M.E. First Semester (Mechanical Engg. (Thermal Engg.)) (New-CGS)
13505 : Advanced Mathematics - III
1 MTE 1

P. Pages : 2

Time : Three Hours

AW - 3799

Max. Marks : 80

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Notes :
1. All question carry equal marks.
2. Answer **two** question from Section A and **two** question from Section B.
3. Assume suitable data wherever necessary.
4. Use of slide rule logarithmic tables, calculators, normal table is permitted.
5. Figures to right indicate full marks.
6. Use of pen Blue/Black ink/refill only for writing the answer book.

SECTION - A

1. a) Solve $\dfrac{\partial^3 z}{\partial x^3} - 2\dfrac{\partial^3 z}{\partial x^2 \partial y} = 2e^{2x} + 3x^2 y$ **6**

   b) Solve $r + 2s + t = 2(y - x) + \sin(x - y)$ **6**

   c) Solve $(D^2 - 6DD' + 9D'^2)z = 12x^2 + 36xy$ **8**

2. a) Solve the equation $\dfrac{\partial^2 z}{\partial x^2} - 2\dfrac{\partial z}{\partial x} + \dfrac{\partial z}{\partial y} = 0$ by the method of separation of variables.   **7**

   b) Solve the equation $\dfrac{\partial^2 u}{\partial x \partial t} = e^{-t}\cos x$ given that $u = 0$ when $t = 0$ and $\dfrac{\partial u}{\partial t} = 0$ when $x = 0$.   **7**

   c) Solve $\dfrac{\partial^2 z}{\partial x^2} + 2\dfrac{\partial^2 z}{\partial x \partial y} + \dfrac{\partial^2 z}{\partial y^2} = x^2 + xy + y^2$ **6**

3. a) Obtain the solution of the equation $\dfrac{\partial^2 z}{\partial x \partial y} = \sin x \sin y$ for which   **8**

   $\dfrac{\partial z}{\partial y} = -2\sin y$ when $x = 0$ and $z = 0$ when y is an odd multiple of $\pi/2$.

   b) Solve $\dfrac{\partial^2 u}{\partial x^2} + \dfrac{\partial^2 u}{\partial y^2} = 0$ which satisfies the conditions $u(0, y) = u(\ell, y) = u(x, 0) = 0$ and   **12**

   $u(x, a) = \sin\dfrac{n\pi x}{\ell}$

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SECTION - B

4. **a)** By the method of least squares find the straight line that best fits the given data. **6**

x	1	2	3	4	5
y	14	27	40	55	68

b) In a partially destroyed laboratory record of an analysis of a correlation data, the following results only are available : variance of x = 9 **8**

Regression equations $8x - 10y + 66 = 0$, $44x - 18y = 214$

what were (a) the mean values of x and y (b) standard deviation of y and (c) the coefficient of correlation between x and y.

c) The probability that a managed 60 will live to be 70 is 0.65. What is the probability that out of ten men now 60, atleast 7 would live to be 70 ? **6**

5. **a)** Use Newton's divided difference formula to find f(x) from the following data. **10**

x	0	1	2	4	5	6
f(x)	1	14	15	5	6	19

b) Apply Lagrange's formula to find f(x) from the data. **10**

x	0	1	4	5
f(x)	4	3	24	39

6. **a)** Use the Runge - Kutta fourth order method to find y(0.2) with h = 0.1 for the initial value problem $\frac{dy}{dx} = \sqrt{x+y}$, $y(0) = 1$. **10**

b) Apply Milne's method, to find a solution of the differential equation $\frac{dy}{dx} = x - y^2$ in the range $0 \le x \le 1$ for the boundary condition $y = 0$ at $x = 0$. **10**

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