TEZPUR UNIVERSITY
Assignment (Spring) 2018
~~Second~~ Mathematical Methods

MMS 401

Total Marks: 30

The figures in the right-hand margin indicate marks for the individual question.
All questions are compulsory.
Answers should be concise and entire answer to a question should be together. State assumptions wherever made.

1. Prove that if two linear functionals $\phi[h]$ and $\xi[h]$ defined on the same space vanish on the same set of elements then $\phi[h] = \lambda\xi[h]$, where λ is a constant. 6

2. Find the extremal for the following functionals. $2 \times 7 = 14$

   (a) $J[y] = \int_{x_1}^{x_2} \frac{1+y'^2}{y} dx$

   (b) $J[y,z] = \int_0^{\frac{\pi}{2}} \left[y'^2 + z'^2 + 2yz\right] dx$ subject to $y(0) = 0$, $y(\frac{\pi}{2}) = 1$, $z(0) = 0$, $z(\frac{\pi}{2}) = -1$

3. Prove the following $2 \times 5 = 10$

   (a) $\frac{d}{dx}\left(x^p I_p(x)\right) = x^p I_{p-1}(x)$

   (b) $xI_p'(x) = pI_p(x) + xI_{p+1}(x)$

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