



CINEC Campus
Faculty of Engineering & Technology
Department of Electrical and Electronics Engineering
BSc Hons (Eng) Electronics & Telecommunication Engineering
Batch 04 Semester 8 Re-Sit Final Examination 2025

Module Code	:	EE4321
Module Title	:	Wireless and Mobile Communications
Date	:	08 th September 2025
Examiners	:	Srimal Punchihewa
Time Allowed	:	3 hours; 0900-1200

INSTRUCTIONS TO CANDIDATES

- This is a closed book examination. No reference materials are allowed.
- This paper consists of six (6) questions. Answer all questions.
- Use only the provided answer booklet, and additional sheets for your answers.
- Write clearly and legibly using a blue or black pen.
- Write your student number on *all* sheets.
- **Start each question on a new page in the answer booklet. Clearly indicate the question number at the top of the page.**
- If parts of the same question are written discontinuously in different sheets, ensure that each part is appropriately labelled with its corresponding question number.
- Where appropriate, include clear diagrams or sketches. These can aid in calculations and help convey your answers effectively.
- If you are unsure about the wording of a question consult the Supervisor or Invigilator or make reasonable assumptions. Clearly state such assumptions in your answer script.
- Marks will be deducted for missing or incorrect measuring units, and failure to adhere to the above instructions.
- This examination paper contains four (4) pages.

Q1

- (a) Consider the following two scenarios before answering this question:
Senario1: A high-rise building in Colombo Fort with large number of floors with a large number of offices and the workers of these offices using cellular mobile phones heavily.
Scenario2: A sparsely populated rural area in Anuradhapura where usage of cellular phones is very limited.

Debate and compare the two scenarios considering

- Size of the cells
- Usage of assigned frequencies
- Location of base-station antennas

(10 marks)

[Total 10 marks]

Q2.

- (a) The Free Space Path Loss (FSPL) model calculates the theoretical minimum signal loss of an electromagnetic wave propagating through free space, assuming an ideal, obstacle-free path.
If the above is true, argue and justify the reasons for path loss in an obstacle free and free space condition.
- (7 marks)
- (b) The two-ray ground reflection model is a radio propagation model that simplifies the wireless channel by considering only two dominant paths for a signal traveling from a transmitter to a receiver: a direct line-of-sight (LOS) path and a ground-reflected path.
Argue and reason whether this model is suitable for complex urban environments with multiple reflections from buildings and other objects or signal blockage from foliage and other obstructions occur.
- (7 marks)
- (c) One assumption made in Two-Ray Model is that "Reflected waves are considered as gracing incidence waves".
Explain the meaning of "gracing incidence waves".
Paraphrase the effect of this assumption in calculations in the model.
- (8 marks)
- (d) Debate the importance of path loss exponent in mobile communications.

(8 marks)

[Total 30 marks]

Q3.

- (a) In mobile communications, a group of cells within a cellular network share a specific set of frequencies to manage co-channel interference and enable frequency reuse across the network. Argue whether this group of cells assume any integer number. Use suitable equations in your explanation.

(8 marks)

- (b) Briefly Explain how cellular system capacity can be increased while minimizing co-channel interference using a method of frequency re-use.

(7 marks)

[Total 15 marks]

Q4.

- (a) In deciding when to handoff, it is important to ensure that the drop in measured signal level is not due to momentary fading and that the mobile is actually moving away from the serving base station. Briefly discuss how this is ensured.

(5 Marks)

- (b) Briefly discuss the “dwell time” and “mobile assisted hand-off”

(5 Marks)

- (c) Discuss two methods to prioritize handoffs.

(5 Marks)

[Total 15 marks]

Q5.

- (a) Characterize the standard used to define the rules for Wi-Fi communication, ensuring devices from different manufacturers can interoperate. Appraise the key standard and other popular standards.

(3 marks)

- (b) Appraise the two key parameters of each wireless LAN standard

(3 marks)

- (c) List the components of an IEEE 802.11 architecture.

Draw a diagram showing how these components are arranged in IEEE 802.11 architecture.

(9 marks)

[Total 15 marks]

Q6.

- (a) Explain how Sensor MAC helps to save energy. (7 marks)
- (b) Draw an illustrative diagram showing arrangement of a Wireless Sensor Network. (8 marks)
- [Total 15 marks]

END OF THE EXAMINATION PAPER



CINEC Campus
Faculty of Engineering and Technology
Department of Electrical and Electronics Engineering
BSc Hons (Eng) Electronic and Telecommunication Engineering
Semester 08 Re-Sit Examination 2025

Module Code : EE4323
Module Title : Advanced Networking
Date : 28th August 2025
Examiners : Dr. Samiru Gayan
Time Allowed : 9.00 AM – 12.00 PM, 3 hours

INSTRUCTIONS TO CANDIDATES

- This paper contains **two** sections on **sixteen** pages.
- Section A consists of 50 multiple-choice questions. Mark the correct answers on the provided answer sheet.
- Section B consists of 3 questions.
- This is a **closed book** examination.
- You should answer **ALL** questions.
- Write legibly with a blue or black pen.
- Use only the **CINEC answering booklet**. Additional sheets may be requested from the invigilators.

MATERIALS REQUIRED

- CINEC answering booklet with extra answering papers.
- You may use a scientific calculator. This must not be programmable. This may be examined during the examination.

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Section A

1. Which layer of the TCP/IP model is responsible for reliable communication?
 - a) Application
 - b) Transport
 - c) Network
 - d) Data Link
2. Which protocol provides connection-oriented communication in the TCP/IP suite?
 - a) UDP
 - b) TCP
 - c) IP
 - d) ICMP
3. What is the default maximum size of a TCP segment (MSS) without options?
 - a) 536 bytes
 - b) 1500 bytes
 - c) 1024 bytes
 - d) 65535 bytes
4. In TCP, the three-way handshake is used for:
 - a) Error detection
 - b) Connection establishment
 - c) Flow control
 - d) Congestion control
5. Which field in the TCP header ensures in-order delivery of data?
 - a) Acknowledgment Number
 - b) Sequence Number
 - c) Window Size
 - d) Checksum
6. Which TCP flag is used to terminate a connection?
 - a) SYN
 - b) ACK
 - c) FIN
 - d) RST
7. In TCP congestion control, the "slow start" algorithm:
 - a) Reduces congestion window exponentially

- b) Increases congestion window exponentially
 - c) Keeps congestion window constant
 - d) Increases congestion window linearly
8. Which protocol is used to resolve an IP address to a MAC address?
- a) DNS
 - b) ARP
 - c) DHCP
 - d) ICMP
9. The protocol responsible for reporting errors in the IP layer is:
- a) TCP
 - b) UDP
 - c) ICMP
 - d) IGMP
10. What is the size of the IPv6 address space?
- a) 32 bits
 - b) 64 bits
 - c) 128 bits
 - d) 256 bits
11. The subnet mask 255.255.255.0 corresponds to how many usable host addresses?
- a) 254
 - b) 255
 - c) 256
 - d) 510
12. The CIDR notation /20 corresponds to which subnet mask?
- a) 255.255.255.0
 - b) 255.255.240.0
 - c) 255.255.248.0
 - d) 255.255.255.240
13. An IP address 192.168.1.65/26 belongs to which subnet?
- a) 192.168.1.0
 - b) 192.168.1.64
 - c) 192.168.1.128
 - d) 192.168.1.192

14. What is the broadcast address for 10.0.5.17/28?
- a) 10.0.5.15
 - b) 10.0.5.31
 - c) 10.0.5.63
 - d) 10.0.5.255
15. Which subnet mask provides exactly 14 usable host addresses?
- a) /24
 - b) /28
 - c) /30
 - d) /29
16. For the network 172.16.0.0/16, how many subnets are created with /20 subnetting?
- a) 4
 - b) 8
 - c) 16
 - d) 32
17. What is the first valid host in the subnet 192.168.100.64/27?
- a) 192.168.100.64
 - b) 192.168.100.65
 - c) 192.168.100.66
 - d) 192.168.100.67
18. Which of the following is a private IP address?
- a) 8.8.8.8
 - b) 172.16.5.4
 - c) 131.107.0.89
 - d) 198.51.100.23
19. Which protocol automatically assigns IP addresses to hosts?
- a) ARP
 - b) DNS
 - c) DHCP
 - d) ICMP
20. Which of the following is a valid loopback address?
- a) 192.168.1.1
 - b) 127.0.0.1

- c) 10.0.0.1
 - d) 0.0.0.0
21. Which topology is most fault-tolerant?
- a) Bus
 - b) Ring
 - c) Star
 - d) Mesh
22. In a star topology, failure of the central hub results in:
- a) Failure of the entire network
 - b) Failure of one link only
 - c) Slower performance
 - d) No effect
23. Which topology uses a token-passing mechanism?
- a) Bus
 - b) Star
 - c) Ring
 - d) Mesh
24. Which network type covers the largest geographical area?
- a) LAN
 - b) MAN
 - c) WAN
 - d) PAN
25. Which device connects different LANs into a WAN?
- a) Hub
 - b) Switch
 - c) Router
 - d) Bridge
26. What is the main disadvantage of a bus topology?
- a) High cabling cost
 - b) Difficult to troubleshoot
 - c) Single point of failure
 - d) Complex routing
27. Which topology requires the most cabling?

- a) Bus
 - b) Ring
 - c) Star
 - d) Mesh
28. Which protocol is used for error reporting in IP networks?
- a) ICMP
 - b) ARP
 - c) TCP
 - d) UDP
29. In Ethernet, what is the maximum transmission unit (MTU)?
- a) 512 bytes
 - b) 1024 bytes
 - c) 1500 bytes
 - d) 9000 bytes
30. VLANs are primarily used to:
- a) Increase bandwidth
 - b) Provide logical segmentation
 - c) Reduce cabling
 - d) Encrypt data
31. Which IP header field limits packet lifetime?
- a) Protocol
 - b) Identification
 - c) TTL
 - d) Fragment offset
32. The main function of NAT is to:
- a) Translate private to public IPs
 - b) Encrypt data
 - c) Assign IP addresses
 - d) Resolve hostnames
33. What is the default port number for HTTPS?
- a) 21
 - b) 80
 - c) 443

- d) 8080
34. Which command is used to test connectivity using ICMP?
- a) nslookup
 - b) traceroute
 - c) ping
 - d) telnet
35. Which routing protocol is distance-vector based?
- a) OSPF
 - b) EIGRP
 - c) RIP
 - d) BGP
36. The address 169.254.x.x is assigned when:
- a) DHCP is unavailable
 - b) ARP fails
 - c) Router is unreachable
 - d) Manual configuration
37. Which of the following is a class A IP address?
- a) 10.0.0.1
 - b) 172.16.0.1
 - c) 192.168.1.1
 - d) 224.0.0.1
38. IPv6 address ::1 represents:
- a) Default route
 - b) Anycast
 - c) Multicast
 - d) Loopback
39. The main purpose of QoS in networking is:
- a) Error correction
 - b) Bandwidth allocation
 - c) Security
 - d) Encryption
40. Which protocol does traceroute primarily use?
- a) TCP

- b) UDP
 - c) ICMP
 - d) ARP
41. In subnetting, VLSM refers to:
- a) Variable Length Subnet Mask
 - b) Virtual LAN Subnet Method
 - c) Very Large Subnet Mask
 - d) Variable LAN Switching Mode
42. Which IP class provides the maximum number of hosts?
- a) Class A
 - b) Class B
 - c) Class C
 - d) Class D
43. Which transport protocol is preferred for streaming applications?
- a) TCP
 - b) UDP
 - c) ICMP
 - d) SCTP
44. The TCP sliding window mechanism is used for:
- a) Error detection
 - b) Flow control
 - c) Congestion avoidance
 - d) Encryption
45. Which protocol is used for secure remote login?
- a) Telnet
 - b) SSH
 - c) FTP
 - d) RDP
46. What is the function of the ICMP "time exceeded" message?
- a) Host unreachable
 - b) Fragmentation needed
 - c) TTL expired
 - d) Redirect packet

47. The OSI model has how many layers?
- a) 5
 - b) 6
 - c) 7
 - d) 8
48. Which protocol translates domain names to IP addresses?
- a) DHCP
 - b) DNS
 - c) ARP
 - d) ICMP
49. MPLS is used for:
- a) Routing optimization
 - b) IP addressing
 - c) Error correction
 - d) Flow control
50. Which protocol is primarily used for sending emails between mail servers?
- a) POP3
 - b) IMAP
 - c) SMTP
 - d) HTTP

Total [25 marks]

Section B

Question 1

- (a) What is the purpose of a Network Interface Card (NIC)? (2 marks)
- (b) A path in a digital circuit-switched network has a data rate of 1 Mbps. The exchange of 1000 bits is required for the setup and teardown phases. The distance between the two parties is 5000 km. Answer the following questions if the propagation speed is $2 \times 10^8 \text{ ms}^{-1}$:
- (i) What is the total delay if 1000 bits of data are exchanged during the data transfer phase? (3 marks)
- (ii) What is the total delay if 100,000 bits of data are exchanged during the data transfer phase? (3 marks)
- (iii) Find the delay per 1000 bits of data for each of the above cases and compare them. What can you infer? (3 marks)
- (c) Transmission of information in any network involves end-to-end addressing and sometimes local addressing. Answer the following questions:
- (i) Why does a circuit-switched network need end-to-end addressing during the setup and teardown phases? Why are no addresses needed during the data transfer phase for this type of network? (3 marks)
- (ii) Why does a datagram network need only end-to-end addressing during the data transfer phase, but no addressing during the setup and teardown phases? (3 marks)
- (d) There are some useful parameters in local area networks (LANs) to get deeper insights into their quality.
- (i) One of such useful parameters in a LAN is the number of bits that can fit in one meter of the medium ($n_{b/m}$). Find the value of $n_{b/m}$ if the data rate is 100 Mbps and the medium propagation speed is $2 \times 10^8 \text{ m/s}$. (3 marks)
- (ii) Another useful parameter in a LAN is the bit length of the medium (L_b), which defines the number of bits that the medium can hold at any time. Find the bit length of a LAN if the data rate is 100 Mbps and the medium length in meters (L_m) for communication between two stations is 200 m. Assume the propagation speed in the medium is $2 \times 10^8 \text{ m/s}$. (3 marks)

- (iii) We define the parameter γ as the number of frames that can fit the medium between two stations. Derive an equation for γ in terms of L_b and the frame length of the medium F_b .

(2 marks)

Total [25 marks]

Question 2

- (a) Provide a brief explanation of the following performance criteria of communication networks, including appropriate mathematical definitions.

- (i) Delay (2 marks)
- (ii) Throughput (2 marks)
- (iii) Packet loss (2 marks)

- (b) Network designers generally attempt to deploy networks that don't have single points of failure, though they don't always succeed. Network topologies that employ redundancy are of much interest.

- (i) Draw an example of a six-node network in which the failure of a single link does not disconnect the entire network (that is, any node can still reach any other node). (3 marks)
- (ii) Draw an example of a six-node network in which the failure of any single link cannot disconnect the entire network, but the failure of some single node does disconnect it. (3 marks)
- (iii) Draw an example of a six-node network in which the failure of any single node cannot disconnect the entire network, but the failure of some single link does disconnect it. (3 marks)

Note: Not all the cases above may have a feasible example.

- (c) We have the information shown below. Show the contents of the IP datagram header sent from the remote host to the home agent.

- Mobile host home address: 130.45.6.7/16
- Mobile host care-of address: 14.56.8.9/8
- Remote host address: 200.4.7.14/24
- Home agent address: 130.45.10.20/16
- Foreign agent address: 14.67.34.6/8

(2 marks)

- (d) An organization is granted the block 211.17.180.0/24. The administrator wants to create 32 subnets.

- (i) Find the subnet mask. (2 marks)
- (ii) Find the number of addresses in each subnet. (2 marks)
- (iii) Find the first and last addresses in subnet 1. (2 marks)
- (iv) Find the first and last addresses in subnet 32. (2 marks)

- (e) Why do Open Shortest Path First (OSPF) messages propagate faster than Routing Information Protocol (RIP) messages? (2 marks)

Total [25 marks]

Question 3

- (a) Briefly explain the distance vector routing algorithm. (4 marks)
- (b) The university plans to upgrade the Wi-Fi network in the three-story library building. The library has study areas, open reading spaces, and a basement archive where Wi-Fi access is also needed. The university expects up to 300 students and staff to connect simultaneously, with a need for smooth performance in areas with high data demands, such as group study rooms where video streaming and large file downloads are common.
- (i) Briefly describe the steps you would take to design a Wi-Fi network to meet the requirements of the library, considering the following factors.
- Choosing the Wi-Fi standard
 - Number and placement of access points (APs)
 - Channel allocation
 - Security measures
 - Network segmentation
- (10 marks)
- (ii) After installation, some users report slow speeds and occasional disconnections in certain areas. Briefly describe your troubleshooting and optimization process.
- (3 marks)
- (iii) Outline the documentation you would prepare for this Wi-Fi network design.
- (3 marks)
- (c) A large organization with a large block address (12.44.184.0/21) is split into one medium-sized company using the block address (12.44.184.0/22) and two small organizations.
- (i) If the first small company uses the block (12.44.188.0/23), what is the remaining block that the second small company can use?
- (3 marks)
- (ii) Explain how the datagrams destined for the two small companies can be correctly routed to these companies if their address blocks are still part of the original company.
- (2 marks)

Total [25 marks]

Answer Sheet: Section A

Name: _____

Index No: _____

01.	a	b	c	d
02.	a	b	c	d
03.	a	b	c	d
04.	a	b	c	d
05.	a	b	c	d
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50.	a	b	c	d

- End of Question Paper -



CINEC Campus
Faculty of Engineering & Technology
Department of Electrical and Electronic Engineering
BSc Hons (Eng) Automotive, Mechanical, Civil, Mechatronics, Electronic
& Telecommunication Engineering
Semester 07 / Re-Sit / Final Examination 2025

Module Code	:	FE4311
Module Title	:	Ethics in Engineering
Date	:	24th Aug 2025
Examiner	:	Eng. Wipula Wimalshanthi
Time Allowed	:	9.00 – 12.00 AM ; 03 hrs

INSTRUCTIONS TO CANDIDATES:

- This is a closed book examination. "Appendix I of IESL By-Laws" is provided to be used as a reference material.
- This paper consists of two (02) questions. Answer ALL questions.
- Use only the provided answer booklet and additional sheets for your answers.
- Write clearly and legibly using a blue or black pen.
- Write your student number on all sheets.
- Start each question on a new page in the answer booklet. Clearly indicate the question number at the top of the page.
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- Where appropriate, include clear diagrams or sketches. These can aid in calculations and help convey your answers effectively.
- If you are unsure about the wording of a question, consult the supervisor or invigilator or make reasonable assumptions. Clearly state such assumptions in your answer script.
- Marks will be deducted for missing or incorrect measuring units, and failure to adhere to the above instructions.
- The question paper contains three (03) pages.
- You may use a scientific calculator. It must not be programmable. That may be examined during the examination.

Question 1

[40 Marks]

- i) *"An engineering practitioner uses his / her knowledge and skills for the benefit of the community to create engineering solutions for a sustainable future."*

Discuss this statement using a real-life example.

[06 Marks]

- ii) Identify six (06) characteristics of a successful engineer and describe how each characteristic could contribute to professional development of engineers.

[06 Marks]

- iii) Discuss a real or hypothetical example of an engineering project that failed due to ethical lapses. What lessons can be learned, and how could ethical decision-making have changed the outcome?

[10 Marks]

- iv) Explain how the IESL Code of Ethics addresses the engineer's commitment towards their professional development while assisting engineers under their purview to progress their careers. Identify the relevant clauses and Rules as applicable.

Refer the Appendix I of the By-laws of IESL in answering this question.

[08 Marks]

- v) State four (04) examples of professional values and identify the skills that would contribute towards developing them.

Discuss how professional values would positively impact customer relations.

[10 Marks]

Question 2

[40 Marks]

Case Study: The Coastal Infrastructure Project

Background:

A coastal protection project is initiated to prevent erosion in a vulnerable fishing village. The lead engineer, Mr. Ruwan, discovers that the contractor has been using substandard concrete that may not withstand the harsh marine environment. The contractor insists that the material meets minimum standards and helps reduce costs.

Scenario:

Mr. Ruwan is concerned that the structure may fail within a few years, endangering lives and property. He is under pressure to approve the work to meet deadlines and budget constraints.

Answer the following questions: [08 marks each]

- i) What ethical problems does Mr. Ruwan face in this situation?
- ii) What actions should Mr. Ruwan take to ensure professional integrity?
- iii) How can Mr. Ruwan ensure transparency and accountability in the project?
- iv) If management refuses to act, what ethical options are available to Mr. Ruwan?
- v) How can Mr. Ruwan use this situation to promote ethical awareness among junior engineers?

[40 Marks]

Disclaimer: The case given above is totally fictitious and has no relation to any organizations or living / deceased persons.

END OF QUESTION PAPER

CODE OF ETHICS

1. Engineers shall hold paramount the health, safety and welfare of the public and proper utilization of the funds and other resources in the performance of their professional duties. It shall take precedence over their responsibility to the profession, sectoral or private interests, employers or to other engineers.
2. Engineers shall always act in such a manner as to uphold and enhance the honour, integrity and dignity of the profession while safeguarding public interest at all times.
3. Engineers shall be committed to the need for sustainable management of the planet's resources and seek to minimize adverse environmental impacts of their engineering works or applications of technology so as to protect both present and future generations.
4. Engineers shall build their reputation on merit and shall not compete unfairly.
5. Engineers shall perform professional services only in the areas of their competence.
6. Engineers shall apply their skills and knowledge in the interest of their employer or client for whom they shall act, in professional matters, as faithful agents or trustees, so far as they do not conflict with the other requirements listed here and the general public interest.
7. Engineers shall give evidence, express opinions or make statements in an objective and truthful manner.
8. Engineers shall continue their professional development throughout their careers and shall actively assist and encourage engineers under their direction to advance their knowledge and experience.

RULES**Clause 1**

Engineers shall hold paramount the health, safety and welfare of the public and proper utilization of the funds and other resources in the performance of their professional duties. It shall take precedence over their responsibility to the profession, sectoral or private interests, employers or to other engineers.

As the first requirement places the interests of the community above all others, Engineers –

- | | |
|-----------------|--|
| Rule 1.1 | Shall be objective and truthful in writing professional reports, issuing statements or submitting testimony. They shall include all relevant and pertinent information in such reports, statements or testimony. |
| Rule 1.2 | Shall endeavour at all times to maintain engineering services essential to public welfare. |
| Rule 1.3 | Shall work in conformity with recognized engineering standards so as not to jeopardize the health, safety and welfare of the public. |
| Rule 1.4 | Shall not participate in assignments that would create conflict of interest between their clients / employers and the public and shall advise the client of their concerns. |
| Rule 1.5 | Shall, in the event of their judgment being over-ruled in matters pertaining to health, safety and welfare of the community, inform their clients or employers of the possible consequences and bring to the clients' / employers' notice their obligations as professionals to inform the relevant authority. |
| Rule 1.6 | Shall contribute to public discussion on engineering matters in their areas of competence; if they consider that by so doing they can constructively advance the wellbeing of the community. |
| Rule 1.7 | Having knowledge of any alleged violation of this Code by others shall co-operate with the proper authorities in furnishing such information or assistance as may be required. |
| Rule 1.8 | Shall not knowingly participate in any act, which will result in waste or misappropriation of public funds. |
| Rule 1.9 | Shall actively contribute to the wellbeing of the society and, when involved, in any engineering project or application of technology, shall, where appropriate, recognize the need to identify, inform and consult affected parties to help resolve problems involved. |

Clause 2

Engineers shall always *act in such a manner as to uphold and enhance the honour, integrity and dignity of the profession* while safeguarding public interest at all times.

This requires that the engineering profession should endeavour by its behaviour to merit the highest esteem of the community. It follows therefore, that engineers:

- Rule 2.1** Shall not involve themselves with any business or professional practice, which they know to be fraudulent or dishonest in nature.
- Rule 2.2** Shall not associate with other persons, corporations or partnerships to conceal unethical acts.
- Rule 2.3** Shall not continue in partnership with, or act in professional matters with any engineer who has been removed from membership of this Institution because of improper conduct.
- Rule 2.4** Shall promote the principle of engagement of engineers upon the basis of merit.
- Rule 2.5** Shall uphold the principle of adequate and appropriate remuneration for professional engineering staff in keeping with their qualifications and market price.

Clause 3

Engineers shall be committed to the need for sustainable management of the planet's resources and seek to minimize adverse environmental impacts of their engineering works or applications of technology so as to protect both present and future generations.

To this end engineers –

- Rule 3.1** Shall carefully evaluate adverse environmental impacts *of their actions* and incorporate practical remedial measures to minimize them.
- Rule 3.2** Shall consider theoretical, legislative, regulatory and policy aspects of environmental protection and sustainable management of the available resources.
- Rule 3.3** *Shall work in close co-operation with members of other professions and disciplines on achieving sustainable development.*
- Rule 3.4** Shall critically analyze how the proposed project or the application of technology relates to sustainability considerations.
- Rule 3.5** Shall identify and assess options for material recovery and disposal.
- Rule 3.6** Shall analyze opportunities for resource and energy conservation and, design appropriately optimized systems.

Clause 4

Engineers shall build their reputation on merit and shall not compete unfairly.

This requirement is to ensure that engineers shall not seek to gain a benefit by improper means. It follows that engineers-

- Rule 4.1** Shall neither pay nor offer, directly or indirectly, inducements to others.
- Rule 4.2** Shall not attempt to supplant another engineer, employed or consulting, who has been appointed, without his consent.
- Rule 4.3** Shall neither falsify nor misrepresent their own or other's qualifications, experience and prior responsibilities.
- Rule 4.4** Shall respect others and not maliciously do anything to tarnish, directly or indirectly, the reputation, prospects or business of others.
- Rule 4.5** Shall not use the advantage of a privileged position to compete unfairly with other engineers.
- Rule 4.6** Shall exercise due restraint in explaining their own work and shall refrain from unfair criticism of the work of other engineers.
- Rule 4.7** Shall give proper credit for professional work to those to whom credit is due.
- Rule 4.8** Shall not resort to any form of plagiarism in their work. (new) This includes use of such materials as written text, statistics or similar data, diagrams, illustrations and photographs in reports, publications, examination answers, coursework submitted for academic or professional qualifications etc., without permission, acknowledgement or reference, as if it is the person's own work.
- Rule 4.9** Shall act with due regard to intellectual property rights of others in their work.
- Rule 4.10** Shall not engage in unfair competition including charging of extremely high or low professional fees compared to market rates, in delivering professional services

Clause 5

Engineers shall perform professional services only in the areas of their competence.

To this end engineers –

- Rule 5.1** Shall undertake assignments only when qualified by education and experience in the specific technical fields involved. If an assignment requires qualifications and experience outside their fields of competence they shall engage competent professionals with necessary qualifications and experience and keep the employers and clients informed of such arrangements.
- Rule 5.2** Shall not affix their signature to any designs or documents dealing with subject matter in which they lack competence, or to any plan or document not prepared under their direction or control.

Clause 6

Engineers shall apply their skills and knowledge in the interest of their employer or client for whom they shall act, in professional matters, as faithful agents or trustees, so far as ft they do not conflict with the other requirements listed here and the general public interest.

It follows that engineers –

- Rule 6.1** Shall at all times avoid all known or potential conflicts of interest that involve the engineer himself. They should keep their employers or clients fully informed on all matters, including financial interests, which could lead to such a conflict, and under no circumstances should they participate in any decision which could involve them in conflict of interest.
- Rule 6.2** Shall when acting as administrators of a contract be impartial between the parties in the interpretation of the contract. This requirement of impartiality shall not diminish
- Rule 6.3** Shall not accept compensation, financial or otherwise from more than one party for services on the same project, unless the circumstances are fully disclosed and agreed to, by all interested parties.
- Rule 6.4** Shall neither solicit nor accept financial or other valuable consideration, including free engineering designs, from material or equipment suppliers for specifying their products (except such designs obtained with the knowledge and consent of the employer or client).
- Rule 6.5** Shall neither solicit nor accept gratuities, directly or indirectly from contractors or their agents, or other parties dealing with their clients or employers in connection with work for which they are responsible.
- Rule 6.6** Shall not accept a commission, fee, reward or other benefit from a Third Party, while advising a client.
- Rule 6.7** Shall advise their clients or employers when as a result of their studies they believe that a project will not be viable.
- Rule 6.8** Shall neither disclose nor use confidential information gained in the course of their employment without express permission, except where public interest and safety are involved.
- Rule 6.9** Shall not complete, sign, or seal designs and/or specifications that are not safe to the public health and welfare and in conformity with accepted engineering standards. If the client or employer insists on such unprofessional conduct, they shall notify the proper authorities and withdraw from further service on the project.

Clause 7

Engineers shall give evidence, express opinions or make statements in an objective and truthful manner.

It follows that –

Rule 7.1

Engineers professional reports, statements or testimony before any tribunal shall be objective and such opinions shall be expressed only on the basis of adequate knowledge and technical competence in the area, but this does not preclude a considered judgment based intuitively on experience and wide relevant knowledge.

Rule 7.2

Engineers shall reveal the existence of any interest, pecuniary or otherwise that could be taken to affect their judgment in a technical matter about which they are making a statement or giving evidence.

Clause 8

Engineers shall continue their professional development throughout their careers and shall actively assist and encourage engineers under their direction to advance their knowledge and experience.

It follows therefore, that engineers –

Rule 8.1

Shall encourage their professional employees and subordinates to further their education, and

Rule 8.2

Shall take a positive interest in and encourage their fellow engineers actively to support the Institution and other bodies, which further the general interest of the profession.

GUIDELINES FOR PROFESSIONAL CONDUCT

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1. Engineers shall be guided in all their professional relations by the highest standards of integrity.
 - a. Engineers shall admit and accept their own errors when proven wrong and refrain from distorting or altering the facts in an attempt to justify their decisions.
 - b. Engineers shall advise their clients or employers when they believe a project will not be successful.
 - c. Engineers shall not accept assignments outside their employment to the detriment of their regular work or interest. Before accepting any assignments outside their employment they will notify their employers and obtain their prior permission.
 - d. Engineers shall avoid any act tending to promote their own interest at the expense of the dignity and integrity of the profession.
2. Engineers shall at all times strive to serve the public interest.
 - a. Engineers shall seek opportunities to be of constructive service in civil affairs and work for the advancement of the safety, health and well being of their community.
 - b. In public or private sector employment engineers shall refrain from participating knowingly in any act that will result in waste or misappropriation of employers funds.
3. Engineers shall refrain from all conduct or practice which is likely to discredit the profession or deceive the public.
 - a. Engineers shall refrain from using statements containing material misrepresentation of fact, or omitting material fact.
 - b. Engineers shall refrain from showmanship, or self-laudation or from attempting to attract clients thereby and making derogatory statements about others. Consistent with the foregoing Engineers may advertise for recruitment of personnel.
 - c. Consistent with the foregoing. Engineers may publish articles in the press or in technical journals but such articles shall not imply credit to the author for work performed by others.
4. Engineers shall not disclose confidential information concerning the business affairs or technical processes of employers without their consent.
5. Engineers shall not be influenced in their professional duties by conflicting interests.
 - a. Engineers shall not accept financial or other considerations, from material or equipment suppliers for specifying their product
 - b. Engineers shall not accept commissions or allowances, directly or indirectly from contractors or other parties in connection with the work for which the Engineer is responsible.
 - b. Consistent with the foregoing Engineers may publish articles in the press on in technical journals but such articles shall not imply credit to the author for work performed by others.
6. Engineers shall uphold the principle of appropriate and adequate compensation for those engaged in engineering work.
 - a. Engineers shall not accept remuneration from either an employee or employment agency for giving employment.
 - b. Engineers, when employing other engineers, shall offer a salary according to professional qualifications, experience and recognised standards.
7. Engineers shall not compete unfairly with other engineers to obtain employment or advancement in employment or in seeking professional engagements by taking advantage of their position, by criticizing other engineers, or by other improper or questionable means.

- a. Engineers shall not request, propose, or accept a professional commission under circumstances in which their professional judgment may be compromised.
 - b. Engineers in salaried position shall accept part-time engineering work only with the expressed permission of the employer and at recognised rates for such work.
 - c. Engineers shall not use equipment, supplies laboratory, or office facilities of an employer to carry out outside private work without the consent of the employer.
8. Engineers shall not attempt to injure, maliciously or falsely, (directly or indirectly) the professional reputation, prospects, practice or employment of other engineers, nor indiscriminately criticize other engineers' work. Engineers who believe others are guilty of unethical or illegal practice shall present such information to the proper authority for action.
- a. Engineers in private practice shall not review the work of another engineer for the same client, except with the knowledge of such engineer, or unless the connection of such engineer with the work has been terminated for unethical practices.
 - b. Engineers in governmental, industrial or educational employ are entitled to review and evaluate the work of other engineers when so required by their employers.
 - c. Engineers in sales or industrial employ shall not criticize products of other manufacturers which are similar to their own.
9. Engineers shall accept personal responsibility for their professional activities.
- a. Engineers shall conform with state registration laws in the practice of engineering.
 - b. Engineers shall not use association with a non-engineer, a corporation, or partnership, as a „cloak“ for unethical acts, but must accept personal responsibility for their professional acts.
10. Engineers shall give credit for engineering work of other engineers to whom credit is due, and will recognise the proprietary interests of others.
- a. Engineers shall, when possible, name the person or persons who may be individually responsible for designs, inventions, writings, or other accomplishments.