Council for Technical Education and Vocational Training

Office of the Controller of Examinations

Sanothimi, Bhaktapur

Regular/Back Exam-2078, Bhadra

Program:	**Diploma in Engineering All**	**Full Marks: 80**
Year/Part:	**I/I (New + Old)**	**Pass Marks: 32**
Subject:	**Engineering Mathematics I**	**Time: 3 hrs**

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.

Group 'A'

Attempt <u>All</u> questions. **[10x3=30]**

1 a) Define in circle. In any triangle ABC, establish the relation $r = \frac{\Delta}{s}$ where the symbols have their usual meanings. [5]

b) Find the general solution of $Cos\theta + Cos3\theta + Cos5\theta = 0$ [5]

OR

Prove that: $tan^{-1}x + tan^{-1}y = tan^{-1}\frac{x+y}{1+xy}$

2 a) Define continuity of a function at a given point. Test the continuity of the function at a given point where [5]

$$f(x) = \begin{bmatrix} 3+2x & for & \frac{-3}{2} \le x \le 0 \\ 3-x^2 & for & 0 < x \le 3/2 \end{bmatrix} \{at\ x = 0$$

OR

Evaluate the limit of $\lim_{x \to \theta} \frac{x\sin\theta - \theta\sin x}{x-\theta}$

b) Find from first principle the derivatives of $y = tanx$ or $y = e^{ax}$. [5]

3 a) What is homogenous equation of second degree? Prove that the homogenous equation of second degree represent a pair or straight line through the origin. [5]

b Find the equation of the straight line through the point (2, 3) and perpendicular to the line $5x - 2y = 8$. [5]

Cont.....

Group 'B'

Attempt <u>All</u> questions. [10x5=50]

4 Sum to n terms of 7+77+777+.....

5 From a group of 6 gentlemen and 4 ladies, a committee of 5 is to be formed. In how many ways can this be done so as to include at most 2 lady?

6 Find the middle term (s) in the expansion of $\left(1+\frac{x}{2}\right)^{15}$.

7 Prove that every quadratic equation cannot have more than two roots.

8 Find the equation of the circle through the intersection of the circles $x^2+y^2-8x-2y+7=0$ and $x^2+y^2-4x+10y+8=0$ and passes through the point $(-1,-2)$.

9 Find $\frac{dy}{dx}$: **<u>(Any One)</u>** (website :- https://www.arjun00.com.np)

(a) $x^3+y^3=3xy^2$ (b) $x=Tant, y=sint\,cost$

10 Integrate : **<u>(Any One)</u>**

i) $\int x^2\,sinx\,dx$ ii) $\int e^{ax}\,casbx\,dx$

11 Find the vertex, focus, equation of directrix and length of latus rectum of the parabola : $y^2-4y-4x-8=0$.

12 Let $f: R \to R$ and $R \to R$ be defined by $f(x)=x^3+1$ and $g(x)=x+5$, find (i) $fog(x)$ (ii) $gof\,(x)$

OR

$If\ \frac{logx}{y-z}=\frac{logy}{z-x}=\frac{logz}{x-y}$, prove that $x^2.y^y.z^z=1$.

13 Prove that the angle between two straight lines $y=m_1x+c_1$ and $y=m_2x+c_2\ is\ tan\theta=\pm\left(\frac{m_1-m_2}{1+m_1m_2}\right)$. Also, prove that

the two lines are parallel and perpendicular to each other if $m_1=m_2$ and $m_1\times m_2=-1$ respectively.

Good Luck!