Khulna University of Engineering & Technology
B. Sc. Engineering 4th Year 2nd Term Examination, 2018
Department of Biomedical Engineering

BME 4251
Biomedical Ethics and Safety

Time: 3 hours **Full Marks: 210**

N.B. i) Answer **ANY THREE** questions from each section in separate answer scripts.
ii) Figures in the right margin indicate full marks.

Section A

(Answer **ANY THREE** questions from this section in **Answer Script A**)

1. a) What is meant by ethics? Classify its scope of study. Construct a set of rules for a standard ethical organization. (12)

   b) "Value may be described as treating actions themselves by putting value to them"-Justify the statement with real life example. (12)

   c) Briefly discuss the clinical guidelines for a kidney transplant. Explain transplant surgery. (06)

   d) Write short notes on – "International Medical Device Standard". (05)

2. a) What are the types of misconduct? (08)

   b) What is meant by conflict of interest? How can you address this issue as a student in a university? (13)

   c) What is commitment? Illustrate the feature of commitment that helps you to be ethical. (14)

3. a) Describe the relationship between ethics and economy. (08)

   b) Illustrate how can you handle a criminal man in your organization if you are the head of the organization. (14)

   c) Discuss the importance of moral development in childhood stating the practices in Bangladesh, Eastern and Western countries. (13)

4. a) What are meant by performance character and moral character? (12)

   b) What are the attributes of clinical ethics in a medical organization? (10)

   c) Suppose in a medical college hospital there is only one heart is available for (i) 17 years old man, (ii) 60 years old man, (iii) 70 years old woman patients coming at a time. State and justify your treatment. (13)

Section B

(Answer **ANY THREE** questions from this section in **Answer Script B**)

5. a) Define bio-safety. Briefly explain the following terms with examples: Pathogen, Microbes. Why do we need a bio safety? (08)

   b) What are different bio-safety levels? Describe them with examples. (12)

   c) Describe laboratory practices, safety equipment and facility construction of different biosafety levels. (15)

6. a) Explain the following terms with suitable examples: Accidents, Incidents, Ill health, Hazards, Risks, Threat and Safety. (14)

   b) Why do we need respirators? When are respirators needed? (06)

   c) Describe different types of respiratory hazards with example. (10)

   d) Why it is important to understand the different states of atmospheric hazards? (05)

7. a) What are the rules and regulations needed to be developed to make experiments on living subject? (15)

   b) Mention the safety practices in entering to a IC unit of a standard hospital. (12)

   c) Discuss the general practices in diagnostic center in Bangladesh for biosafety. (08)

8. a) Explain risk assessment. Narrate five steps of risk assessment. Mention the key points to consider assessing infection risk. (12)

   b) Explain the provision and use of personal protective equipment. (08)

   c) Mention the key duties of employers for performing health and safety law. (07)

   d) What are the duties of nominated laboratory safety officers? (08)

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BME 4231
Telemedicine and Healthcare

Time: 3 hours **Full Marks: 210**

N.B. i) Answer **ANY THREE** questions from each section in separate answer scripts.
ii) Figures in the right margin indicate full marks.

Section A

(Answer **ANY THREE** questions from this section in **Answer Script A**)

1. a) Define telemedicine. Mention its practical applications, types and limitations. (12)

   b) What are the benefits of home telehealth? Mention the equipment selection criteria of home telehealth. (13)

   c) Write short notes on: (10)
      (i) P-healthcare
      (ii) E-health/e-medicine
      (iii) m-healthcare.

2. a) Briefly demonstrate a practical case study of telemedicine system in context of Bangladesh and mention its method of implementation, barriers and achievements in improving healthcare services. (15)

   b) How smart home can contribute on telemedicine program? (07)

   c) What are the human and sociotechnical factors of telemedicine? Briefly discuss them. (13)

3. a) What are the ethical and legal challenges of telemedicine program? Give a general outline for them. (20)

   b) Discuss evaluation methodology for telemedicine system. (15)

4. a) What steps should be considered by health professionals before starting a business in telemedicine sector? Briefly discuss them. (20)

   b) Give a block diagram showing all the relevant questions that need to be asked in order to evaluate a telemedicine system. (15)

Section B

(Answer **ANY THREE** questions from this section in **Answer Script B**)

5. a) What is communication network? Why the concept of communication network is required to implement a telemedicine system? (08)

   b) Illustrate the concept of an electronic drugstore. What benefits can be achieved from an electronic drugstore from medical, social and economical aspects? (10)

   c) What are the common types of wireless networks used in telemedicine systems? Write down the technical features of Bluetooth communications. (10)

   d) Compare licensed and unlicensed frequency band communication network to adopt in a telemedicine system. (07)

6. a) Show the structure of a typical Body Area Network (BAN) and identify each component. What are the common types of mobile base unit? (10)

   b) Sketch a telemedicine framework for emergency rescue. Briefly explain the necessary support at the scene and for a paramedics approaching to the incident. (12)

   c) What can possibly go wrong at the hospital when treating remote recovery patients at an accident scene? (07)

   d) How people tracking can be made useful in many telemedicine applications? (06)

7. a) Mention some examples of wearable devices measuring body temperature. Briefly demonstrate a telemedicine solution for measuring body core temperature. (15)

   b) What is photoplethysmography? How does a "Fitbit" work? (10)

   c) Why traditional sphygmomanometer is not suitable for telemedicine applications? Briefly show the technological evolution in blood pressure monitoring devices. (10)

8. a) Why smart sensing technologies are highly preferable for m-health applications? Mention different types of telemedicine devices using smartphone platform. (10)

   b) Demonstrate with neat sketch how a smartphone can be turned up to make a telehealth microscope. (10)

   c) List some example commercial telemedicine device for monitoring: (08)
      (i) Blood pressure
      (ii) Blood O_2 level
      (iii) Blood glucose level
      (iv) ECG.

   d) Write short note on PACS. (07)

Khulna University of Engineering & Technology
B. Sc. Engineering 4th Year 2nd Term Examination, 2018
Department of Biomedical Engineering

BME 4217
Rehabilitation Engineering

Time: 3 hours **Full Marks: 210**

N.B. i) Answer ANY THREE questions from each section in separate answer scripts.
ii) Figures in the right margin indicate full marks.

Section A
(Answer ANY THREE questions from this section in Answer Script A)

1.	a)	What is rehabilitation engineering? Briefly explain the role of rehabilitation engineers.	(10)
	b)	Define physiological sensor. Design a smart shirt with physiological sensor.	(10)
	c)	What is handicap? How handicap was identified by WHO.	(05)
	d)	Write down the effects of prolonged inactivity and bed rest on body system.	(10)
2.	a)	Write down the types of hearing loss. How the auditory function of human can be tested?	(10)
	b)	Draw and label the 'Bone conduction' and 'Air conduction' pathway.	(10)
	c)	What type of hearing aid is suitable for sensoneural hearing loss? Why? Write down the working principle of hearing aids.	(10)
	d)	What is cochlear implant? What are the parts of cochlear implant?	(05)
3.	a)	What are the main communication skills? Write down the factors that affect communication.	(07)
	b)	What is visual communication? Why visual communication is important skill to hear?	(06)
	c)	Define aphasia. What are the risk factors of aphasia? How is aphasia treated?	(10)
	d)	Write down the components of microcontroller based electronic walking stick for blind. Design a low cost blind stick with different sensors.	(12)
4.	a)	Define prosthesis. Write down the different levels of lower limb prosthesis.	(08)
	b)	Describe the hip disarticulation prosthesis with simple diagram.	(12)
	c)	State the name of the materials that are used in hip disarticulation prosthesis. Write down the advantage and disadvantage of these materials.	(10)
	d)	Write short note on 'Canadian-type hip disarticulation prosthesis'.	(05)

Section B

(Answer ANY THREE questions from this section in **Answer Script B**)

5. a) Define assistive technology. Discuss on different types of assistive technologies used for rehabilitation of disabled people. (12)

   b) Write down the benefits and challenges of assistive technology. (09)

   c) Define orthosis. Classify and explain different orthoses in terms of their location and function. (14)

6. a) Write down the features that are needed to consider in designing an orthotic. (09)

   b) List different materials that are commonly used to develop orthotics devices. Also compare the mechanical properties of orthotic materials with natural muscle. (11)

   c) Explain the biomechanical principle behind orthotics device design. (15)

7. a) Explain the working principle of typical artificial muscle. (10)

   b) Design an intelligent AFO for disabilities with drop foot impairment and explain the design strategy. (20)

   c) What are the differences between orthosis and prosthesis? (05)

8. a) Write down the procedural steps involved in prostheses development. (08)

   b) Discuss on design concepts of simple myoelectric prosthetic arm using necessary diagrams. (14)

   c) Write an essay on different mobility aids used for rehabilitation of disabled people. (13)

Khulna University of Engineering & Technology
B. Sc. Engineering 4th Year 2nd Term Examination, 2018
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BME 4215
Bio-Nanotechnology

Time: 3 hours **Full Marks: 210**

N.B. i) Answer **ANY THREE** questions from each section in separate answer scripts.
ii) Figures in the right margin indicate full marks.

Section A

(Answer **ANY THREE** questions from this section in **Answer Script A)**

1. a) What does the prefix 'nano' in the word nanotechnology indicate? Mention in brief the scope of nanotechnology in our everyday life. (07)

b) Explain in detail Electrical, Magnetic, Chemical, Optical, Thermal and Mechanical properties of nanostructured materials. (14)

c) Why are properties of nanoscale objects different than those of the same materials at the bulk scale? (14)

2. a) Briefly explain the term "Bio-nanotechnology". What are the major fields in Bio-nanotechnology? (07)

b) Enlist the advantages of bio-nanotechnology to determine the pathophysiological conditions and anatomical changes of diseased tissues. (08)

c) Explain how carbon nanotubes are useful for target-specific drug delivery and cancer therapy. (10)

d) Write short notes on: (10)
i. Molecular Imaging;
ii. Drug development by bio-nanotechnology.

3. a) What are nanomaterials? Write different modes of classification of nanomaterials. (08)

b) How nanostructured biomaterials are useful in medical applications? Explain your answer with examples. (10)

c) What types of biomaterials are preferred for the aceptabular cup of a hip implant? What design parameters are utilized during the selection process? (10)

d) Briefly explain the biocompatibility. Also discuss the design consideration that should be taken into account for specific applications of biomaterials. (07)

4. a) Describe the key challenges of the biotechnology at nanoscale. (09)

b) How can nanotechnology help us to protect our environment? (13)

c) What are the potential hazards of nanoparticles in human body? In which areas of nanotechnology in the environment need to be investigated to evaluate the impact of nanoparticles? (13)

Section B

(Answer **ANY THREE** questions from this section in **Answer Script B**)

5.	a)	What is self assembly? Enumerate the fabrication process of novel biomaterials through self assembly.	(10)
	b)	What is DNA? "DNA is appropriate for Bio-nanotechnology"- justify the statement.	(10)
	c)	What is P-O-C? Enumerate the advantages of paper based diagnosis system.	(10)
	d)	Write a short note on universal influenza vaccine.	(05)
6.	a)	Enlist the types of liposome. Explain the importance of liposome as nanoparticle.	(10)
	b)	Write down the differences between gram positive and gram negative bacteria. Classify bacteria based on their oxygen requirement.	(10)
	c)	Explain the development process of viral nanoparticle.	(15)
7.	a)	What is peptide lego? Briefly discuss the application of peptide nanotube.	(10)
	b)	What is virus? Classify virus according to their morphology. Enumerate the basic differences between virus and bacteria.	(10)
	c)	"SLN is better than niosome and liposome"- explain by your own thought.	(10)
	d)	Write a short note on 3-D cell culture.	(05)
8.	a)	Write down the application of virus in drug delivery system.	(10)
	b)	Enumerate the criteria of a simple test by the guidelines of FDA.	(10)
	c)	What is DNA nanotube? Enumerate the application of DNA nanotube.	(10)
	d)	Write a short note on current limitations of Bio-nanotechnology.	(05)