Koteshwor, Kathmandu

FIRST TERMINAL EXAMINATION 2080

Subject : MATHEMATICS **GRADE XII (SCIENCE)** **F.M.: 75**
Time : 3:00 hrs. **SET B** **P.M. : 30**

Group 'A' 11×1=11

1. How many numbers of five digit can be formed from the number 2,0,4,3,8 when repetition of digits is not allowed?
   a) 96 b) 120 c) 144 d) 14
2. The value of P (n, n–1) is
   a) n! b) (n–1)! c) (n+1)! d) 1
3. If $\Sigma n = 55$, then Σn^3 is equal to
   a) 110 b) 385 c) 3025 d) 116375
4. If any ΔABC, $\frac{\cos A}{a} = \frac{\cos B}{b}$, then the triangle is
   a) Isosceles b) Equilateral
   c) Right angle d) Scalene
5. If A = 30°, B = 45°, C = 6, then b is
   a) $6(\sqrt{3}+1)$ b) $6(\sqrt{3}-1)$ c) 12 d) 6
6. If $\left|\vec{a}+\vec{b}\right| = \left|\vec{a}-\vec{b}\right|$, then $\vec{a}.\vec{b}$ = ... ?
   a) 1 b) $\frac{1}{2}$ c) 0 d) 2
7. $\int \frac{dx}{\sqrt{9-4x^2}}$ = ... ?
   a) $\frac{1}{2}\sin^{-1}\left(\frac{2x}{3}\right)+C$ b) $\sin^{-1}\left(\frac{2x}{3}\right)+C$
   c) $\tan^{-1}\left(\frac{2x}{3}\right)+C$ d) $\frac{1}{2}\tan^{-1}\left(\frac{2x}{3}\right)+C$
8. $\int \frac{\sin(2\tan^{-1}x)}{1+x^2}dx$ = ... ?
   a) $\cos(2\tan^{-1}x)+C$ b) $-\cos(2\tan^{-1}x)+C$
   c) $\frac{1}{2}\cos(2\tan^{-1}x)+C$ d) $-\frac{1}{2}\cos(2\tan^{-1}x)+C$
9. $\int\left(\frac{\cos 2x-1}{\cos 2x+1}\right)dx$ =
   a) tan x–x+c b) x+tanx+c c) x–tanx+c d) –x–cot x+c
10. What is the amplitude of a complex number i?
    a) – 1 b) 90° c) 270° d) 1
11. The augmented matrix of the system of equations x+y = 3 & 2x–3y+1 = 0 is
    a) $\begin{bmatrix}1 & 1 & : & 3\\ 2 & -3 & : & 1\end{bmatrix}$ b) $\begin{bmatrix}1 & 1 & : & 3\\ 2 & -3 & : & -1\end{bmatrix}$
    c) $\begin{bmatrix}1 & 1 & : & -3\\ 2 & 3 & : & 1\end{bmatrix}$ d) $\begin{bmatrix}1 & 2 & : & 3\\ 1 & -2 & : & -1\end{bmatrix}$

Group 'B' 8×5= 40

12. a) How many permutations are there of the letters of the word 'SAARC'? [2]
    b) The Nepali National Cricket Team consisting 16 players includes 2 wicketkeepers and 6 bowlers. In how many ways can a cricket team of eleven players containing 1 wicketkeeper and at least 5 bowlers be selected? [3]
13. a) Sum to infinity: $1+3x+5x^2+7x^3+\ldots\ldots$ $(-1<x<1)$. [2]
    b) Write the formula for the sum of first (n+1) even natural number. [1]
    c) Write the formula for the sum of cubes of first 'n' natural number. [1]
    d) Find the sum of squares of first 20 natural number. [1]
14. a) Prove: $1-\tan\frac{A}{2}\tan\frac{B}{2}=\frac{2c}{a+b+c}$ [2]
    b) Prove that in any triangle: $\sin\frac{A}{2}=\sqrt{\frac{(S-b)(S-c)}{bc}}$. [3]

15. a) In any triangle ABC, if $a = 3$, $b = 3\sqrt{3}$, $A = 30°$, find B. [2]

b) In any ΔABC, if $A = 30°$ and $B = 90°$, find a:b:c. [3]

16. a) Using cramer's rule, solve:

$3x+2y+9 = 0$ & $2x-3y+6 = 0$. [2]

b) Solve the following equations using inverse matrix method: [3]

$x-3y-7z = 6$, $2x+3y+z = 9$, and $4x+y = 7$

17. a) State principle of mathematical induction.

b) Prove by method of induction that $1+2+3+.....+n = \frac{n(n+1)}{2}$ [3]

18. a) Write the integral of $\int \frac{1}{\sqrt{a^2 - x^2}}\, dx$ [1]

b) Define proper rational fraction with suitable example. [1]

c) Integrate: $\int \frac{1}{(x+a)(x+b)}\, dx$ by using concept of partial fraction. [3]

19. a) Show that $\int \frac{1}{\sqrt{x^2 + a^2}}\, dx = \log\left(x + \sqrt{x^2 + a^2}\right) + C$ [2]

b) Evaluate: $\int \frac{dx}{\sqrt{3 - 2x - x^2}}$ [3]

Group 'C' $8 \times 3 = 24$

20. a) Define projection of $\vec{a}$ on $\vec{b}$. [1]

b) Prove by vector method:

$\cos(A+B) = \cos A \cos B - \sin A \sin B$ [3]

c) For what value of m are the vectors $\vec{i} - 2\vec{j} + 4\vec{k}$, $2\vec{i} + 7\vec{j} + m\vec{k}$ orthogonal? [2]

d) State cosine law. [2]

21. a) If $z_1 = r_1(\cos\theta_1 + i \sin\theta_1)$ and $z_2 = r_2(\cos\theta_2 + i \sin\theta_2)$

i) What is the argument of $z_1 z_2$? 1]

ii) What is the modules of $z_1 z_2$? 1]

iii) What is the polar form of $z_1 z_2$? 1]

iv) Write the amplitude of $z = r(\cos\theta + i\sin\theta)$. 1]

b) Apply De-Moivre's theorem to compute $(-1 - \sqrt{3}\, i)^4$. 2]

c) If ω is a cube of unity, Find the value of: $(1 + \omega - \omega^2)(1 - \omega + \omega^2)$. 2]

22. a) Evaluate the integral $\int \sqrt{x^2 + a^2}\, dx$. Replace 'a' with a numerical value and then find the integral. [3]

b) Evaluate: $\int \frac{dx}{5 + 3\sin x}$ [3]

c) Evaluate: $\int \frac{dx}{1 + e^x}$. [2]

Good Luck