Exam Date & Time: 29-Jul-2022 (02:00 PM - 05:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FOURTH SEMESTER B.TECH MAKE UP EXAMINATIONS, JULY 2022

BIOMEDICAL INSTRUMENTATION [BME 4301]

Marks: 50 **Duration: 180 mins.**

A

Answer all the questions.

1) Illustrate the physiological effects of 1sec exposure to various levels of 60Hz AC current applied to the body. (4)

A)

B) Illustrate the unipolar chest lead configuration, in an ECG recording system. (3)

C) Discuss the different characteristic EEG waves observed in normal subjects. (3)

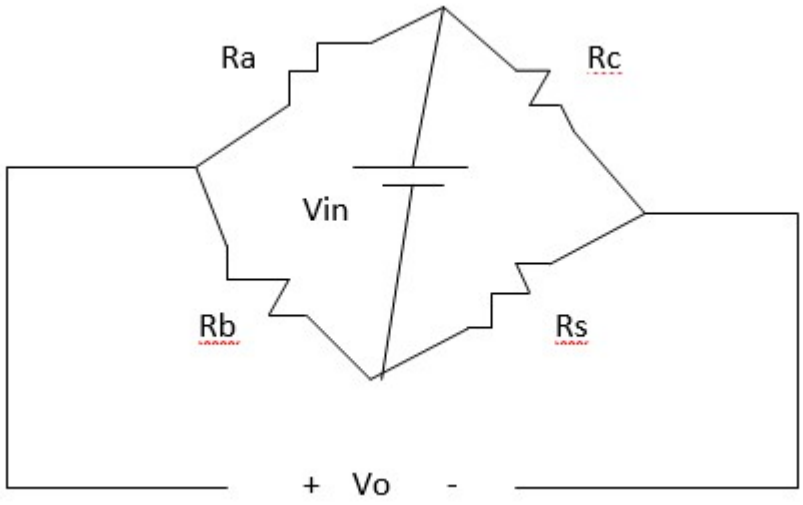
2) With the circuit diagram, determine the expression for the output of an instrumentation amplifier. (4)

A)

B) Illustrate the features of a 4^{th} generation CT machine and show that it is faster (w.r.t image acquisition) than its predecessor. (3)

C) Illustrate the different waves, and time intervals in a typical ECG signal and show the procedure to calculate the heart rate, time intervals, and amplitudes. (3)

3) A) The resistor R_s is a thermistor that varies with temperature. When the temperature is 70^oC, the resistor has a value of $1K\Omega$. Determine the value of R_b so that the bridge is balanced at a temperature of 70^oC. When the temperature rises to 71^oC, the resistance R_s drops to 999Ω. Determine the output voltage of the bridge at that temperature. Assume $V_{in}=12V$, $R_a=4700\Omega$ & $R_c=1000\Omega$. (4)



B) Contrast the two cardiac therapeutic processes - defibrillation and cardioversion. (3)

C) Contrast 'Micro-shock' with that of 'Macro-shock'. (3)

4) The four wires of an unbonded strain gauge form a four arm active bridge. In the null condition, each wire has a resistance of 200Ω. When a force is applied, resistance of each wire changes by 10Ω. Determine the output voltage if a 10V excitation potential is applied to the bridge. (4)

A)

B) A quarter arm strain gauge bridge has strain gauge of 120Ω in its active arm. The three fixed resistors are each of 120Ω. If the active arm strain gauge is applied a strain (tension) of 1450μm/m, determine the bridge output voltage. The bridge excitation voltage is 10Vdc. The gauge factor is 2.0. (3)

C) Demonstrate the 'auscultatory' method of blood pressure measurement using 'pressure vs time' graph. (3)

5) Illustrate the correlation between Electrocardiogram & Phonocardiogram. (4)

A)

B) Discuss the internationally recognized method of electrode placement for EEG signal acquisition. (3)

C) With a suitable schematic, discuss the structure and significance of a 'disposable' surface electrode. (3)

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