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MAIN EXAMINATION

AUGUST – DECEMBER 2018 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER AND LIBRARY SCIENCE

REGULAR PROGRAMME

CMT 100: PHYSICS FOR COMPUTER SCIENCE

Date: DECEMBER 2018	**Duration: 2 Hours**
INSTRUCTIONS: Answer Question ONE and any other TWO Questions	

Q1. a) i) Differentiate scalar quantity from vector quantity, give two examples of each quantity. **(4 marks)**

ii) Express the following quantities using fundamental dimensions: force, voltage and work. **(6 marks)**

iii) State Gauss law. **(2 marks)**

b) A 100V battery is connected across a resistor and causes a current of 5 mA to flow. Determine the resistance of the resistor. If the voltage is now reduced to 25V, what will be the new value of the current flowing? **(4 marks)**

c) i) A current of 2mA flows in a radio resistor R when a p.d of 4V is connected. What are the values of the resistance and the conductance? **(4 marks)**

ii) An electric heating element to dissipate 480 watts on 240V mains is to be made from Nichromeribbon 1mm wide and thickness of 0.05mm. Calculate the length of the ribbon required if the resistivity of Nichrome is $1.1 \times 10^{-6} \Omega m$. (**5 Marks)**

d) i) State Kirchhoff laws of electricity. **(2 marks)**

ii) A magnetic flux of 400 *μ w b* passing through a coil of 1200 turns is reversed in 0.1 seconds. Calculate the average value of the emf induced in the coil. **(3 marks)**

Q2. a) Two capacitors A and B are connected in series across a 100V supply and it is observed that the p.ds across them are 60V and 40V respectively. A capacitor of 2μF is now connected in parallel with A and p.d across B rises to 90V. Calculate the capacitance of A and B in microfarads. **(10 marks)**

b) Derive a relationship for the total resistance when resistors are connected in parallel. **(4 marks)**

c) Calculate the velocity of the electrons in a conductor having 10^{29} free electrons per cubic metre and a cross-sectional area of $2mm^2$ when the current flow is 23mA. **(6 Marks)**

Q3. a) An electron of charge $e=1.6x10^{-19}C$ is situated in a uniform electric field of intensity 120000V/m. Find the force on it, its acceleration and the time it takes to travel 20mm from rest. (Electron mass, $m=9.1x10^{-31}kg$). **(10 marks)**

b) Two positive point charges of 15 and 10μC respectively are 10cm apart. Find the work done in bringing them 4cm closer so they are 6cm apart. **(10 marks)**

Q4. a) What is the peak value of an alternating current which produces three times the heat per second as a direct current of 2A in a resistor R? **(5 marks)**

b) Determine the power flowing into an electrical sink for which the voltage is 340sinwt V and current is 5.6sinwt A, where w=0.2π rad/s. Also determine the energy absorbed (or generated) during a 10s period starting at time, t=0. **(8 marks)**

c) An a.c voltage of 4V peak is connected to a 100Ω resistor R.
   i) What is the phase of current and voltage? **(1mark)**
   ii) Calculate the current in R in mA. **(3marks)**
   iii) What is the power in R in mW? **(3marks)**

Q5. a) An alternating voltage has the equation
V = 141.4 sin 377t
Determine the values of
i) Root mean square voltage **(3 marks)**
ii) Frequency **(3 marks)**

iii) The instantaneous voltage when t = 3ms. **(3 marks)**

b) A circuit having a resistance of 12Ω, an inductance of 0.15H and a capacitance of 100 μ F in series, is connected across a 100V, 50Hz supply. Calculate the

i) Impedance **(4 marks)**
ii) current **(1 mark)**
i) Voltage across R, L and C. **(3 marks)**
ii) Phase difference between the current and the supply voltage **(3 marks)**

END