -17$$

$$5x + y + 3z = 14$$

$$x + 10y + 9z = 7$$

4. The distance(s) covered by a car in a given time ( $t$ ) is given in the following table:

|                    |    |    |    |    |    |
|--------------------|----|----|----|----|----|
| Time (in minutes): | 12 | 14 | 18 | 20 | 24 |
| Distance (Km):     | 14 | 18 | 23 | 25 | 34 |

Find the acceleration of the car at  $t = 17$  minutes.

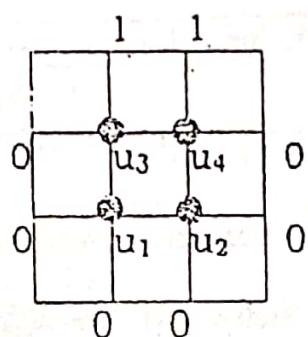
(2)

5. Establish trapezoidal rule for integration and hence evaluate

$\int_0^1 \frac{dx}{1+x^2}$  using Trapezoidal rule by dividing the [0, 1] into 6 equal parts. Also obtain the approximate value of  $\pi$ .

6. Apply Runge-kutta fourth order method to find the solution of differential equation  $\frac{dy}{dx} = x^2 + y^2$  at  $x = 1.2$  in steps of 0.1; given that  $y=1.5$  when  $x=1$ .

7. Solve the Partial differential equation  $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$  for the figure given below, by Gauss Jacobi's method.



Group B

Answer TWO questions.

2×10=20

8. Write a high level program to find the root of the equation using Newton-Raphson method. Also, draw its flowchart. 6+4
9. Write an algorithm and a high level program to solve differential equation using Euler's method. 4+6
10. Write a high level program with its flowchart to find integration of the given function using Simpson's 1/3 rule. 6+4





(2)

## PURBAANCHAL UNIVERSITY

B.E. (Computer / Electronics & Comm.) / Fifth Semester / Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

Candidates are required to give their answers in their own words as far as practicable.  
All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

### Answer SIX questions:

#### Group A

(a) Define error. If the calculated value of  $\int_0^{\pi} \sin x dx$  is 0.46343

Find the error, absolute error, relative error and percentage error. 5

(b) Evaluate the  $x^2 - 2x + 1$  using Newton Raphson Method. 5

2. Fit the curve in the form of  $y = ae^{bx}$  using least square method and find the value of  $y$  at  $x = 4.5$  and  $6.5$ . 10

| x | 2 | 3  | 4  | 5  | 6  | 7  |
|---|---|----|----|----|----|----|
| y | 5 | 10 | 17 | 26 | 37 | 50 |

3. Evaluate  $\int_{-1}^1 \frac{dx}{1+x^2}$  using Simpson's 1/3 rule with  $n = 10$ . 10

4. Solve the differential equation  $\frac{dy}{dx} = \frac{y+1-x}{y-x}$  with  $y(0)=1$  using 4th order R.K. method. 10

5. Find the Eigen value and corresponding Eigen vector of the following matrix, using power method. 10

$$\begin{bmatrix} 2 & 0 & 1 \\ 1 & 1 & 1 \\ 1 & -1 & 3 \end{bmatrix}$$

|      |     |   |
|------|-----|---|
| 18 I | 2.0 | V |
| 347  | 3.3 | V |

V SEMESTER BACHELOR OF ENGINEERING UNIVERSITY

LEVEL : B.E (Computer/Electronics & communication)  
SUBJECT : BEC3700CQ, Numerical Methods

(T)

TIME: 03:00 hrs.

Full Marks: 30 Q. [7] Pass marks: 32

Candidates are required to give their answer in their own words as far as practicable.

All questions carry equal marks.

Attempt any SIX questions from GROUP-A and TWO from GROUP-B.

**GROUP-A**

[8] (a) What is truncation error? Find out the truncation Error while evaluating the  $\sin(30)$  by using power series upto the fifth power.

[5] Evaluate the square root of 5 using Fixed point Iteration algorithm.

[2] Find the Newton Raphson Method based formula to find  $\sqrt{5}$  and  $\sqrt[3]{5}$ , when N is the positive Number. Apply the method to N=16 correct to three decimal place.

[5] Obtain the regression plane to fit the following data.

| x | y |
|---|---|
| 0 | 1 |
| 1 | 2 |
| 2 | 3 |
| 3 | 4 |
| 4 | 5 |

[8] (b) Using Lagrange's Interpolation formula find the value of  $f(1.5)$  given  $f(0)=1, f(1)=2, f(2)=3, f(3)=4, f(4)=5$ .

Using Double and triple integration methods

Find the value of  $\int \int \int e^{-x-y-z} dx dy dz$  over the region  $0 \leq x \leq 1, 0 \leq y \leq 1, 0 \leq z \leq 1$ .

Using Trapezoidal Assumption

Estimate the area under the curve  $y = x^2$  between  $x=0$  and  $x=1$  using Trapezoidal rule.

Using Trapezoidal rule estimate the value of  $\int_0^1 x^2 dx$ .

Using Trapezoidal rule estimate the value of  $\int_0^1 x^2 dx$ .

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Using Trapezoidal rule estimate the value of  $\int_0^1 x^2 dx$ .

Using Trapezoidal rule estimate the value of  $\int_0^1 x^2 dx$ .

$$\begin{bmatrix} 2 & 0 & 1 \\ 1 & 1 & 1 \\ 1 & -1 & 3 \end{bmatrix}$$

[9] Write a program in any high level language to find the solution of non-linear equation using Bisection Methods

[10] Write the algorithm for CROUT's method of LU Factorization

[11] Write a program in any high level language to find the solution of linear system of equation using Gauss Elimination.

[12] Draw a flow chart for solving differential equation using Euler's methods.

[13] Solve the following system of equations using Gauss Se

iteration method.

$$10x - y - 4z + w = 14$$

$$x + 10y - 2z - 4w = 9$$

$$2x - 3y + 15z + 2w = -14$$

$$3x + 5y - 6z - 11w = 2$$

Solve the Poisson equation

$$\nabla^2 f = 2x^2 y^2$$

Over the square domain  $0 \leq x \leq 3$  and  $0 \leq y \leq 3$  with  $f=0$  on the boundary and  $h=1$ .

**GROUP-B**

[9] Write a program in any high level language to find the solution of non-linear equation using Bisection Methods

[10] Write the algorithm for CROUT's method of LU Factorization

[11] Write a program in any high level language to find the solution of linear system of equation using Gauss Elimination.

[12] Draw a flow chart for solving differential equation using Euler's methods.

[13] Solve the following system of equations using Gauss Se

iteration method.

[14] Solve the following system of equations using Gauss Se

iteration method.

[15] Solve the following system of equations using Gauss Se

iteration method.

[16] Solve the following system of equations using Gauss Se

iteration method.

# PURBANCHAL UNIVERSITY

**2010**

B.E. (Computer/Electronics & Comin.)/Fifth Semester/Chance

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

**BEG370CO: Numerical Methods**

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

### Group A

Answer SIX questions.

**$6 \times 10 = 60$**

- 1(a) What is roundoff error? Find the roundoff error in storing the number 786.7645 using four digit mantisa.
- (b) Evaluate  $\sqrt{10}$  using Newton-Raphson method with initial value of  $x_0 = 2$ .
2. State the test for convergence of fixed point Iteration method for solving non-linear equation. Find the approximate root of the equation,  $x^2 - 2x - 8 = 0$  correct to three decimal places using fixed point iteration method, starting with  $x_0 = 5$ .

3. For the following table of values

|       |    |    |    |    |    |
|-------|----|----|----|----|----|
| x:    | 10 | 20 | 30 | 40 | 50 |
| f(x): | 2  | 5  | 10 | 12 | 20 |

Find  $f(14)$  and  $f(48)$ .

4. Fit the quadratic curve to the following data points:

|    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|
| x: | 0  | 2  | 5  | 10 | 12 | 18 |
| y: | 10 | 12 | 15 | 20 | 22 | 30 |

5. Obtain  $dy/dx$  and  $d^2y/dx^2$  for  $x = 1.2$  from the following table of values of  $x$  and  $y$ .

|   |        |        |        |        |        |        |        |
|---|--------|--------|--------|--------|--------|--------|--------|
| x | 1.0    | 1.2    | 1.4    | 1.6    | 1.8    | 2.0    | 2.2    |
| y | 2.7183 | 3.3201 | 4.0552 | 4.9530 | 6.0496 | 7.3891 | 9.0250 |

6. Find the largest eigenvalue  $\lambda_1$  and the corresponding eigenvector  $V_1$  of the matrix.

(2)

$$\begin{bmatrix} 1 & 2 & 0 \\ 2 & 1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$$

Use power method.

7. Give the equation:

$\frac{d^2y}{dx^2} = e^{x^2}$  with  $y(0) = 0$ ,  $y(1) = 0$  estimate the values of  $y(x)$  at  $x = 0.25, 0.5$  and  $0.75$ .

8. Solve the equation  $u_{xx} + u_{yy} = 0$  in the domain of the given figure by a) Jacobi Method b) Gauss Siedel's Method

|   |       |       |       |
|---|-------|-------|-------|
|   | 1     | 1     |       |
| 0 |       | $u_4$ | $u_3$ |
| 0 | $u_1$ | $u_2$ | 0     |
| 0 |       | 0     | 0     |

Group B

Answer TWO questions.

2x10=20

9. Write a program in any high level language to evaluate numerical integration of a given function using Simson's 3/8 rule.
10. Write an algorithm to find the solution of the systems of linear equations using Jacobi Integration method.
11. Write a program in any high level language to find the solution of a differential equation using Ranga-Kutta Method.

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