

National Electrical Engineering Quiz : 2008

University College Cork, Dublin Institute of Technology, Galway-Mayo Institute of Technology, Waterford Institute of Technology

Round 1 : General Knowledge

- [1] What is the capital city of Kenya?
- [2] Who is the author of the book on which the film of the same name, "Atonement", is based?
- [3] Who is the current Irish Minister for Communications, Energy and Natural Resources?
- [4] Who succeeded Donald Rumsfeld as US Secretary of Defense?
- [5] Name the creator of the Simpson's cartoon.
- [6] Bulgaria and Rumania joined the EU on January 1st, 2007. How many countries are now members of the EU?
- [7] What is the term of office of the President of Ireland?
- [8] What is the nominal mains frequency of the Irish electricity supply?

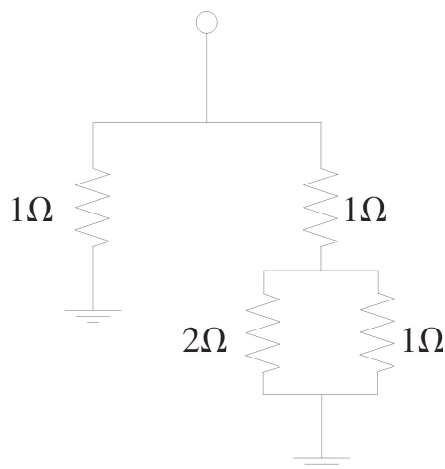
Round 2 : Maths Round

- [1] A multiple-choice exam has a marking scheme whereby a point is given for the correct answer but a point is deducted for an incorrect answer. A student answers all 100 questions in the exam and achieves an overall mark of 50. How many questions were correctly answered?
- [2] What is the log to base 100 of 0.01 decimal?
- [3] What are the two integer solutions to $x^2 - 2x = 15$?
- [4] How many different four-member teams can be formed from 7 students?
- [5] What is the value of $e^{-i\pi}$, where $i = \sqrt{-1}$?
- [6] The number 81 is divided into two integer parts. One part is a multiple of 8 and the other is a multiple of 5. What are the two parts?

- [7] A string of length L is formed into a circle by joining both ends. If the resultant area of the circle so formed is π square meters, what's the length of the string?
- [8] If $\log_{10} 2 \approx 0.3$ and $\log_{10} 3 \approx 0.477$, what is $\log_{10} 24$?

Round 3 : Science and Engineering

- [1] The specific heat capacity of a material is defined as the amount of energy required to increase the temperature of unit mass of the material by one degree. What are the SI units of specific heat capacity?
- [2] The braking distance for a car travelling at 60km/h on dry roads is 37.5 metres. Assuming uniform deceleration, how many seconds does the car take to stop?
- [3] A capacitor stores energy. Is the energy stored in the Electric field, the Magnetic field, or both?
- [4] At what point in its motion does a pendulum have its greatest acceleration?
- [5] A stretched string has a vibration frequency of 30 Hz, if the tension in the string is doubled, what is the new vibration frequency?
- [6] To dissipate 10 watts of AC power in a 5 ohm resistor, what amplitude should the sinusoidal current in the resistor have?
- [7] What is the total resistance of this circuit?



- [8] "A body immersed in a fluid is buoyed up by a force equal to the weight of the displaced fluid." Who is this principle named after?

Round 4 : Picture Round

- [1] Name this actor: -



- [2] Name this celebrity couple.



[3] Name this actress: -



[4] Name this lady?



[5] Name the rugby player at the top of this photo.



[6] Name this person: -



[7] Name the woman in this photograph: -

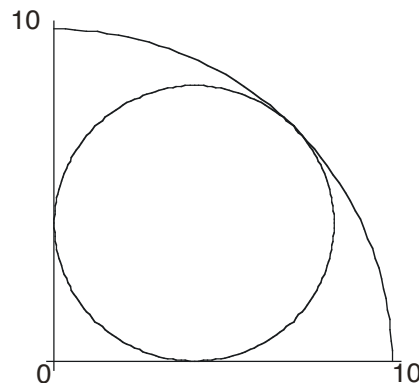


[8] Who is this cup holder?



Round 5 : Maths

- [1] As shown below, a circle is inscribed in a quadrant of a circle whose radius is 10cm. Find the radius of the inscribed circle.



- [2] Find the value of

$$\cos^2(0^\circ) + \cos^2(1^\circ) + \cos^2(89^\circ) + \cos^2(90^\circ)$$

where n° is n in degrees.

- [3] What is the remainder of: -

$$\frac{10^{46} + 4}{11} ?$$

- [4] A tangent to the curve $y = x^2$ has a slope of 45 degrees. Where does this tangent cut the y-axis?
- [5] A drawer contains 12 identical red socks, 10 identical blue socks, and 8 identical green socks. What is the minimum number of socks you would have to take out so that it is impossible for you not to have a matching pair?
- [6] What is the minimum value of x satisfying: -

$$4 + x^2 \leq 20.$$

- [7] If $y = x^x$, determine the value of $\frac{dy}{dx}$.

- [8] A series of numbers, beginning with 17, is both an arithmetic and a geometric progression. Find the sum of the first million terms of the series.

Round 6 : Science and Engineering

- [1] In astronomy, what is a supernova?
- [2] Who wrote “A Brief History of Time”?
- [3] What was the surname of the 1909 co-winner of the Nobel Prize in Physics, famous for having pioneered trans-Atlantic radio transmissions and who was of Irish/Italian extraction?
- [4] Who was the first person ever to win two Nobel prizes?
- [5] In communications applications, what is the term “wi-fi” a contraction of (i.e. short for)?
- [6] One kilogram of water at 100 degrees Celcius and one kilogram of ice at 0 degrees Celcius are mixed. When all the ice has liquefied, is the temperature of the final mixture (a) less than 20 degrees, (b) equal 50 degrees or (c) greater than 50 degrees?
- [7] Two identical pendulums, one located at the North pole and the other at the equator, oscillate with the same amplitude. Relative to the pendulum at the North pole, does the pendulum at the equator swing faster, slower, or at the same rate?
- [8] Name the world-famous electrical engineer, whose surname was that of an Irish river, who is generally credited with founding the science of information theory.

Round 7 : Maths Pictures

- [1] Evaluate: -

$$\lim_{x \rightarrow 1} \frac{x^3 + 2x^2 + x + 10}{x^3 + 3x^2 + x + 5}$$

- [2] Find the values of x and y if: -

$$\begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 56 \\ 12 \end{bmatrix}$$

- [3] Simplify the following as a polynomial:

$$\frac{x^4 + x^3 - x^2 + 1}{x + 1}$$

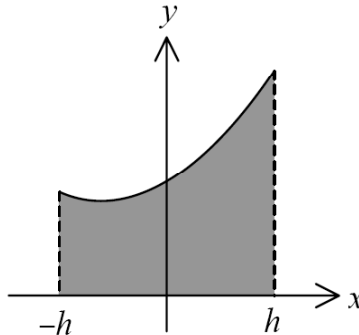
- [4] Determine the value of: -

$$\left(\sqrt[5]{169}\right)^{2.5}$$

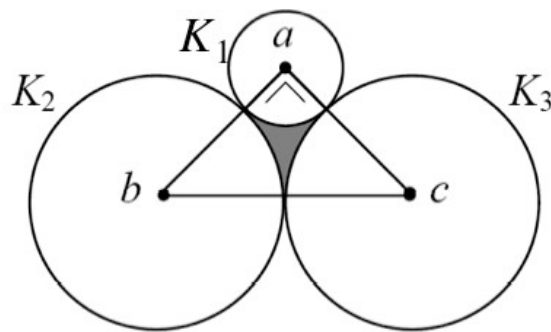
- [5] Which evaluates the smallest number; A, B or C?

$$A = \int_{-1}^1 5x^4 dx \quad B = \int_{-1}^1 6x^5 dx \quad C = \int_{-1}^1 7x^6 dx$$

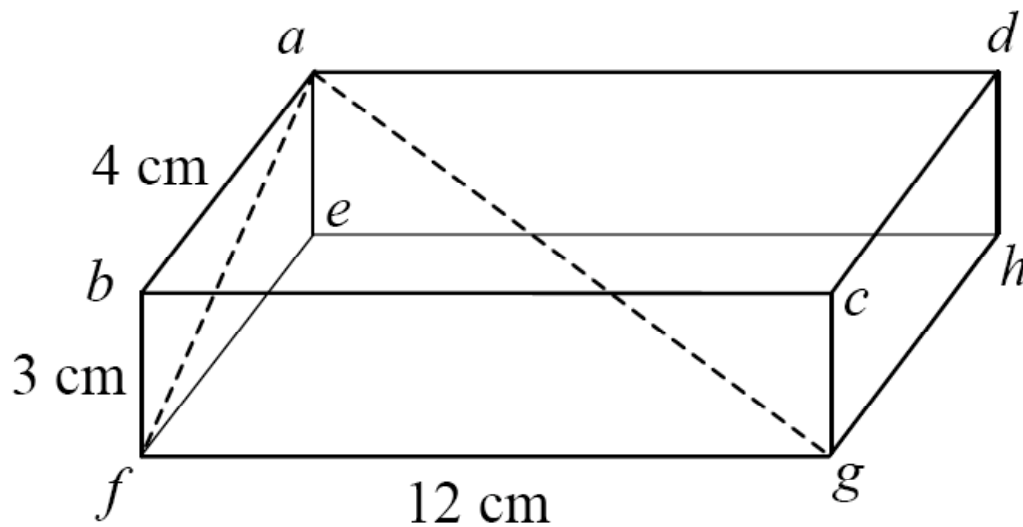
- [6] The graph of the function $y = ax^2 + bx + c$ from $x = -h$ to $x = +h$ is shown in the diagram. Calculate the area of the shaded portion.



- [7] a, b and c are the centres of circles K_1 , K_2 and K_3 respectively. The three circles touch externally and $ab \perp ac$. K_2 and K_3 each have radius $2\sqrt{2}$ cm. Find, in surd form, the length of the radius of K_1 .



- [8] The diagram shows a rectangular box. Rectangle abcd is the top of the box and rectangle efgh is the base of the box. Given $|ab| = 4$ cm, $|bf| = 3$ cm and $|fg| = 12$ cm, find $|ag|$.



Round 8 : General Knowledge

- [1] In the southern hemisphere how many months have 30 days?
- [2] Who was the first Irish woman to successfully trek to the South Pole?
- [3] Who released the keyboardless and mouseless “Surface” computer in 2007?
- [4] What is the surname of the Kenyan president whose recent re-election lead to a political and social crisis?
- [5] Which famous Hollywood star is married to Keith Urban?
- [6] Who plays the role of Ben Gates in “National Treasure: Book of Secrets” which topped the US and Canada box office charts in January 2008?
- [7] Which TV presenter in the BBC’s Top Gear show recently lost money after publishing his bank details in his newspaper column (to prove that no-one could access his funds!)?
- [8] How many times did Lance Armstrong win the Tour De France?

Round 1 : General Knowledge : Answers

- [1] Nairobi
- [2] Ian McEwan
- [3] Eamon Ryan
- [4] Robert Gates
- [5] Matt Groening
- [6] 27
- [7] 7 years
- [8] 50 Hz

Round 2 : Maths Round : Answers

- [1] 75
- [2] -1
- [3] 5 and -3
- [4] 35
- [5] -1
- [6] (56 and 25) or (16 and 65)
- [7] $2\pi m$
- [8] 1.377

Round 3 : Science and Engineering : Answers

- [1] $J/(kgK)$ or $J.kg^{-1}.K^{-1}$
- [2] 4.5 seconds
- [3] Electric Field
- [4] "at the extremities of its motion"
- [5] $30\sqrt{2} \text{ Hz} \approx 42.4\text{Hz}$
- [6] 2 Amps
- [7] $5/8 \text{ ohms} = 0.625 \text{ ohms}$
- [8] Archimedes

Round 4 : Picture Round : Answers

- [1] Kiefer Sutherland
- [2] Harrison Ford & Calista Flockhart
- [3] Teri Hatcher Of Desperate Housewives
- [4] Mary Hanafin (Minister for Science & Education)
- [5] Paul O'Connell
- [6] Kylie Minogue
- [7] Heroes Star Hayden Panettiere
- [8] Padraig Harrington

Round 5 : Maths : Answers

- [1] $\frac{10}{1+\sqrt{2}} cm \approx 4.142cm$
- [2] 2
- [3] 5
- [4] $y = -\frac{1}{4}$
- [5] 4
- [6] -4
- [7] $x^x(1 + \ln[x])$
- [8] 17,000,000

Round 6 : Science and Engineering : Answers

- [1] An exploding star
- [2] Stephen Hawking
- [3] Marconi
- [4] Marie Curie
- [5] wireless fidelity
- [6] less than 20 degrees
- [7] slower

[8] Claude Shannon

Round 7 : Maths Pictures : Answers

[1] 1.4

[2] $x=34, y=22$

[3] $x^3 - x + 1$

[4] 13

[5] B

[6] $\frac{2ah^3}{3} + 2hc$

[7] $2(2 - \sqrt{2})cm$

[8] 13cm

Round 8 : General Knowledge : Answers

[1] 11

[2] Dr Clare O'Leary

[3] Microsoft

[4] Kibaki

[5] Nicole Kidman

[6] Nicholas Cage

[7] Jeremy Clarkson

[8] 7