Nepal college of information technology

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| Level: Bachelor | Semester – Spring | Year : 2013 |
| Programme: BE | | Full Marks : 100 |
| Course: Engineering Mathematics IV | | Time : 3hrs. |

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| *Candidates are required to give their answers in their own words as far as practicable.* |
| *The figures in the margin indicate full marks.* |
| Attempt all the questions. |

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| 1. | a. Define a harmonic function and its harmonic conjugate. Show that  u(x, y) = sinh x cosh y is harmonic and find corresponding analytic function.  b. State and prove Cauchy Integral Theorem and evaluate : | 8  7 |
| 2. | 1. Define pole and essential singularity of a function. State Cauchy Residue theorem and hence evaluate:   Where c : | z | = 4, counter-clockwise.  b). Expand in the series to the function in the regions :  a).  b) | 8  7 |
| 3. | 1. Derive the one dimensional wave equation. 2. A tightly stretched string with fixed end points x=0 and x=L is initially in a position given by . If it is released from the rest from this position, find the displacement. 7   4. a. Derive one dimensional heat equation. 8  b. An insulated rod of length L has its ends A and B maintained at  and  respectively until steady state condition prevails. If B is suddenly reduced to , find the temperature distribution at a distance x from A at any time t. | 8 |
| 5. | 1. Show that 2. Find the Fourier cosine transform of the function f(x) = e-mx  (m>0), hence show that   OR  Define Parseval’s Identity for Fourier sine transform. Find Fourier sine transform of f(x)= where x>0, hence show that | 8  7 |
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| 6. | 1. State the first shifting theorem for Z transformation and hence find   OR  Find the Z transform of  and then find  and   1. Find the z-transform of the following functions: 8. 2. 1 ii)  iii)  iv) n | 7 |
| 7. | Answer the following questions.   1. Using the method of separation of variable solve the partial differential equation 4 2. Find the real part of sinh z. 3. Define Fourier series. 4. Find the Z transform of Discrete Delta function. |  |