Council for Technical Education and Vocational Training

Office of the Controller of Examinations

Sanothimi, Bhaktapur

Regular/Back Exam-2076, Falgun/Chaitra

Program: Diploma in Civil/Arch/Ref & A/C/Mech/ Ele/Elx/Geom/IT/Com/Hyd/Auto/Ele & Elx Engineering — **Full Marks: 80**

Year/Part: I/I (New+Old) — **Pass Marks: 32**

Subject: Engineering Mathematics — **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' [5×2)x3=30]

Attempt **All** Questions.

1. a) In any triangle ABC, If $a^4+b^4+c^4-2c^2(a^2+b^2)=0$; prove that $\angle c = 45°$ or $135°$.

b) Prove that $2Tan^{-1}\,1/_3 + Tan^{-1}\frac{1}{7} = \frac{1}{4}\pi$

OR

Find the general solution of the equation $Sin^2\theta - 2cos\theta + \frac{1}{4} = 0$

2. a) Evaluate: $\lim_{x \to y} \frac{xTany - yTanx}{x-y}$

b) Test the continuity of $f(x) = \frac{x^2-64}{8-x}$ at $x = 8$

3. a) Show that lines joining the origin to the point of intersection of the line fx-gy= λ and $ax^2 + 2hxy - by^2 + gx + fy = 0$ are at right angles for all values of λ≠0.

b) Find the eg^n of a straight line passing through (-2,-3) and making angle 45° with the line 2x-3y+5=0

Group 'B' [10×5=50]

Attempt **Any Ten** Questions.

4. Find the sum of n terms of the series 1+11+111+1111+.....

5. Show that the quadratic equation $ax^2 + bx + c = 0$ can not have more than two roots.

6. Find the middle term in the expansion of $\left(x + \frac{1}{2x^2}\right)^{12}$

7. Prove that $1 + \frac{1}{3.2^2} + \frac{1}{5.2^4} + \frac{1}{7.2^6} + \ldots\ldots\ldots\ldots = \text{Loge}3$.

8. Find, from first principle, the derivative of
$f(x) = \frac{1}{\sqrt{x}}$ or $f(x) = Tan\ 4x$

9. Find $\frac{dy}{dx}$ (Any one)

i) $x^3 + y^3 = 3xy^2$ ii) $x^2 + y^2 = Tan\ xy$

10. Evaluate: $\int \frac{dx}{x^2\sqrt{x^2-4}}$

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11. Evaluate $\int_0^{\pi/4} Tan^3 x dx$

12. Find the equation of a circle which touches both axes and radius is 4.

13. Find the equation of the parabola whose vertex is at (-1,2) and directrix x=4

14. From 6 gentlemen and 4 laties a committee of 5 is to be formed. In how many ways can this be done so as to include at least one lady.

15. Define inverse of a function. In which condition does the inverse of function exist? If $f(x) = x^2 - 3$ find $f^{-1}(x)$

Good Luck!

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