S6 APPLIED MATHS SPECIAL TEST TIME:1 HOUR 20 MINUTES

Use this time to test your speed and accuracy. You may not open you book before trying through the work. Thank you for the cooperation.

1. Forces of $8\mathbf{i} - 4\mathbf{j}\ N$, $4\mathbf{i}\ N$ and $-5\mathbf{i} - 20\mathbf{j}\ N$ act on a particle. Calculate the magnitude and direction of the resultant force. (Ans: 25N, $E\,73.74^0\,S$)

2. The table below shows values of x and the corresponding values of $f(x)$:

x	2.8	3.5	4.0	5.5
$f(x)$	7.4	8.8	9.2	11.2

Use linear interpolation or extrapolation to find;

(i) $f(3.0)$ (ii) $f^{-1}(12.2)$ (Ans: 7.8 , 4.75)

3. The lengths, in centimeters, of drinking straws produced by a factory have a normal distribution with mean μ and standard deviation σ. It is found out that 10% of the straws are shorter than 20 cm while 15% of the straws are longer than 30 cm. Find the values of μ and σ. (Ans: $\mu = 25.5307$, $\delta = 4.3141$)

4. Derive the simplest formula based on Newton Raphson's method for estimating the forth root of 15. Hence, taking the initial estimate to the root as 1.8, find the root correct to three decimal places. (Ans: $\frac{3x_n^4 + 15}{4x_n^3}$, 1.968)

5. A box of mass 20 kg is placed on a rough plane inclined at angle of 30^0. The coefficient of friction between the box and the plane is 0.4. Calculate the magnitude of the horizontal force P which is required to prevent the box from sliding down the plane. (Ans: 28.2391N)

6. A game involves throwing a pair of fair dice and the score is the sum of the numbers that show upper most. Rewards of \$25, \$30, \$80 and \$0 are given for scores of 7, 9, 10 and any other score not 7, 9 or 10. Determine the expected reward for a man who plays the game. (Ans: $\$14\frac{1}{6}$)

7. A string of length 170 cm is attached at its ends to two points at the same horizontal level, and 150 cm apart. The string carries a smooth ring of mass 3 kg.

   Given that a horizontal force F applied to the ring keeps the system in equilibrium with the angle between the sections of string being right angle, find the value of F and the tension in the string. (Take $g = 10ms^{-2}$)(Ans: F = 12.3529N, T=22.9412N)