Code No. : 13303

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD
B.E. (CBCS) III-Semester Main Examinations, December-2017
Partial Differential Equations & Numerical Methods

Time: 3 hours   Max. Marks: 70

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Part-A (10 × 2=20 Marks)

1. Express $f(x) = x$ as a Fourier series in the interval $-\pi < x < \pi$
2. Write Dirichlet's conditions.
3. Obtain the Partial differential equation by eliminating the arbitrary function f from $f(x + yz, x^2 + y^2 - z^2) = 0$
4. Find the complete integral of $p^2q^2(px + qy - z) = 2$
5. Use Method of separation of variables to solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$ where $u(x, 0) = 6e^{-3x}$
6. Write one –dimensional Heat equation
7. Find a real root of the equation $x^3 - 5x + 1 = 0$ using Bisection method.
8. Evaluate $\Delta tan^{-1}x$
9. Fit a straight line $y = a + bx$ for the following data.

x	0	1	3	6	8
y	1	3	2	5	4

10. If two regression lines are $3x + 2y = 26$ and $6x + y = 31$.then find the mean values and the correlation coefficient between x and y

Part-B (5 × 10 = 50 Marks)

11. a) Obtain the Fourier series for $f(x) = e^{-x}$ in the interval $0 < x < 2\pi$ [5]

    b) Find the Fourier series expansion for $f(x) = \begin{cases} -\pi, -\pi < x < 0 \\ x, \quad 0 < x < \pi \end{cases}$ [5]

    Hence show that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + ----- = \frac{\pi^2}{8}$

12. a) Solve $6yz - 6pxy - 3qy^2 + pq = 0$ by Charpit's method.   [5]

    b) Solve $(x + y^2)p + yq = z + x^2$.   [5]

13. a) A tightly stretched string of length l with fixed ends is initially in equilibrium Position. [6]
       It is set vibrating by giving each point a velocity $v_0 sin^3 \frac{\pi x}{l}$. Find the displacement $y(x, t)$

    b) Find the solution of Laplace equation by the Method of separation of variables.   [4]

14. a) Apply Runge-Kutta Fourth order method to find an approximate value of y for $x = 0.2$ [6]
       insteps of 0.1. If $\frac{dy}{dx} = x + y^2$ given that $y(0) = 1$

    b) Find the cubic polynomial for the following data.   [4]

X:	0	1	2	3
Y:	1	2	1	10

15. a) Obtain the regression line y on x for the following data.   [5]

X:	1	2	3	4	5
Y:	2	5	3	8	7

     b) If θ is the acute angle between the two regression lines then show that: [5]

$$tan\theta = \frac{1-r^2}{r}\frac{\sigma_x\sigma_y}{\sigma_x{}^2+\sigma_y{}^2}$$

     Explain the significance when $r = 0$

16. a) Obtain the Fourier half- range cosine series for $f(x) = x sinx$ in the interval   [5]
$0 < x < \pi$

     b) Find the complete integral of $\sqrt{p} + \sqrt{q} = 2x^2 + y$ [5]

17. Answer any *two* of the following:

     a) Use the Lagrange's interpolation formula to find the value of y when $x = 10$ for the   [5]
following data.

X:	5	6	9	11
Y:	12	13	14	16

     b) Derive the normal equations by the method of least squares for the straight line   [5]
$y = a + bx$

     c) Solve one dimensional heat equation by variables separable method.   [5]

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