



Name : .....  
Roll No. : .....  
Invigilator's Signature : .....

**CS/B.TECH (BME)/SEM-8/BME-803B/2011  
2011**

**BIOLOGICAL CONTROL SYSTEMS**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

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

**GROUP – A  
( Multiple Choice Type Questions )**

1. Choose the correct alternatives for the following :

10 × 1 = 10

- i) Design of the thermoregulatory processes in 'homeothermic' animal is an example of
  - a) closed loop system
  - b) open loop system
  - c) both (a) and (b)
  - d) none of these.
  
- ii) When a solvent moves by bulk flow it carries some solute with it and the process is called
  - a) active transport
  - b) solvent drag
  - c) bulk flow
  - d) filtration.



- iii) A non-hormonal anti-insulin is
- a) cortisol
  - b) estrogen
  - c) ketones
  - d) insulin antibody.
- iv) Nucleus ambiguus regulates hypertension as
- a) parasympathetic centre
  - b) vasomotor centre
  - c) sympathetic centre
  - d) cardiac centre.
- v) Atrial natriuretic peptide controls blood pressure by correcting
- a) hypervolemia
  - b) hypovolemia
  - c) venous return
  - d) peripheral resistance.
- vi) Glycogenolysis is promoted by activating the enzyme
- a) Carbonic anhydrase
  - b) Phosphorylase
  - c) Lipase
  - d) Glucokinase.
- vii) Increased heat production in the body is a reason of stimulation of
- a) Posterior group of nuclei of hypothalamus
  - b) Anterior group of nuclei of hypothalamus
  - c) Vasomotor centre of medulla
  - d) Limbic system of cerebral cortex.



- viii) When renal threshold value for blood sugar exceeds, the disease condition is called
- a) haemophilia                      b) hypoglycemia  
 c) haemachuria                      d) glycosuria.
- ix) At any given  $PCO_2$  level amount of  $CO_2$  is taken up by
- a) oxygenated blood                  b) deoxygenated blood  
 c) mixed blood                      d) none of these.
- x) The number of osmoles per kg of solvent is called
- a) Osmolarity                          b) Moles  
 c) Osmolality                          d) Normality.

**GROUP – B**

**( Short Answer Type Questions )**

Answer any *three* of the following.                   $3 \times 5 = 15$

2. What are the similarities and differences between biological control system and engineering control system ?  $2 \times 2 = 4$
3. How does chemoreceptor reflex control blood pressure ?                  5
4. How do different types of mediated transports regulate movement of substances through biological membrane ?                  5
5. Write the importance of 'Hamburger Phenomenon' in relation to  $CO_2$  transport through blood.                  5
6. Describe three compartment model of the lungs.                  5
7. Describe the effect of feedback on the system performance characteristics — stability, sensitivity, overall gain and bandwidth.                  5



**GROUP – C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

8. Write the regulatory process of body temperature in human being giving emphasis on the role of lungs, hypothalamus and different hormones. 15
9. What do you mean by 'anti-insulin' ? How is blood sugar level biologically controlled by endocrine system ? 3 + 12
10. What is buffer ? How do plasma proteins and haemoglobin biologically regulate acid base balance ? Describe the role of phosphate buffer and bicarbonate buffer in the acid base balance. 2 + 6 + 7
11. How does counter-current-multiplier system regulate urine concentration and volume ? How is diuresis related to long term control of hypertension ? 10 + 5
12. Explain the role of various controlling factors which help in the uptake of  $O_2$  in the lungs and dissociation of it in the tissues. 15
13. What is Transfer function ? How is it related with impulse response ? Describe the properties of Transfer function. 2 + 3 + 10

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