

Use of internet resources via smart phones or laptops is illegal during this exam. Please do NOT force me to penalize any of you. Use the precious organ inside your skull to analyze problems

BYM 501E FUNDAMENTALS OF BIOMEDICAL ENGINEERING (14463)

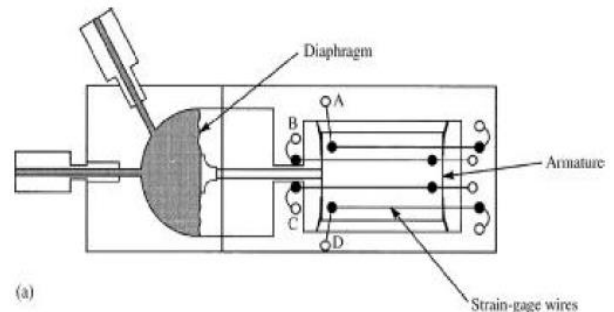
Inci ÇILESIZ

Final Examination ✎ 4 January 2016 ⌚ 15.00-17.00

1. What instruments (signal generator, multimeter, oscilloscope, etc.) would you use and how would you design measurements to measure dynamic properties of a biomedical measurement system? Which properties would you measure? Why and how? (15 points)
2. Compare and contrast (you may think of blood tests, biopsy results, and alike) (a) sensitivity vs. specificity and (b) accuracy vs. precision (10 points)
3. Define, compare and contrast (advantages vs. disadvantages, etc.) the following terms in terms of biomedical measurements and instrumentation and provide examples (e.g., name instruments, devices, methods) for each set of terms (a) direct / indirect; (b) invasive / non-invasive; and (c) intra-corporeal / extra-corporeal. (10 points)

4. On the right you see a strain-gauge pressure sensor. (10 points)

- a. State whether it is bonded or un-bonded type, why?
- b. How is the pressure signal transduced into an electrical signal?

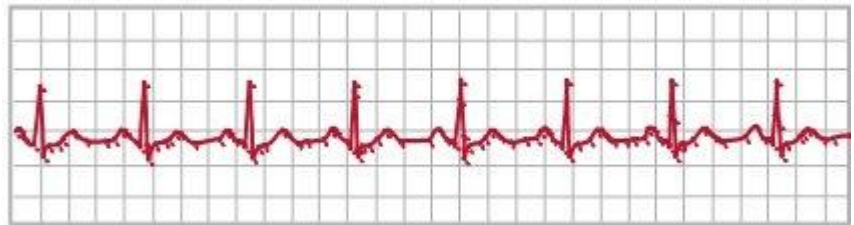


5. Compare and contrast within 5 sentences maximum macroshock vs. microshock in terms of electrical hazards in a clinical environment. (10 points)

6. Show mathematically, that by using the augmented leads, detected bioelectric signal amplitude is increased 50% as compared to unipolar frontal plane leads without effecting the direction of the lead vector? (10 points)

7. Explain within 5 sentences maximum the function of driven-right-leg circuit. (10 points)

8. On the right you see a typical EKG signal from Lead I. Try to guess and sketch how the Lead II signal will look like. (10 points)



9. Correlate heart sounds with electrical and mechanical events of the cardiac cycle on a diagram showing time evolution of (a) aortic and (b) left ventricular blood pressures, (c) EKG signal and (d) the heart sounds (at least the major two!). (10 points)

10. Compare and contrast within 5 sentences maximum macroshock vs. microshock in terms of electrical hazards in a clinical environment. (5 points)

GOOD LUCK