VITMEE Previous Year Question Papers 2011

1. If F is function such that F(0) = 2, F(1) = 3, F(x + 2) = 2F(x) - F(x + 1) for x ≥ 0, then F(5) is equal to
   (a) -7
   (b) -3
   (c) 17
   (d) 13
2. Let S be a set containing n elements. Then, number of binary operations on S is
   (a) n^n
   (b) 2^n^2
   (c) n^n^2
   (d) n^2
3. The numerically greatest term in the expansion of (3 - 5x)^11 when x = 1/5, is
   (a) 55 x 3^9
   (b) 55 x 3^6
   (c) 45 x 3^9
   (d) 45 x 3^6
4. The number of solutions of the equation sin(e^x) = 5^x + 5^{-x}, is
   (a) 0
   (b) 1
   (c) 2
   (d) infinitely many
5. If a^x = b^y = c^z = d^u and a, b, c, d are in GP, then x, y, z, u are in
   (a) AP
   (b) GP
   (c) HP
   (d) None of these
6. If z satisfies the equation |z| - z = 1 + 2i, then z is equal to
   (a) 3/2 + 2i
   (b) 3/2 - 2i
   (c) 2 - 3/2i
   (d) 2 + 3/2i
7. If z = (1 - i√3)/(1 + i√3), then arg(z) is
   (a) 60°
   (b) 120°
   (c) 240°
   (d) 300°
8. If f(x) = √($\log_{10} x^2$), the set of all values of x for which f(x) is real, is
   (a) [-1, 1]
   (b) [1, ∞)
   (c) (-∞, -1]
   (d) (-∞, -1] ∪ [1, ∞)

9. For what values of m can the expression $2x^2 + mx + 3y^2 - 5y - 2$ be expressed as the product of two linear factors?
   (a) 0
   (b) ±1
   (c) ±7
   (d) 49
10. If B is a non-singular matrix and A is a square matrix, then $\det(B^{-1}AB)$ is equal to
   (a) $\det(A^{-1})$
   (b) $\det(B^{-1})$
   (c) $\det(A)$
   (d) $\det(B)$
11. If f(x), g(x) and h(x) are three polynomials of degree 2 and $\Delta(x) = \begin{vmatrix} f(x) & g(x) & h(x) \\ f'(x) & g'(x) & h'(x) \\ f''(x) & g''(x) & h''(x) \end{vmatrix}$ then $\Delta(x)$ is a polynomial of degree
   (a) 2
   (b) 3
   (c) 0
   (d) at most 3
12. The chances of defective screws in three boxes A, B, C are 1/5, 1/6, 1/7 respectively. A box is selected at random and a screw drawn from it at random is found to be defective. Then, the probability that it came from box A, is
   (a) 16/29
   (b) 1/15
   (c) 27/59
   (d) 42/107
13. The value of $\cos\theta / (1 + \sin\theta)$ is equal to
   (a) $\tan(\theta/2 - \pi/4)$
   (b) $\tan(-\pi/4 - \theta/2)$
   (c) $\tan(\pi/4 - \theta/2)$
   (d) $\tan(\pi/4 + \theta/2)$
14. If $3\sin\theta + 5\cos\theta = 5$, then the value of $5\sin\theta - 3\cos\theta$ is equal to
   (a) 5
   (b) 3
   (c) 4
   (d) None of these
15. The principal value of $\sin^{-1}(\sin 5\pi/6)$ is
   (a) $\pi/6$
   (b) $5\pi/6$
   (c) $7\pi/6$
   (d) None of these

16. A rod of length l slides with its ends on two perpendicular lines. Then, the locus of its mid point is
    (a) $x^2 + y^2 = l^2/4$
    (b) $x^2 + y^2 = l^2/4$
    (c) $x^2 - y^2 = l^2/4$
    (d) None of these
17. The equation of straight line through the intersection of line $2x + y = 1$ and $3x + 2y = 5$ and passing through the origin is
    (a) $7x + 3y = 0$
    (b) $7x - y = 0$
    (c) $3x + 2y = 0$
    (d) $x + y = 0$
18. The line joining (5, 0) to $(10 \cos\theta, 10 \sin\theta)$ is divided internally in the ratio 2:3 at P. If θ varies, then the locus of P is
    (a) a straight line
    (b) a pair of straight lines
    (c) a circle
    (d) None of the above
19. If $2x + y + k = 0$ is a normal to the parabola $y^2 = -8x$, then the value of k is
    (a) 8
    (b) 16
    (c) 24
    (d) 32
20. $\lim_{n\to\infty} [1/(1\cdot2) + 1/(2\cdot3) + 1/(3\cdot4) + \ldots + 1/(n(n+1))]$ is equal to
    (a) 1
    (b) -1
    (c) 0
    (d) None of these
21. The condition that the line $lx + my = 1$ may be normal to the curve $y^2 = 4ax$, is
    (a) $al^3 - 2alm^2 = m^2$
    (b) $al^2 + 2alm^3 = m^2$
    (c) $al^3 + 2alm^2 = m^2$
    (d) $al^3 + 2alm^2 = m^2$
22. If $\int f(x)\,dx = f(x)$, then $\int \{f(x)\}^2\,dx$ is equal to
    (a) $(1/2)\{f(x)\}^2$
    (b) $\{f(x)\}^3$
    (c) $\{f(x)\}^3/3$
    (d) $\{f(x)\}^2$
23. $\int \sin^{-1}\{(2x+2)/\sqrt{(4x^2+8x+13)}\}\,dx$ is equal to
    (a) $(x+1)\tan^{-1}((2x+2)/3) - (3/4)\log((4x^2+8x+13)/9) + c$
    (b) $(3/2)\tan^{-1}((2x+2)/3) - (3/4)\log((4x^2+8x+13)/9) + c$

(c) $(x+1)\tan^{-1}((2x+2)/3) - (3/2)\log(4x^2+8x+13) + c$
(d) $(3/2)(x+1)\tan^{-1}((2x+2)/3) - (3/4)\log(4x^2+8x+13) + c$

24. If the equation of an ellipse is $3x^2 + 2y^2 + 6x - 8y + 5 = 0$, then which of the following are true?
(a) $e = 1/\sqrt{3}$
(b) centre is (-1, 2)
(c) foci are (-1, 1) and (-1, 3)
(d) All of the above

25. The equation of the common tangents to the two hyperbolas $x^2/a^2 - y^2/b^2 = 1$ and $y^2/a^2 - x^2/b^2 = 1$, are
(a) $y = \pm x \pm \sqrt{(b^2 - a^2)}$
(b) $y = \pm x \pm \sqrt{(a^2 - b^2)}$
(c) $y = \pm x \pm \sqrt{(a^2 + b^2)}$
(d) $y = \pm x \pm (a^2 - b^2)$

26. Domain of the function $f(x) = \log x \cos x$, is
(a) $(-\pi/2, \pi/2) - \{1\}$
(b) $[-\pi/2, \pi/2] - \{1\}$
(c) $(-\pi/2, \pi/2)$
(d) None of these

27. Range of the function $y = \sin^{-1}(x^2/(1+x^2))$, is
(a) $(0, \pi/2)$
(b) $[0, \pi/2)$
(c) $(0, \pi/2]$
(d) $[0, \pi/2]$

28. If $x = \sec\theta - \cos\theta$, $y = \sec^2\theta - \cos^2\theta$, then $(x^2 + 4)(dy/dx)^2$ is equal to
(a) $n^2(y^2 - 4)$
(b) $n^2(4 - y^2)$
(c) $n^2(y^2 + 4)$
(d) None of these

29. If $y = \sqrt{(x + \sqrt{(y + \sqrt{(x + \sqrt{(y + \ldots \infty)})})})}$, then dy/dx is equal to
(a) $(y + x)/(y^2 - 2x)$
(b) $(y^3 - x)/(2y^2 - 2xy - 1)$
(c) $(y^3 + x)/(2y^2 - x)$
(d) None of these

30. If $\int_1^x dt/\sqrt{(t^2 - 1)} = \pi/6$, then x can be equal to
(a) $2/\sqrt{3}$
(b) $\sqrt{3}$
(c) 2
(d) None of these

31. The area bounded by the curve $y = |\sin x|$, x-axis and the lines $|x| = \pi$, is
(a) 2 sq unit
(b) 1 sq unit

(c) 4 sq unit
(d) None of these

32. The degree of the differential equation of all curves having normal of constant length c is
(a) 1
(b) 3
(c) 4
(d) None of these

33. If $\vec{a} = 2\hat{i} + 2\hat{j} + 3\hat{k}$, $\vec{b} = -\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{c} = 3\hat{i} + \hat{j}$, then $\vec{a} + t\vec{b}$ is perpendicular to $\vec{c}$, if t is equal to
(a) 2
(b) 4
(c) 6
(d) 8

34. The distance between the line $\vec{r} = 2\hat{i} - 2\hat{j} + 3\hat{k} + \lambda(\hat{i} - \hat{j} + 4\hat{k})$ and the plane $\vec{r} \cdot (\hat{i} + 5\hat{j} + \hat{k}) = 5$, is
(a) 10/3
(b) $10/\sqrt{5}$
(c) $10/(3\sqrt{3})$
(d) 10/9

35. The equation of sphere concentric with the sphere $x^2 + y^2 + z^2 - 4x - 6y - 8z - 5 = 0$ and which passes through the origin, is
(a) $x^2 + y^2 + z^2 - 4x - 6y - 8z = 0$
(b) $x^2 + y^2 + z^2 - 6y - 8z = 0$
(c) $x^2 + y^2 + z^2 = 0$
(d) $x^2 + y^2 + z^2 - 4x - 6y - 8z - 6 = 0$

36. If the lines $(x-1)/2 = (y+1)/3 = (z-1)/4$ and $(x-3)/1 = (y-k)/2 = z/1$ intersect, then the value of k, is
(a) 3/2
(b) 9/2
(c) -2/9
(d) -3/2

37. The two curves y = 3^x and y = 5^x intersect at an angle
(a) $\tan^{-1}((\log 3 - \log 5)/(1 + \log 3 \log 5))$
(b) $\tan^{-1}((\log 3 + \log 5)/(1 - \log 3 \log 5))$
(c) $\tan^{-1}((\log 3 + \log 5)/(1 + \log 3 \log 5))$
(d) $\tan^{-1}((\log 3 - \log 5)/(1 - \log 3 \log 5))$

38. The equation $\lambda x^2 + 4xy + y^2 + \lambda x + 3y + 2 = 0$ represents a parabola, if λ is
(a) 0
(b) 1
(c) 2
(d) 4

39. If two circles $2x^2 + 2y^2 - 3x + 6y + k = 0$ and $x^2 + y^2 - 4x + 10y + 16 = 0$ cut orthogonally, then the value of k is
    (a) 41
    (b) 14
    (c) 4
    (d) 1
40. If A(-2, 1), B(2, 3) and C(-2, -4) are three points. Then, the angle between BA and BC is
    (a) $\tan^{-1}(2/3)$
    (b) $\tan^{-1}(3/2)$
    (c) $\tan^{-1}(1/3)$
    (d) $\tan^{-1}(1/2)$