

Mansoura University	Mathematics (4)	Tuesday, 12/11/2019	
Faculty of Engineering	MTH102	Time allowed: 45 min.	
BME (Level 100)	Midterm Exam	Full Mark: 20 marks	
الاسم (باللغة العربية):			

Answer the following questions

(1) [6 marks] Find the Fourier series for the function

$$f(x) = x, \quad 0 < x < 4 \quad \text{and} \quad f(x+4) = f(x).$$

(2) [8 marks] Solve the wave equation

$$u_{tt} = u_{xx}, \quad 0 < x < \pi, \quad t > 0,$$

$$u(0, t) = u(\pi, t) = 0,$$

$$u(x, 0) = 1, \quad u_t(x, 0) = 0.$$

(3) [6 marks] Find the steady-state solution  $v(x)$  for the heat equation

$$u_t = u_{xx} + 2, \quad 0 < x < 2, \quad t > 0$$

$$u(0, t) = 2, \quad u(2, t) = 6 \quad \text{and} \quad u(x, 0) = f(x).$$

With my best wishes

Dr. Mustafa El-Agamy

---