Final exam questions

Subject group name: **Fluid Mechanics Measurements**

Neptun code: ZVEGEÁTNW03

Credit points: 5

Subject in this subject group:

- **Fluid Mechanics Measurements** (BMEGEÁTNW03)

Program: Mechanical Engineering Modelling, MSc (2N-MW0)

Specialization: Fluid Mechanics

Responsible person:

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You can check the current subject forms at the Educational Portal of the Faculty of Mechanical Engineering.

https://oktatas.gpk.bme.hu/

Always check the for updates at edu.gpk.bme.hu before preparing for the exam, especially if the subject group contains at least one subject from your final semester!

Valid from 01 September 2021

Prof. János Vad

professor

1. Carry out a brief comparison in various velocity metering devices, such as Pitot-static probe; hot-wire anemometer (CTA); LDA, PIV, stereo PIV, from the perspective of their fundamental features (number of velocity components; point-like or tomographic measurements; invasive / non-invasive technique). Specify one application example for each technique, and give a reason.
2. Give an example, with explanation, for the following statement: A flow measurement technique (instrumentation) is „of high standard" only IF the entire experimental procedure and the evaluation of results are also of a high standard.
3. Give an example, with explanation, for the following statement: Paradox: „we need to know the answer before we begin the measurement."
4. Give an example, with an explanation, for full exploitation of a sophisticated measuring technique. Demonstrate how the use of the same technique becomes senseless in the absence of full exploitation of the opportunities delivered by it.
5. Static pressure probe, Ser disk, coin probe: operational principle with a sketch; one application example for each, with justification.
6. Pitot probe, Kiel probe, Pitot-static probe: operational principle with a sketch; one application example for each, with justification.
7. Venturi probe, S-probe, peak probe: operational principle with a sketch; one application example for each, with justification.
8. Cylinder probe, finger probe, five hole-probe: operational principle with a sketch; one application example for each, with justification.
9. Diaphragm manometers: electric capacitor principle with a sketch; three application examples.
10. Turbine velocimeter (for velocity measurement, e.g. "Mini-air"), rotating vane anemometer (for flow rate metering): operational principle with a sketch; one application example for each, with justification.
11. Thermal anemometer, resistance thermometer: operational principle with a sketch; one application example for each, with justification.
12. Measurement of unsteady pressure: three principles [capacitor (condenser microphone), pieso-inductive, pieso-resistive] with sketches; one application example for each, with justification.
13. Comparison between flow rate measurements i) deduced from velocity measurements and ii) using contraction elements, illustrated by examples (invasiveness, capability for following unsteadiness, expenses, demands and regulations, accuracy).
14. Flowmeters: ultrasonic flowmeter (e.g. transit time principle); magneto-inductive (MHD) flowmeter. Operational principle with a sketch; advantages and limits; one application example for each, with justification.
15. Flowmeters: capacitive cross-correlation technique; vortex shedding flowmeter. Operational principle with a sketch; advantages and limits; one application example for each.
16. Flowmeters: Coriolis flowmeter; variable area flowmeter (rotameter). Operational principle with a sketch; advantages and limits; one application example for each.
17. Flowmeters: turbine flowmeter; volumetric (e.g. oval wheel) flowmeters. Operational principle with a sketch; advantages and limits; one application example for each.

18. Laser Doppler anemometry. Operational principle with a sketch (e.g. single component, backscattering); advantages and limits; one application example.
19. Hot wire anemometry (e.g. CTA). Operational principle with a sketch; advantages and limits; one application example.
20. Particle Image Velocimetry. Operational principle with a sketch; advantages and limits; one application example.