KEY

Section 1: Algebra

1.1 a,b,c
1.2 Multiplicative group of non-zero reals.
1.3 Yes. Eg:(12345)(67)
1.4 12
1.5 1,3,5,7
1.6 b
1.7 a
1.8 1
1.9 $\mathbf{x}^T\mathbf{x} = 1$
1.10 a,c

Section 2: Analysis

2.1 2π
2.2 $\frac{\pi}{6}$
2.3 a,c
2.4 b,c
2.5 c
2.6 c
2.7 a,c
2.8 $f'(z) = u_x(x,y) + iv_x(x,y)$
2.9 $f(S) = \{u + iv : |u| < 1,\ v > 0\}$
2.10 1

Section 3: Topology

3.1 b,c
3.2 none
3.3 b
3.4 b
3.5 b,c
3.6 $\mathcal{C}[0,1]$
3.7 a,c
3.8 a,b
3.9 a
3.10 a,c

Section 4: Applied Mathematics

4.1 $t = 2$
4.2 $mx'' = mg - k(x')^2, x(0) = x'(0) = 0$
4.3 $v^2 = 2gy$
4.4 $\sigma_n = n\omega_n$
4.5 $x(t) = c_1e^{-3t} + c_2e^{2t}, y(t) = -4c_1e^{-3t} + c_2e^{2t}$
4.6 $4\pi^2$
4.7 $u(x,t) = \frac{1}{2}[f(x+t) + f(x-t)]$
4.8 $\frac{1}{2}$
4.9 $x_{n+1} = \frac{1}{2}\left(x_n + \frac{10}{x_n}\right)$
4.10 $F(s) = \frac{6}{s^4}$

Section 5: Miscellaneous

5.1 $4\sqrt{2}$
5.2 9
5.3 a,b,c
5.4 29
5.5 220
5.6 $\frac{1}{2} + i\frac{\sqrt{3}}{2}$
5.7 $n2^{n-1}$
5.8 Maximum $= \sqrt{14}$; Minimum $= -\sqrt{14}$
5.9 a,b,c
5.10 $\frac{1}{3}$

Note:
1. Accept any correct example for Qn. 1.3.
2. Accept any correct equivalent form of the answers for Qns. 2.8, 4.2, 4.3, 4.5 and 4.9.
3. If (c) is marked in Qn. 5.3, accept even if others are not marked.