

ENGINEERING TRIPOS PART IIA

**Module 3A3: FLUID MECHANICS II**

**ANSWERS**

1(b) (i) 0.974 (ii) 0.0473 (iii) 0.377

(c) (ii) 0.528 throat; 0.152 before shock; 0.608 after shock; 0.737 exit

2(b) (i) 0.459, 1.788 (ii) 0.0124, 0.0020

3(b) (ii) 10.4 kg/s

(c) (ii) 15.6 kg/s, 3.58 bar

4(a) (ii) 9.50, 9.65 (iii) 9.9%, 8.9%

5(a) (ii) 0.08%, 0.12%

6(a) (i) Second-order space; first-order time

(b)  $\frac{1}{2} \left( \frac{a\Delta t}{\Delta x} \right)^2$

7(b) (iv)  $-U_2^2$

8(b) 0.477

(c) 0.372

(d) 280 K, 0.908 bar, 117 m/s, 42.7 m/s

(e) 820 rad/s

(f) 1.23

(g) 0.551