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



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **14MA2002** | **Duration :** | **3hrs** |
| **Sub. Name :** | **FOURIER SERIES AND APPLICATIONS** | **Max. Marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. |  | | Find the Fourier series for f(x) = x2  in (- π, π ), hence show that | CO1 | 20 |
| **(OR)** | | | | | |
| 2. |  | In -π < x < π, express sin h(ax) and cos h(ax) in Fourier series of periodicity 2π. | | CO1 | 20 |
|  |  |  | |  |  |
| 3. | a. | Find half range Fourier cosine series for f(x) = x(- x) in 0<x<. | | CO1 | 10 |
| b. | Compute the first two harmonics of the Fourier series of f(x) given in following table.   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | x | 0 | /3 | 2/3 |  | 4/3 | 5/3 | 2 | | f(x) | 1.0 | 1.4 | 1.9 | 1.7 | 1.5 | 1.2 | 1.0 | | | CO1 | 10 |
| **(OR)** | | | | | |
| 4. | a. | | Expand x( π – x) as a sine series in (0, π), hence show that | CO1 | 10 |
| b. | | Find the complex form of the Fourier series of f(x) = in -1 ≤ x ≤ 1. | CO1 | 10 |
|  |  | |  |  |  |
| 5. |  | | 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 3x ( - x). Find the displacement. | CO2 | 20 |
| **(OR)** | | | | | |
| 6. |  | | A tightly stretched string with fixed end points x=0 and  is initially in a position given by y (x,0) = y0 sin3 (). If it is released from rest from this position, find the displacement y at any time and at any distance from the end x = 0. | CO2 | 20 |
|  |  | |  |  |  |
| 7. |  | | A rod 30cm long has ends A and B kept at 200c and 800 C respectively, until steady state conditions prevail. The temperature at each end is then suddenly reduced to 00 C and kept so. Find the resulting temperature function u(x,t) taking x= 0 at A. | CO3 | 20 |
| **(OR)** | | | | | |
| 8. |  | | The ends A and B of a rod ‘’ cm long have the temperatures 40°C and 90°C until steady state prevails. The temperature at A is suddenly raised to 90°C and at the same time at B is lowered to 40°C. Find the temperature distribution in the rod at time ‘t’. | CO3 | 20 |
|  | | | **Compulsory**: |  |  |
| 9. |  | | A rectangular plate with insulated surface is 10cm wide and so long compared to its width that it may be considered infinite length without introducing appreciable error. If the temperature at short edge y=0 is given by  u =20x , for 0  = 20(10-x) , for 5  and all the other three edges are kept at 00 C. Find the steady state temperature at any point of the plate. | CO3 | 20 |