Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_\_

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**End Semester Examination – Nov/Dec – 2018**

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| **Code :** | **11MA209/ 12MA206/ MA247** | **Duration :** | **3hrs** |
| **Sub. Name :** | **FOURIER SERIES, TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS** | **Max. marks :** | **100** |

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| **Q. No.** | **Questions** | **Marks** |
| **PART-A(10X1=10 MARKS)** | | |
| 1. | State the Euler’s formulae when f(x) is expanded as a Fourier series in C < x < C + 2π. | 1 |
| 2. | The Fourier series of an even function contains \_\_\_\_\_\_\_\_\_\_. | 1 |
| 3. | If the number of constants to be eliminated is equal to the number of independent variables,  then the PDE is of second and higher order.( say True or False) | 1 |
| 4. | Find the particular integral of (D2 - DD′) z =e2x+y. | 1 |
| 5. | The complete integral of the equation z = px + qy + f(p,q) is \_\_\_\_\_\_\_\_\_\_\_. | 1 |
| 6. | How many boundary conditions are required to solve . | 1 |
| 7. | Write down the partial differential equation that represents variable neat flow in two dimensions. | 1 |
| 8. | Write the two dimensional Laplace equation in polar coordinates. | 1 |
| 9. | Prove that the Fourier transform is linear. | 1 |
| 10. | Define Fourier sine transform of f(x). | 1 |

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| **PART B(5 X 3= 15 MARKS)** | | |
| 11. | Find an for a periodic function f(x) = x – x2 in 0 < x < 2. | 3 |
| 12. | Form the PDE by eliminating the arbitrary constants from | 3 |
| 13. | Express the boundary conditions mathematically : The semi-infinite strip, 0< x < L whose edge y = 0 is kept at temperature k x ( L – x ) and all the other edges are insulated. | 3 |
| 14. | Write all the three possible solutions of laplace’s equation in Cartesian co-ordinate. | 3 |
| 15. | Find the finite Fourier Cosine transform of f(x) = x2 in (0, ) | 3 |

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| **PART C(5 X 15= 75 MARKS)** | | | |
| 16. | a. | If f(x) = kx for 0 < x <  = k (-x) for < x <  Show that in the range (0, ) | 7 |
| b. | Find the Fourier series upto the third harmonic for y = f(x) in (0, 2π) defined by the table of values given below.  x : 0   π   2π  y : 1 1.4 1.9 1.7 1.5 1.2 1.0 | 8 |
| (OR) | | | |
| 17. | a. | Find the fourier series for f(x) = x2  in (- π, π ) ,hence  show that | 8 |
| b. | Expand x( π – x) as a sine series in (0, π ), hence show that | 7 |
| 18. | a. | Solve (y – z) p – (2x +y) q = 2x + z. | 8 |
| b. | Solve completely the P.D.E | 7 |
| (OR) | | | |
| 19. | a. | Solve | 8 |
| b. | Solve z = p2 + q2 | 7 |
| 20. |  | A tightly stretched string with fixed end points. x = 0 and x =  is initially at rest in its equilibrium position. If it is set vibrating giving each point a velocity . Find the displacement. | 15 |
| (OR) | | | |
| 21. |  | The ends A and B of a rod 10cm long have the temperatures 20C and 40C until steady state prevails. The temperature at A is suddenly raised to 50C and at the same time that at B is lowered to 10C. Find the temperature distribution in the rod at any time t. | 15 |
| 22. |  | An infinitely long rectangular plate with insulated surfaces is 10cm wide. The two long edges and one short edge are kept at zero temperature, while the other short edge x = 0 is kept at temperature given by  u = 20 y for 0 ≤ y ≤ 5  = 20 (10 – y ) for 5 ≤ y ≤ 10  Find the steady stare temperature at any point in the plate. | 15 |
| (OR) | | | |
| 23. |  | Determine the steady state temperature in a semi circular plate of radius ‘ b’ cm with insulated faces. The bounding diameter is kept at 0 o C and the temperature on the circumference is k θ ( π - θ ) when 0 < θ < π . | 15 |
| 24. | a. | Find the fourier transform of f(x) if  ,  hence show that | 8 |
| b. | Find the inverse Fourier transform of s – 1 e – as . | 7 |
| (OR) | | | |
| 25. | a. | Find the fourier transform of  , hence prove  that | 8 |
| b. | Evaluate  using fourier transform. | 7 |