Name:..... Application ID:.....

Set-2

Bangabasi Evening College

Department of Mathematics

PG Admission Test-2015

(Notations and Symbols have their usual meanings)

All Questions are compulsory *25X2=50*

1. Let f(t) be a function that piecewise continuous on every finite interval in the range $t \geq 0$ and satisfies $|f(t)| \leq Me^{-kt}$ for all $t \geq 0$ and some constant k& M. Then Laplace Transform of f(t) exists for all

(a) $\Re e(s) > k$ (b) $\Re e(s) < k$ (c) $\Re e(s) = k$ (d) None of these

2. For $0 \leq t < \infty$ the maximum value of the function $f(t) = e^{-t} - 2e^{-2t}$ occurs at

(a) $t = \log_e 4$ (b) $t = \log_e 2$ (c) $t = 0$ (d) $t = \log_e 8$

3. The system of linear equations

$$\begin{pmatrix} 2 & 1 & 3 \\ 3 & 0 & 1 \\ 1 & 2 & 5 \end{pmatrix} \begin{pmatrix} p \\ q \\ r \end{pmatrix} = \begin{pmatrix} 5 \\ -4 \\ 14 \end{pmatrix} \text{ has}$$

(a) A unique solution

(b) Infinitely many solutions

(c) No solution

(d) Exactly two solutions

4. The real part of an analytic function $f(z)$ where $z = x + iy$ is given by $e^{-y}\cos x$. The imaginary part of $f(z)$ is

(a) $e^{y}\cos x$ (b) $e^{-y}\sin x$ (c) $-e^{x}\sin x$ (d) $-e^{-y}\sin x$

5. The maximum value of the determinant among all 2×2 real symmetric matrices with trace 14 is

(a) 50 (b) 1 (c) 49 (d) 0

6. Which one of the following statements is NOT true for a square matrix?

(a) If A is upper triangular, the eigenvalues of A are the diagonal elements of it

(b) If A is real symmetric, the eigenvalues of A are always real and positive

(c) If A is real, the eigenvalues of A and A' are always the same

(d) If all the principal minors of A are positive, all the eigenvalues of A are also positive

7. Critical damping is the

(a) Largest amount of damping for which no oscillation occurs in free vibration

(b) Smallest amount of damping for which no oscillation occurs in free vibration

(c) Largest amount of damping for which the motion is simple harmonic in free vibration

(d) Smallest amount of damping for which the motion is simple harmonic in free vibration

8. The integral $\oint_C (ydx - xdy)$ is evaluated along the circle $x^2 + y^2 = \frac{1}{4}$ traversed in counter clockwise direction. The integral is equal to

(a) 0 (b) $-\pi/4$ (c) $-\pi/2$ (d) $\pi/4$

9. Consider a spatial curve in three-dimensional space given in parametric form by $x(t) = \cos t,\ y(t) = \sin t,\ z(t) = \frac{2}{\pi}t,\ 0 \le t \le \frac{\pi}{2}$. The length of the curve is

(a) 1.8622 (b) 1.7622 (c) 1.6622 (d) 1

10. $S = \{\frac{1}{m} + \frac{1}{n} : m, n \in \mathrm{N}\}$ Then derived set of S is

(a) $\{0\} \cup \{\frac{1}{k} : k \in \mathrm{N}\}$

(b) Only $\{0\}$

(c) Only $\{\frac{1}{k} : k \in \mathrm{N}\}$

(d) No point of S is a limit point

11. The set $U = \{x \in \Re : \sin x = \frac{1}{2}\}$ is

(a) Open (b) Closed (c) Both (a) and (b) (d) Neither open nor closed

12. A function $f : [a,b] \to \Re$ is bounded variation. Then

a) Necessarily f is continuous

(b) Necessarily f is bounded

(c) f satisfies Lipschitz condition

(d) None of these

13. $\sum_{n=1}^{\infty} x_n$ be a convergent series of positive terms then $\sum_{n=1}^{\infty} \frac{x_n}{1+x_n}$ is

(a) Convergent

(b) Divergent

(c) Convergent but conditionally

(d) Absolutely convergent

14. Which of the following condition does NOT ensure the convergence of a real sequence $\{a_n\}$?

(a) $|a_n - a_{n+1}| \to 0$ as $n \to \infty$

(b) $\sum_{n=1}^{\infty} |a_n - a_{n+1}|$ is convergent

(c) $\sum_{n=1}^{\infty} n a_n$ is convergent

(d) The sequence $\{a_n\}$, $\{a_{2n+1}\}$ and $\{a_{3n}\}$ are convergent

15. Let $f(x) = \sin \frac{1}{x}, x \neq 0$. Then f(x) can be continuous at $x = 0$

(a) If $f(0) = 0$

(b) If $f(0) = 1$

(c) If $f(0) = -1$

(d) For no value of $f(0)$

16. Let A be a finite set of size n, the number of elements in the power set of $A \times A$ is

(a) 2^{2^n} (b) 2^{n^2} (c) $(2^n)^2$ (d) None of these

17. If all the elements of the key column are negative then the LPP has

(a) Multiple optimal solutions

(b) Unbounded solution

(c) Feasible but not basic solution

(d) Degenerate basic feasible solution.

18. If $y' = x + y$ and y(1) = 0, then y(1.1) according to Euler's Method is [h= 0.1]

(a) 0.1 (b) 0.3 (c) 0.5 (d) 0.9

19. A particle moves in a circle of radius 'a', and then its velocity and acceleration are

(a) $a\omega, a\sqrt{\omega^4 - \left(\frac{d\omega}{dt}\right)^2}$

(b) $a\omega, a\sqrt{\omega^2 + \left(\frac{d\omega}{dt}\right)^2}$

(c) $a\omega, a\sqrt{\omega^2 - \left(\frac{d\omega}{dt}\right)^2}$

(d) $a\omega, a\sqrt{\omega^4 + \left(\frac{d\omega}{dt}\right)^2}$

20. Consider the IVP: $\frac{dy(t)}{dt} = -ky(t), (k > 0)$ with $y(o) = 1$, then $\lim_{t \to \infty} y(t) =$

(a) 1 (b) ∞ (c) 0 (d) all of these

21. The eigen values of the dynamical system $\dot{X} = AX$, where $A = \begin{pmatrix} 3 & 1 \\ 1 & 3 \end{pmatrix}$ are

(a) 2, 4 (b) 2, 2 (c) 1, 4 (d) $4 \pm i2$

22. The solution of the PDE $\left(\frac{\partial z}{\partial x}\right)\left(\frac{\partial z}{\partial y}\right)=1$ is

(a) $z=ax+by+c,\ ab=1$

(b) $z=ax^2+by^2,\ ab=1$

(c) $z=ax^2+by+c,\ ab=1$

(d) $z=ax+by^2+c,\ ab=1$

23. For the LPP Maximize $Z=x+3y$, sub. to $3x+y\le 3,\ x,y\ge 0$ the optimum value of the objective function is

(a) 1 (b) 3 (c) 9 (d) 10

24. The function $f(z)=|z|^2$ in the complex plane C is analytic

(a) Everywhere

(b) Nowhere

(c) Somewhere

(d) At z = 0

25. The apsidal angle of the orbit $r=a(1-\cos\theta)$ is

(a) π (b) 2π (c) $\pi/2$ (d) $\pi/4$

---------- Good Luck! ....