OCR
RECOGNISING ACHIEVEMENT

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GCE

D&T: SYSTEMS & CONTROL TECHNOLOGY

INSERT

INSERT – FORMULAE SHEET

INSTRUCTIONS TO CANDIDATES

This insert is to be used as required.

This insert consists of 4 printed pages.

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General

Area of rectangle $= l \times w$

Area of triangle $= \frac{b \times h}{2}$

Area of circle $= \frac{\pi d^2}{4}$

Circumference of circle $= \pi d$

Volume of rectangular prism $= l \times w \times h$

Volume of cylinder = area of base circle x h

Volume of cone $= \frac{\text{area of base circle x } h}{3}$

Electrical and Electronic Systems

$V = I \times R$

$W = V \times I$

Resistors in series $R_{total} = R_1 + R_2 + R_3$ etc.

Resistors in parallel $\frac{1}{R_{total}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$ etc.

OR

$R_{total} = \frac{R_1 \times R_2}{R_1 + R_2}$

Potential Divider $V_{out} = V_{in} \times \frac{R_2}{R_1 + R_2}$

Capacitor time constant $T = C \times R$

Capacitors in series $\frac{1}{C_{total}} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}$ etc.

Capacitors in parallel $C_{total} = C_1 + C_2 + C_3$ etc.

Mark space ratio $= \frac{T_{on}}{T_{off}}$

Astable frequency (f) $= \frac{1}{1.4 \times C_1 \times R_1}$

555 astable frequency (f) $= \frac{1.44}{(R_a + 2R_b)C}$

output high time $= 0.693(R_a + R_b)C$

output low time $= 0.693(R_b)C$

555 monostable time constant

on time $= 1.1R_aC$

Voltage gain $= \frac{V_{out}}{V_{in}}$

Non inverting amplifier $V_{out} = V_{in} \times \frac{(R_f + R_{in})}{R_{in}}$

Inverting amplifier $V_{out} = -V_{in} \times \frac{R_f}{R_{in}}$

Summing amplifier $V_{out} = -R_f \times (\frac{V_1}{R_1} + \frac{V_2}{R_2} + \frac{V_3}{R_3})$ etc.

Differential amplifier $V_{out} = \frac{-R_f}{R_a} \times (V_2 - V_1)$

MOSFET $g_m = \frac{\Delta I_d}{\Delta V_{gs}}$

Battery life battery capacity = current x time

Mechanical Systems

Moment = force x perpendicular distance

Stress = $\frac{\text{force}}{\text{cross sectional area}}$

Strain = $\frac{\text{change in length}}{\text{original length}}$

Young modulus of elasticity = $\frac{\text{stress}}{\text{strain}}$

Work done = force x distance moved

Power = force x velocity

Work done = torque x angle turned

Power = torque x angular velocity

Pneumatic Systems

Force = pressure x area

Compression ratio = $\frac{\text{gauge pressure + atmospheric pressure}}{\text{atmospheric pressure}}$

Volume of air used = area x stroke x compression ratio

Lifting load = vacuum level x area