



Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH (BME)/SEM-7/BME-702/2011-12

2011

**ARTIFICIAL ORGANS & REHABILITATION
ENGINEERING**

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) In audiometry, SPL scale stands for
- a) Sound Permit Level
 - b) Sound Pascal Level
 - c) Sound Pressure Level
 - d) Sound Progress Level.
- ii) For skin grafting, the grafting material should be
- a) biocompatible
 - b) biodegradable
 - c) both (a) and (b)
 - d) bioreactive.



- iii) Glucose Oxidase is used in the
- a) Insulin pump b) Insulin syringe
c) Insulin capsule d) Insulin pen.
- iv) Which of the following is an example of a Prosthetic Device ?
- a) Artificial hand b) Wheelchair
c) Denture d) Contact lens.
- v) Oxygenators are used in the surgical condition commonly known as
- a) CPB b) COPD
c) Angioplasty d) Angiography.
- vi) In artificial blood, PFC stands for
- a) phosphorous, fluorine, chlorine
b) polytetra fluoro carbon
c) per fluoro carbon
d) none of these.
- vii) In artificial oxygenator, defoaming is carried out by passing oxygenated blood over
- a) nylon coated screen
b) dacron coated screen
c) silicone coated screen
d) polyethylene coated screen.
- viii) The maximum resistance offer in hemodialysis by
- a) blood film
b) dialysate film
c) hemodialysis membrane
d) flow rate.
- ix) Which bone is used in bone-conduction audiometry ?
- a) Incus b) Humerous
c) Radius d) Mastoid.
- x) Masking is done if the hearing loss difference in pure-tone threshold between two ears is greater than
- a) 10 dB b) 20 dB
c) 40 dB d) 60 dB.



GROUP – B

(Short Answer Type Questions)

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

2. Explain 'Plasma skimming' phenomena of blood through blood vessel. Calculate the total amount of dialysate required for 4 hours hemodialysis. 4 + 1
3. a) Calculate the blood flow velocity through ascending aorta and its Reynold's number.
[Inner dia. of aorta 2.0 cm, cardiac output 70 ml/beat working at normal rate, blood viscosity 3.5 c.p. & sp. gr. of blood 1.056] 2 + 1
- b) Calculate the urea concentration in outlet blood after single dialysis.
[Urea conc. in inlet blood is 150 mg%, mass transfer coefficient 1/60 min/cm, membrane area 1 m² and blood flow rate 200 ml/min.] 2
4. How can you improve the function of a partially inactive hand or upper extremities by using electrical / electronic circuitry ?
5. What do you mean by Rehabilitation Engineering ? Define orthosis and prosthesis. 3 + 2
6. Differentiate between Mechanical and Bioengineered Heart Valves.
7. What is Artificial skin ? Explain the mechanism of skin grafting in human. 1 + 4

GROUP – C

(Long Answer Type Questions)

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

8. What do you mean by blood rheology ? Discuss the effect of different factors on blood rheology. Briefly explain the problems associated with ECD. 2 + 6 + 7



9. a) Why an artificial lung is needed during bypass heart surgery ? 3
- b) Silicone rubber is designed as an extra corporeal membrane oxygenator for heart-lung bypass surgery. Calculate the area of membrane, which is fed with 100% pure O_2 (water saturated) at $37^\circ C$.
(Cardiac output 4 L/min, gas flow rate 10 L/min, O_2 and CO_2 transfer rate 5.7 and 4.5 ml/100 ml of blood, membrane permeability of O_2 and CO_2 0.51 and 2.72 cc/min-mm Hg at STP, partial pr. of water vapour is 47 mm of Hg at $37^\circ C$) 7
- c) What is masking in audiometry and why is it essential ? 5
10. What are the clinical causes of hearing loss ? Mention the major categories of hearing aids. Describe the hearing aid with special notes on transducers. What is myoelectric hand ? 2 + 4 + 6 + 3
11. Explain hemodialysis machine with a neat sketch. Deduce the equation for artificial kidney or overall mass-transfer in dialyzers. Describe the function of wearable artificial kidney machine. 5 + 5 + 5
12. What are oxygenators ? What are the different types of oxygenators and how do they function ? What do you understand by the closed loop Insulin pump and how is it beneficial ? What is Type I Diabetes mellitus ? 3 + 5 + 4 + 3
13. Write short notes on any *three* of the following : 3 × 5
- a) Artificial Blood
 - b) Mobility Aids
 - c) Prosthetic Heart Valves
 - d) Retinoscopy
 - e) Ophthalmoscopy.
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