Graphic Era
HILL UNIVERSITY
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End Term (Odd) Semester Examination November 2025

Roll no.................................

Name of the Course and semester: Diploma CS 5
Name of the Paper: Operating System
Paper Code: DTCS504

Time: 3 hour   Maximum Marks: 100

Note:
- *(i)* All the questions are compulsory.
- *(ii)* Answer any two sub questions from a, b and c in each main question.
- *(iii)* Total marks for each question is 20 (twenty).
- *(iv)* Each sub-question carries 10 marks.

Q1.   (2X10=20 Marks)
- a. Define an Operating System. Explain its main functions and objectives in managing computer resources. CO1
- b. Trace the development of Operating Systems from the first to the fourth generation of computers, emphasizing how hardware progress shaped OS design. CO1
- c. Differentiate between Multitasking and Multiprogramming. Explain key differences between them with suitable examples. CO1

Q2.   (2X10=20 Marks)
- a. What do you understand by system calls? Discuss the major types of system calls and explain their functions with relevant examples from common operating systems. CO2
- b. Outline the steps involved in the booting process of an Operating System. Clarify the difference between cold and warm booting using suitable examples. CO2
- c. Compare the Monolithic and Microkernel architectures of an Operating System. Highlight their structure, operation, advantages, and limitations with neat, labeled diagrams. CO2

Q3.   (2X10=20 Marks)
- a. Define a process. Explain the various states of a process and describe the role of the Process Control Block (PCB) in process management with a neat diagram. CO3
- b. What are threads in an operating system? Discuss the advantages of multithreading and differentiate between user-level and kernel-level threads with examples. CO3
- c. Discuss Inter-Process Communication (IPC) techniques and contrast direct and indirect communication methods. CO3

Q4.   (2X10=20 Marks)
a. Consider the following processes:

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

Using Shortest Job First (Non-Preemptive) scheduling, draw the Gantt chart and calculate the Completion Time (CT), Turnaround Time (TAT), and Waiting Time (WT) for each process. Also find the Average TAT and Average WT. CO4

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b. Consider the following processes:

Process ID	Arrival Time	Burst Time	Priority
P1	0	4	2
P2	1	3	3
P3	2	1	4
P4	3	5	5
P5	4	2	5

Using Priority (Preemptive) Scheduling, draw the Gantt chart and calculate the Completion Time (CT), Turnaround Time (TAT), and Waiting Time (WT) for each process.
Also, find the Average TAT and Average WT.
(Higher number represents higher priority). CO4
c. Define deadlock in the context of operating systems. Describe the system model associated with deadlocks and discuss the essential conditions that must be satisfied for a deadlock to take place. CO4

Q5.   (2X10=20 Marks)
a. What is a file? Explain the main attributes of a file and list the basic operations that can be performed on files. CO5
b. Compare Single-Level and Two-Level Directory Structures. Mention how they work, their benefits, and their limitations with neat, labeled diagrams. CO5
c. What is the FIFO (First-In, First-Out) Page Replacement Algorithm? Explain its working using the reference string 5, 2, 3, 2, 7, 1, 3, 4, 5, 1 with 3 page frames, and demonstrate the page replacement process step-by-step. CO5