

BACHELOR OF COMPUTER APPLICATIONS (BCA)

(Revised Syllabus)

BCA(Revised Syllabus)/ASSIGN/SEMESTER-IV

ASSIGNMENTS

(July – 2026 & January - 2027)

**(BCS-040, MCS-024, BCS-041, BCS-042,
MCSL-016, BCSL-043, BCSL-044, BCSL-045)**



**SCHOOL OF COMPUTER AND INFORMATION SCIENCES
INDIRA GANDHI NATIONAL OPEN UNIVERSITY
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Important Notes

1. Submit your assignments to the Coordinator of your Study Centre on or before the due date.
2. Assignment submission before due dates is compulsory to become eligible for appearing in corresponding Term End Examinations. For further details, please refer to BCA Programme Guide.
3. To become eligible for appearing the Term End Practical Examination for the lab courses, it is essential to fulfill the minimum attendance requirements as well as submission of assignments (on or before the due date). For further details, please refer to the BCA Programme Guide.

Course Code	:	BCS-041
Course Title	:	Fundamentals of Computer Networks
Assignment Number	:	BCA (IV)/041/Assignment/2026-27
Maximum Marks	:	100
Weightage	:	25%
Last Date of Submission	:	31 st October, 2026 (for July 2026 Session)
	:	30 th April, 2027 (for January 2027 Session)

Note: This assignment consists of eight questions carrying 10 marks each (80 marks). The remaining 20 marks are allotted for Viva-Voce. Illustrate your answers with suitable diagrams wherever necessary.

Q1: (10 Marks)

A university campus has recently upgraded its network infrastructure by replacing copper cables with optical fiber.

- (a) Explain the working principle of optical fiber communication. Compare **Step-Index Single Mode**, **Step-Index Multimode**, and **Graded-Index Multimode** optical fibers with respect to structure, transmission characteristics, bandwidth, and applications. (5 Marks)
- (b) Describe the TCP/IP reference model. Explain the responsibilities of each layer and identify **two protocols** commonly associated with every layer. Also explain how encapsulation takes place while sending data from an application to the physical network. (5 Marks)

Q2: (10 Marks)

- (a) A company operates offices in Delhi, Mumbai, and Bengaluru using dynamic routing. Due to an incorrect routing update, several routers continue forwarding packets along an invalid route. Explain how such routing loops occur in **Distance Vector Routing**. Discuss the **Count-to-Infinity problem** and explain any two techniques used to overcome it. (5 Marks)
- (b) Explain the concept of **Angle Modulation**. Differentiate between **Frequency Modulation (FM)** and **Phase Modulation (PM)**. Discuss two practical applications and two limitations of angle modulation techniques. (5 Marks)

Q3: (10 Marks)

- (a) A sender wants to transmit the binary data (5 Marks)

1101101010

using the generator polynomial

$$G(x) = x^4 + x + 1$$

Calculate the CRC bits and determine the transmitted codeword. Show all intermediate binary division steps.

- (b) During a natural disaster, rescue teams establish a temporary wireless communication system without using any fixed infrastructure. Explain the architecture, characteristics, advantages, limitations, and applications of an **Ad Hoc Wireless Network** in such situations. (5 Marks)

Q4: (10 Marks)

- (a) Explain the role of **ICMP** in IP communication. Classify ICMP messages into different categories and describe at least **two examples** from each category with suitable use cases. (5 Marks)
- (b) What is a **Network Interface Card (NIC)**? Explain its major hardware components and describe how modern NICs improve communication efficiency using techniques such as DMA, buffering, checksum offloading, and interrupt moderation. (5 Marks)

Q5: (10 Marks)

- (a) Explain the purpose of cryptographic hash functions in network security. Describe the working of the **MD5 message digest algorithm** with the help of a block diagram or flowchart. Also mention its limitations in modern security applications. (5 Marks)
- (b) Compare **Hub**, **Bridge**, **Layer-2 Switch**, and **Layer-3 Switch** based on their operating layer, forwarding mechanism, collision domains, broadcast domains, advantages, and typical applications. (5 Marks)

Q6: (10 Marks)

- (a) Differentiate between **POP3** and **IMAP4** with respect to message storage, synchronization, security, and multi-device access. Explain which protocol is more suitable for today's cloud-based email services with proper justification. (5 Marks)
- (b) In an RSA cryptosystem, (5 Marks)
- $p = 11$
 - $q = 17$
 - Public exponent (e) = 7

Calculate:

1. n
2. $\phi(n)$
3. Private key (d)
4. Encrypt the message **M = 9**

Show all calculations.

Q7: (10 Marks)

- (a) Compare the following Medium Access Control techniques: (5 Marks)
- CSMA/CD
 - CSMA/CA

- Token Passing

Discuss their working principles, collision handling mechanisms, advantages, limitations, and suitable application environments.

- (b) Explain the **Round Robin** scheduling technique used in communication networks. How does it differ from **Polling** in terms of operation, efficiency, fairness, and network overhead? **(5 Marks)**

Q8: (10 Marks)

- (a) Compare Distance Vector Routing and Link State Routing with respect to: **(5 Marks)**

- Routing information exchanged
- Convergence speed
- Scalability
- Routing overhead
- Fault tolerance
- Example routing protocols

Also explain why Link State Routing is generally preferred in large enterprise networks.

- (b) What is **Quality of Service (QoS)** in computer networks? Explain any **three** of the following QoS mechanisms with suitable examples: **(5 Marks)**

- Traffic Classification
- Traffic Shaping
- Priority Queuing
- Resource Reservation
- Congestion Avoidance
- Packet Scheduling

Also discuss the importance of QoS for VoIP and video conferencing applications.