TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	All (Except BAR)	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Engineering Mathematics I *(SH 401)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. If $y=\sin(m\sin^{-1}x)$, show that $(1-x^2)y_{n+2}-(2n+1)xy_{n+1}+(m^2-n^2)y_n=0$, where suffices of y denote the respective order of derivatives of y. [5]
2. State Lagrange's mean value theorem. Verify it for the function $y=\sin x$ on $\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$. Is this theorem valid for the function $y=\tan x$ on $[0,\pi]$? [1+3+1]
3. Evaluate $\lim_{x\to 0}\left(\frac{\tan x}{x}\right)^{1/x}$ [5]
4. Find the asymptotes of the curve $(x+y)^2(x+2y+2)=x+9y-2$. [5]
5. Find the pedal equation of the curve $y^2=4a(x+a)$. [5]
6. Evaluate, if possible $\int_0^e \ell n\, x\,dx$. [5]
7. Apply differentiation under integral sign to evaluate $\int_0^\infty \frac{e^{-ax}\sin x}{x}dx$ and then show that $\int_0^\infty \frac{\sin x}{x}dx=\frac{\pi}{2}$. [4+1]
8. Define Beta and Gamma function and use it to show that, $\int_0^{\pi/6}\cos^4 3\theta\sin^2 6\theta\ d\theta=\frac{5\pi}{192}$. [5]
9. Find the volume of the solid formed by the revolution of the cardioid r = a(1 + cos θ) about the initial line. [5]
10. Solve the differential equation $\frac{dy}{dx}+y\cot x=2\cos x$. [5]
11. If p stands for $\frac{dy}{dx}$, then solve the differential equation $y-2px+ayp^2=0$. [5]
12. Solve the differential equation $(D^2-2D+5)y=e^{2x}\sin x$. [5]
13. Solve the differential equation $(x^2D^2+xD+1)y=\sin(\log x^2)$ [5]
14. Define ellipse and obtain the equation of ellipse in standard form. [5]
15. Prove that the locus of a point which moves in such a way that the difference of its distances from the point (5, 0) and (-5, 0) is 2 is a hyperbola. [5]
16. Describe and sketch the graph of the conic $r=\frac{10}{3+2\sin\theta}$ [5]

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