V Sem 2013

M 4443

BSc

Reg. No. : ....

Name : ....

V Semester B.A./B.Sc./B.Com./B.B.A./B.B.A. T.T.M./B.B.M./B.C.A./B.S.W./
B.A. Afsal-Ul-ulama Degree (CCSS – Reg./Supple./Imp.)
Examination, November 2013
Core Course in Mathematics
5B09 MAT – Differential Equations and Numerical Analysis

Time : 3 Hours | Max. Weightage : 30

1. Fill in the blanks : **(Weightage 1)**

   a) The general solution of $y'' + y = 0$ is _________

   b) If y_1 (x) and y_2 (x) are two solutions of the equation $y'' + P(x)y' + Q(x)y = 0$ on [a, b] then they are linearly dependent on this interval if Wronskian is _________

   c) The characteristic equation of $y'' - y' - 6y = 0$ is _________

   d) Consider the non homogeneous equation $y'' + py' + qy = R(x)$, where $R(x) = e^{ax}$. Then if a is not a root of the auxiliary equation, the particular solution is _________

Answer **any six** from the following (Weightage **1 each**) :

2. Check whether the equation (sinx tany + 1) dx + cosec^2ydy = 0 is exact and if so solve it.

3. Solve $(x - 4)\, y^4 dx - x^3 (y^2 - 3)\, dy = 0$.

4. Solve $x^2y'' + 2xy' - 12y = 0$.

5. Solve $y'' - 2y' + 12x - 10$.

6. What are assumptions in the derivation of one dimensional wave equation ?

7. How many initial and boundary conditions are required to solve one – dimensional heat flow equation ? If time derivative is zero, what will be its solution ?

P.T.O.

8. Explain the Picard's method of successive approximation.

9. Using Newton Raphson method, find the root of the equation $x + \log_{10} x = 3.375$ correct to four significant figures.

10. Find a solution of $x^3 + x - 1 = 0$ by iteration.

Answer **any seven** from the following (Weightage **2 each**)

11. Solve $(2x^2y^2 + y)\,dx + (3x - x^3y)\,dy = 0$.

12. Solve $\cos(x + y)dy = dx$.

13. Solve $(1+x)^2\frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = \sin 2[\log(1+x)]$.

14. Show that $y = C_1x + C_2x^2$ is the general solution of $x^2y'' - 2xy' + 2y = 0$ on any interval not containing zero and find the solution for which $y(1) = 3$ and $y'(1) = 5$.

15. Find the general solution of $y'' - 2y' + 5y = 25x^2 + 12$.

16. Using method of separation of variables, solve the equation $4\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 3u$ subject to $u = 3e^{-y} - e^{-5y}$ when $x = 0$.

17. If a string of length $4l$ is initially at rest in its equilibrium position and each of its points is given initial velocity V where $V = \frac{cx}{l}$ in $0 < x < 2l$

$$= \frac{c}{l}(4l - x) \text{ in } 2l < x < 4l.$$

Find the displacement of the string at any time.

18. Solve the system of equations $3x + y - z = 3$; $2x - 8y + z = -5$; $x - 2y + 9z = 8$ using Gauss elimination method.

19. The following table gives corresponding values of x and y. From the difference table express y as function of x :

x	:	0	1	2	3	4
y	:	3	6	11	18	27

20. Using Picard's method, find a solution of $\frac{dy}{dx} = 2x(1+y)$ upto fourth approximation, when $y(0) = 0$.

Answer **any three** from the following (Weightage **3 each**) :

21. Solve $3e^x \tan y dx + (1 + e^x) \sec^2 y dy = 0$, given $y = \frac{\pi}{4}$ when $x = 0$.

22. Solve $\cos (x + y)\, dy = dx$.

23. Find a particular solution of $y'' - y' - 6y = e^{-x}$, first by undetermined coefficients and then by variation of parameters.

24. Given $y' = x^2 - y$, $y(0) = 1$, find $y(0.1)$, $y(0.2)$ using Runge-Kutta method of fourth order.

25. Using Taylor series method solve $\frac{dy}{dx} = x^2 - y$, $y(0) = 1$ at $x = 0.1, 0.2, 0.3$ and 0.4.
