Hall Ticket Number:

Code No.: 21214 S

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. II Year (E.E.E.) I-Semester Supplementary Examinations, May/June-2017

Partial Differential Equations and Numerical Methods

Time: 3 hours   Max. Marks: 70

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

Part-A (10 X 2=20 Marks)

1. Find the value of b_1 for the Fourier series $f(x) = \frac{1}{4}(\pi - x)^2, 0 < x < 2\pi$
2. Define Dirichlet's Conditions.
3. Form PDE by the elimination of arbitrary constants for the following equation $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$
4. Solve $(y-z)p + (x-y)q = z-x$
5. Solve the equation $\frac{\partial^2 z}{\partial x^2}-2\frac{\partial z}{\partial x}+\frac{\partial z}{\partial y}=0$ by the method of separation of variables.
6. Show that $u = x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$ is a solution of Laplace equation.
7. State Lagrange's formula for unequal intervals.
8. Write Regula-Falsi iteration formula to find a root of the equation.
9. Prove that $z\{\cos n\theta\} = \frac{z(z-\cos\theta)}{z^2-2z\cos\theta+1}$ if $|z|>1$
10. Write the linear property of Z-transforms.

Part-B (5 × 10 = 50 Marks)
(All bits carry equal marks)

11. a) Find the Fourier series to represent the function f(x) given by

$$f(x)=\begin{cases} x, & 0 \le x \le \pi \\ 2\pi - x, & \pi \le x \le 2\pi \end{cases}$$

b) Find the fourier series for the function $f(x) = x - x^2, -1 < x < 1$

12. a) Solve $z^2(p^2 + q^2 + 1) = a^2$

b) Solve $2zx - px^2 - 2qxy + pq = 0$ by Charpit's method.

13. a) A tightly stretched string with fixed end points $x = 0$ and $x = \ell$ initially in a position given by $y = y_0 \sin^3(\pi x/\ell)$ If it is released from rest from this position. Find the displacement y(x, t).

b) Solve the equation $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2}$ with boundary conditions $u(x, 0) = 3\sin(n\pi x/\ell)$, $u(0, t) = 0$, $u(\ell, t) = 0$ where $0 < x < \ell$, $t > 0$

Contd...2

14. a) Find the first, second and third derivatives of the function tabulated below at the point x = 1.5

X:	1.5	2.0	2.5	3.0	3.5	4.0
F(x)	3.375	7.0	13.625	24.0	38.875	59.0

b) Use Runge–Kutta method of 4th order to find y when x = 1.2 in steps of 0.1 given that $\frac{dy}{dx} = x^2 + y^2$ and y(1) = 1.5

15. a) Find the inverse Z – Transform of $\frac{z^2+2z}{(z-1)(z-2)(z-3)}$

b) Solve the difference equation $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$ given $y_0 = y_1 = 0$

16. a) Expand $\pi x - x^2$ in a half range sine series in the interval $(0, \pi)$

b) Solve $p^2 - q^2 = x - y$

17. Answer any two of the following:

a) Solve the Heat equation $\left(\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}\right)$ using method of separation of variables.

b) Describe the procedure for obtaining first and second derivative of a function by Numerical methods.

c) State and prove convolution theorem for Z-transforms.

****