FIRST REVISION EXAMINATION - 2020

Thirunelveli District **STANDARD - XII** **Reg. No** ☐☐☐☐☐☐

TIME: 3.00 hours **MATHEMATICS** **MARKS: 90**

Part - I

Note 1) Answer all the questions.

2) Choose the most siutable answer from the given four allternatives and write the option code and corresponding answer: 20 x 1 = 20

1. If $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ and A (adj A) = $\begin{bmatrix} K & O \\ O & K \end{bmatrix}$, then K =

   a) o b) $\sin\theta$ c) 1 d) $\cos\theta$

2. The principal argument of $\frac{3}{-1+i}$ is

   a) $\frac{-5\pi}{6}$ b) $\frac{-2\pi}{3}$ c) $\frac{-3\pi}{4}$ d) $-\pi/2$

3. If α,β,γ are the roots of the equation $x^3 + px^2 + qx + r = 0$ then the value of $\sum\frac{1}{\beta\gamma}$

   a) $\frac{q}{r}$ b) $\frac{-q}{r}$ c) $\frac{-p}{r}$ d) $\frac{p}{r}$

4. The number of real numbers is $[0,2\pi]$ satisfying $\sin^4 x - 2\sin^2 x + 1$ is

   a) 2 b) 4 c) 1 d) ∞

5. If $\sin^{-1} x + \sin^{-1} y = \frac{2\pi}{3}$, then $\cos^{-1} x + \cos^{-1} y$ is equal to

   a) $\frac{2\pi}{3}$ b) $\frac{\pi}{3}$ c) $\pi/6$ d) π

6. Which of the follwing is not true regarding the value of y = cosecx.

   a) falls from ∞ to 1 for $x \in \left[0, \pi/2\right]$

   b) raises from 1 to ∞ for $x \in \left(\pi/2, \pi\right)$

   c) falls from $-\infty$ to -1 for $x \in \left[\pi, 3\pi/2\right]$

   d) falls from -1 to $-\infty$ for $x \in \left[3\pi/2, 2\pi\right]$

7. If P (x , y) be any point on $16x^2 + 25y^2 = 400$ with foci F_1 (3 , 0) and F_2 (-3 ,0) then $PF_1 + PF_2$ is

   a) 8 b) 6 c) 10 d) 12

8. The angle between the line $\vec{r} = (\hat{i} + 2\hat{j} - 3\hat{k}) + t(2\hat{i} + \hat{j} - 2\hat{k})$ and the plane $\vec{r}.(\hat{i} + \hat{j}) + 4 = 0$ is

   a) 0° b) 30° c) 45° d) 90°

9. Which of the following is not true?

   a) If z = (2+3i) (1-i) then $z^{-1} = \frac{5}{26} - \frac{i}{26}$ b) value of $(1+i)^8$ is 16

   c) $|3z-5+i| = 4$ represents a circle with centre $\left(-5/3, 1/3\right)$ and radius $4/3$

   d) cube roots of unity are 1, $\frac{-1+i\sqrt{3}}{2}$, $\frac{-1-i\sqrt{3}}{2}$

10. The minimum value of the function $|3-x|+6$ is
a) 0 b) 3 c) 6 d) 9
11. If f (x,y,z) = xy + yz + zx, then $f_z - f_x$ is equal to
a) z-x b) y-z c) x-z d) y-x
12. The volume of solid of revolution of the region bounded by $y^2 = x(a-x)$, about x x - axis is
a) πa^3 b) $\frac{\pi a^3}{4}$ c) $\frac{\pi a^3}{5}$ d) $\frac{\pi a^3}{6}$
13. Which of the following is / are true?
a) $\int_0^a x.f(x)\,dx = \frac{a}{2}\int_0^a f(x)dx$ if $f(a-x) = -f(x)$ b) $\int_0^\infty e^{-ax}.x^n.dx = \frac{n!}{a^{n-1}}$
c) $\int_0^1 x^m(1-x)^n dx = \frac{m!\times n!}{(m+n+1)!}$ where m e n are positive integers ; d) $\int_0^a \frac{f(x)}{f(x)+f(a-x)}dx = a$
14. The general solution of the differential equation $\log\left(\frac{dy}{dx}\right) = x + y$ is
a) $e^x+e^y = c$ b) $e^x+e^{-y} = c$ c) $e^{-x}+e^y = c$ d) $e^{-x}+e^{-y}= c$
15. The differential equation representing the family of curves y = A cos (x +B), where A and B are Parameters is
a) $\frac{d^2y}{dx^2} - y = 0$ b) $\frac{d^2y}{dx^2} + y = 0$ c) $\frac{d^2y}{dx^2} = 0$ d) $\frac{d^2x}{dy^2} = 0$
16. Which of the following islaretrue?
a) f (x) = $x^2 - 2x - 3$ is strictly decreasing in $(2,\infty)$
b) $\lim_{x\to 1} x^{\frac{1}{1-x}} = e$
c) The cure y = 3 + sin x is concave upward in, $(0,\pi)$.
d) value of "C" satisfied by Rolle's theorem for $f(x) = x + \frac{1}{x}, x \in \left[\frac{1}{2}, 2\right]$ is 1.
17. A pair of dice numbered 1,2,3,4,5,6 of a six sided die and 1,2,3,4 of a four - sided die is rolled and the sum is determined. Let the random variable x denote this sum. Then the number of elements in the inverse image of 7 is
a) 1 b) 2 c) 3 d) 4
18. If in 6 trials, x is a binomlal variable which follows the relation q p(x=4) = p(x=2), then the probability of success is
a) 0.125 b) 0.25 c) 0.375 d) 0.75
19. The operation * defined by $a * b = \frac{ab}{7}$ is not a binary operation on
a) Q^+ b) Z c) R d) C
20. Which one is the inverse of the statement $(p\vee q) \rightarrow (p\wedge q)$
a) $(p\wedge q) \rightarrow p\vee q$ b) $\neg(p\vee q) \rightarrow (p\wedge q)$
c) $(\neg p\vee \neg q) \rightarrow (\neg p\wedge \neg q)$ d) $(\neg p\wedge \neg q) \rightarrow (\neg p\vee \neg q)$

PART - II

Answer any 7 question. 7 x 2 = 14
Qn. No: 30 is Compulsory.

21. Establish the equivalence property: $p \rightarrow q \equiv \neg p \vee q$.
22. Find an approximate value of $\sqrt{9.2}$

23. Solve : $(1+x^3)\,dy - x^2 y\,dx = 0$
24. A balloon rises straight up at 10 m/s. An Observer is 40 m away. from the spot where the balloon left the ground. Find the rate of change of the balloon's angle of elevation in radian per second when the balloon is 30 metres above the ground.
25. If $[x+iy]^{1/3} = a+ib$ then prove that $\frac{x}{a}+\frac{y}{b} = 4(a^2-b^2)$
26. Find the value of $\tan\left[\cos^{-1}\left(\frac{1}{2}\right) - \sin^{-1}\left(-\frac{1}{2}\right)\right]$
27. Obtain the equation of circle for which (3, 4) and (2,-7) are the ends of a diameter
28. Find the cartesian equation of plane passing through the point with position vector $4\hat{i}+2\hat{j}-3\hat{k}$ and normal to vector $2\hat{i}-\hat{j}+\hat{k}$
29. Evaluate: $\int_0^{\pi/2} \sin^4 x \cos^6 x\,dx.$
30. The probability density function of x is given by

$$f(x) = \begin{cases} k\,xe^{-2x} & \text{for } x > 0 \\ 0 & \text{for } x \le 0 \end{cases}$$ find the value of "K".

PART - III

Answer any 7 question. 7 x 3 = 21

Qn. No: 40 is Compulsory.

31. Solve by matrix inversion method: $5x + 2y = 3,\ 3x + 2y = 5$
32. Find the value of $\sum_{k=1}^{8}\left[\cos\frac{2k\pi}{9} + i\sin\frac{2k\pi}{9}\right]$
33. Discuss the nature of the roots of the polynomial $x^5 - 19x^4 + 2x^3 + 5x^2 + 11$
34. Find the equation of ellipse with length of latus rectum 4, distance between foci $4\sqrt{2}$ and major axis as y - axis.
35. Find the non - parametric form of vector equation of the plane passing through the points (-1, 2, 0), (2, 2, -1) and parallel to the straight line $\frac{x-1}{1} = \frac{2y+1}{2} = \frac{z+1}{-1}$
36. Find the intervals of monotonicity and local extrema of the function $f(x) = x\log x + 3x$
37. Find the area of the region bounded by x - axis, the curve $y = |\cos x|$, the lines x=0 and $x = \pi$
38. Solve: $\left[x + y\cos\left(\frac{y}{x}\right)\right]dx = x\cos\left(\frac{y}{x}\right)dy$
39. Find the mean and variance of the probability mass function

$$f(x) = \begin{cases} 2(x-1) & 1 < x < 2 \\ 0 & \text{, otherwise.} \end{cases}$$

40. If $w(x, y, z) = x^2(y-z) + y^2(z-x) + z^2(x-y)$ then find $\frac{\partial w}{\partial x} + \frac{\partial w}{\partial y} + \frac{\partial w}{\partial z}$

PART - IV

Answer all the questions. $7 \times 5 = 35$

41. a Investigate for what values of λ and μ the system of linear equation.
$x + 2y + z = 7$, $x + y + \lambda z = \mu$, $x + 3y - 5z = 5$ has
i) no solution ii) a unique solution iii) an infinite number of solutions
(Or)
Show that the lines $\frac{x+1}{3} = \frac{y+3}{5} = \frac{z+5}{7}$ and $\frac{x-2}{1} = \frac{y-4}{3} = \frac{z-6}{5}$ intersect. Also find the point of intersection.

42. Find the centre, foci, vertices of hyperbola $9x^2 - 16y^2 - 18x + 32y - 151 = 0$ (Or)
Solve: $\cos^2 x \frac{dy}{dx} + y = \tan x$

43. If Z_1, Z_2 and Z_3 are three complex numbers such that $|z_1| = 1, |z_2| = 2, |z_3| = 3,$ and $|z_1 + z_2 + z_3| = 1$, show that $|9z_1z_2 + 4z_1z_3 + z_2z_3| = 6$. (Or)
If the roots of $x^3 + Px^2 + qx + r = 0$ are us H.P prove that qpqr $= 2q^3 + 27r^2$

44. Solve : $\cot^{-1}x - \cot^{-1}(x+2) = \frac{\pi}{12}, x > 0$ (Or)
Using integration find the area of the region bounded by triangle ABC, whose vertices A, B and C are (-1,1), (3, 2) and (0 ,5) respectively.

45. Find the angle between $y = x^2$ and $y = (x-3)^2$, (Or)
$w(x, y, z) = xy + yz + zx$, $x = u - v$, $y = uv$, $z = u + v$, $u, v \in R$. Find $\frac{\partial w}{\partial u}, \frac{\partial w}{\partial v}$ and evaluate then at $\left(\frac{1}{2}, 1\right)$.

46. The probability density function of X is given by $f(x) = \begin{cases} k.e^{\frac{-x}{3}} & \text{for } x > 0 \\ 0 & \text{for } x \leq 0 \end{cases}$
Find (i) the value of k (ii) the distribution function
(iii) $P(5 \leq x)$ (iv) $P(x \leq 4)$ (Or)
On the average, 20% of the products manufactured by ABC company are found to be defective. If we select 6 of these products at random and x denotes the numbers of defective products find the probability that (i) two products are defective (ii) atmost one product is defective (iii) atleast two products are defective.

47. Verify (i) closure (ii) commutative (iii) associative (iv) Identity (v) Inverse for the operation X_{11} on a subset A = { 1,3,4,5,9} of the set of remainders {0,1,2,3,4,5,6,7,8,9,10}. (Or)
Let A be Q \ {1}. Define * on A by x*y = x+y-xy. Is * binary on A? If so examine commutative associative, Identify and Inverse properties for the operation * on A

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