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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: B.Tech ASEA

Subject (Course): Aircraft Instruments and Measurements

Course Code: ASEG 424

No. of page/s: 02

Semester – VII

Max. Marks : 100

Duration : 3 Hrs

Section A

(All the questions are Compulsory)

(5 x 4 = 20 Marks)

1. The expected value of the voltage across a resistor is 80V. However, the measurement gives a value of 79V. Calculate
 - a. Absolute Error
 - b. % Error
 - c. Relative Accuracy
 - d. % of Accuracy
2. Draw a line diagram of a dual pitot and static system for instrument panels in an aircraft.
3. What do you understand by terms gimbal lock and gimbal error.
4. How are the gyroscopic properties utilized in flight instruments.
5. Imagine a single coil in a magnetic field and sketch the following when placed parallel, right angle and at an angle θ :
 - a. Components with respect to the magnetic field
 - b. Total flux induced

Section B

(All the questions are Compulsory)

(10 x 4 = 40 Marks)

6. Identify the order of the below mentioned instruments and derive the transfer function accordingly.
 - a. Mercury in glass Thermometer
 - b. Potentiometer
7. Explain the principle of Pitot tube and drive the suitable relationship.
8. Draw the circuit diagram of a typical pressure head heating system and explain its operation. What effects do the drain holes of pressure head have on the indications of the instruments connected to it?

9. Neatly sketch and describe the construction and operation of a float type of fuel-quantity gauge.

Section C

(All the questions are Compulsory)

(20 x 2 = 40 Marks)

10. With respect to the terrestrial magnetism, Answer the following:
- Define the following
 - Magnetic Meridian
 - Magnetic Variation
 - Isogonal Lines
 - Draw diagrams to illustrate the relationship between the earth's magnetic components and magnetic dip at the equator and at the magnetic poles.

OR

With respect to typical aircraft compass answer the following:

- Describe the magnetic system in aircraft compass
 - How is the effect of dip overcome
 - Define acceleration error and northerly turning error
 - Assuming an aircraft is flying in southern hemisphere, what errors in compass readings will be introduced when
 - Aircraft accelerates on easterly heading
 - Aircraft turns from a southerly heading towards east
11. Illustrate the electrical interconnection of the following elements in flight detector elements:
- Pitch and Roll attitude information from gyroscope
 - Glide slope and localizer pointer with the ILS.

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Section A

(All the questions are Compulsory)

(5 x 4 = 20 Marks)

1. Draw a diagram to illustrate a wheatstone bridge circuit, and how the circuit may be utilized for the measurements of temperature.
2. Neatly sketch and illustrate a typical constant area dead weight tester.
3. Why is it preferable for fuel-quantity indicating systems to measure the fuel weight rather than fuel volume?
4. Define two fundamental properties of gyroscope. On what factors do these properties depend?
5. What are the general sources of errors in a measurement?

Section B

(All the questions are Compulsory)

(10 x 4 = 40 Marks)

6. Neatly sketch and define the following magnetic moments
 - a. Magnet at right angle to the uniform field
 - b. Magnet at angle θ to the uniform field
 - c. Magnet at 0° with the uniform field
 - d. Magnet at 180° with uniform field
7. Draw the fundamental operating principles of the main components of remote indicating compass system in a block diagram
8. Explain the thermocouple principle, and state to what temperature measurement it is applied. What metal combinations are used in thermocouple probes engine cylinder head temperature, exhaust gas temperature.

9. What are the pressure measurement elements commonly used in aircraft cockpit. List and explain in detail. Also, identify the materials most commonly in the elements.

Section C

(All the questions are Compulsory)

(20 x 2 = 40 Marks)

10. In a detector element, Answer the following
- a. Illustrate the characteristics of permalloy in a B/H curve and compare the following characteristics with Iron:
 - i. Permeability
 - ii. Saturation Point
 - iii. Hysteresis
 - iv. Coercivity
 - b. Imagine the detector element is at an angle to component H. Sketch the total flux and emf induced in secondary pick off coil.
11. Which of the capacitance variable used in a capacitance type fuel-quantity system? how the capacitance is effected due to the decrease in fuel and how is it measured? Describe the construction of a typical tank unit. Represent capacitance type fuel-quantity system in a circuit diagram.

OR

List the instruments required for monitoring the power of turbojet engines. By means of a schematic diagram, explain the operation of an EPR indicating system.