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Teórica (UEG). [MMF3-B:2007-8]

TEMA 3: Ecuaciones en derivadas parciales *

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Resolver las EDP siguientes:

1. //Oteo//

| | |
|-----|---|
| EDP | $u_t = u_{xx}$ |
| CC | $u(0, t) = 0 \quad (0 < t < \infty)$ $u(1, t) = 0$ |
| CI | $u(x, 0) = 1 \quad (0 < x < 1)$ |

2. //Oteo//

| | |
|-----|---|
| EDP | $u_t = u_{xx}$ |
| CC | $u(0, t) = 0 \quad (0 < t < \infty)$ $u(1, t) = 0$ |
| CI | $u(x, 0) = x^2 - x \quad (0 < x < 1)$ |

3. //Oteo//

| | |
|-----|---|
| EDP | $u_{tt} = u_{xx}$ |
| CC | $u(0, t) = 0 \quad (0 < t < \infty)$ $u(L, t) = 0$ |
| CI | $u(x, 0) = \sin(3\pi x/L) \quad (0 < x < L)$ $u_t(x, 0) = (3\pi\alpha/L) \sin(3\pi x/L)$ |

4. //Oteo// Problema de la cuerda de guitarra vibrando

| | |
|-----|--|
| EDP | $u_{tt} = u_{xx}$ |
| CC | $u(0, t) = 0 \quad (0 < t < \infty)$ $u(1, t) = 0 \quad (0 < x < 1)$ |
| CI | $u(x, 0) = \begin{cases} 2hx & x \leq 1/2 \\ 2h(1-x) & 1/2 < x \leq 1 \end{cases}$ $u_t(x, 0) = 0 \quad h : cte.$ |

5. //Javier [Mireia]//

| | |
|-----|---|
| EDP | $u_t = \alpha^2 u_{xx}$ |
| CC | $u(0, t) = 300 \quad (0 < t < \infty)$ $u(L, t) = 200$ |
| CI | $u(x, 0) = \exp(-x) - x + 300 \quad (0 < x < L)$ |

6. //Pablo [Noelia]//

| | |
|-----|---|
| EDP | $u_{tt} = \frac{1}{4} u_{xx}$ |
| CI | $u(x, 0) = x^2 \quad (-\infty < x < \infty)$ $u_t(x, 0) = \tan x \quad (0 < t < \infty)$ |

*Preguntas y soluciones contrastadas por [...]

7. //Mireia [Javier]//

| | |
|-----|---|
| EDP | $u_t = 4u_{xx}$ |
| CC | $u(0, t) = 0 \quad (0 < t < \infty)$ $u(1, t) = e$ |
| CI | $u(x, 0) = x \exp(x) \quad (0 < x < 1)$ |

8. //José Alfonso [Ignacio]// ... y dibujar la solución en el intervalo $[0, L]$

| | |
|-----|---|
| EDP | $u_{tt} = (2L/3T)u_{xx}$ |
| CI | $u(x, 0) = A \sin(2\pi x/L) \quad (-\infty < x < \infty)$ $u_t(x, 0) = 0 \quad (0 < t < \infty)$ |

9. //José Alfonso [Ignacio]// ... y dibujar la solución para $c = 1$

| | |
|-----|---|
| EDP | $u_{tt} = c^2 u_{xx}$ |
| CI | $u(x, 0) = \exp(-x^2) \quad (-\infty < x < \infty)$ $u_t(x, 0) = 4x \exp(-x^2) \quad (0 < t < \infty)$ |

10. //Carmina [Celia]//

| | |
|-----|---|
| EDP | $u_{tt} = c^2 u_{xx}$ |
| CI | $u(x, 0) = 0 \quad (-\infty < x < \infty)$ $u_t(x, 0) = \sin \pi x \quad (0 < t < \infty)$ |

11. //Celia [Carmina]//

| | |
|-----|---|
| EDP | $u_t = u_{xx}$ |
| CC | $u(0, t) = 0 \quad (0 < t < \infty)$ $u(1, t) = 2$ |
| CI | $u(x, 0) = \sin \pi x + 2x \quad (0 < x < 1)$ |

12. //Héctor [Adrián]//

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|-----|---|
| EDP | $u_{tt} = (\pi^2/4)u_{xx}$ |
| CI | $u(x, 0) = \sin 2x \quad (-\infty < x < \infty)$ $u_t(x, 0) = x \cos(2x^2) \quad (0 < t < \infty)$ |

13. //Adrián [Héctor]//

| | |
|-----|--|
| EDP | $u_{tt} = c^2 u_{xx}$ |
| CI | $u(x, 0) = \sin x \quad (-\infty < x < \infty)$ $u_t(x, 0) = \sin x \quad (0 < t < \infty)$ |

14. //Bernat [Carlos R.]//

| | |
|-----|--|
| EDP | $u_{tt} = 4u_{xx}$ |
| CI | $u(x, 0) = \cos x \quad (-\infty < x < \infty)$ $u_t(x, 0) = r \sin x \quad (0 < t < \infty), r : cte.$ |

15. //Miguel [Sergio]//

| | |
|-----|---|
| EDP | $u_{tt} = c^2 u_{xx}$ |
| CI | $u(x, 0) = \exp(-x/c) \quad (-\infty < x < \infty)$ $u_t(x, 0) = \exp(x/c) \quad (0 < t < \infty)$ |

16. //Sergio [Miguel]//

| | |
|-----|---|
| EDP | $u_{tt} = u_{xx}$ |
| CI | $u(x, 0) = 0 \quad (-\infty < x < \infty)$ $u_t(x, 0) = \cos \pi x \quad (0 < t < \infty)$ |

17. //María [Luis]//

| | |
|-----|--|
| EDP | $u_{tt} = c^2 u_{xx}$ |
| CI | $u(x, 0) = 0 \quad (-\infty < x < \infty)$ $u_t(x, 0) = -\tan x \quad (0 < t < \infty)$ |

18. //Luis [María]//

| | |
|-----|--|
| EDP | $u_{tt} = c^2 u_{xx}$ |
| CI | $u(x, 0) = 0 \quad (-\infty < x < \infty)$ $u_t(x, 0) = x \ln x \quad (0 < t < \infty)$ |

19. //Paloma [Carlos A.]//

| | |
|-----|--|
| EDP | $u_{tt} = 4u_{xx}$ |
| CI | $u(x, 0) = 0 \quad (-\infty < x < \infty)$ $u_t(x, 0) = 1/(1 + x^2) \quad (0 < t < \infty)$ |

20. //carlos A. [Paloma]//

| | |
|-----|--|
| EDP | $u_{tt} = (1/4)u_{xx}$ |
| CI | $u(x, 0) = 0 \quad (-\infty < x < \infty)$ $u_t(x, 0) = 1 - x^2 \quad (0 < t < \infty)$ |

21. //Teresa [Fran]//

| | |
|-----|---|
| EDP | $u_t = \alpha^2 u_{xx}$ |
| CC | $u(0, t) = 0 \quad (0 < t < \infty)$ $u(1, t) = 0$ |
| CI | $u(x, 0) = x^2 \quad (0 < x < 1)$ |

22. //Carlos R. [Luis B.]//

| | |
|-----|---|
| EDP | $u_t = \alpha^2 u_{xx}$ |
| CC | $u(0, t) = 0 \quad (0 < t < \infty)$ $u(1, t) = 0$ |
| CI | $u(x, 0) = x + x^2 \quad (0 < x < 1)$ |

23. //Luis B. [Carlos R.]//

| | |
|-----|---|
| EDP | $u_t = \pi u_{xx}$ |
| CC | $u(0, t) = 0 \quad (0 < t < \infty)$ $u(4, t) = 0$ |
| CI | $u(x, 0) = \exp[-(x - 1)^2] + \exp[-(x - 3)^2] \quad (0 < x < 4)$ |