Printed Pages : 3

NBT-101/EBT-101

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 154104

Roll No.

B. Tech.

(SEM. I) (ODD SEM.) THEORY EXAMINATION, 2014-15

ELEMENTARY MATHEMATICS-I

Time : **3** Hours] [Total Marks : **100**

SECTION - A

1 Attempt **All** Parts of this question : **(2×10 = 20)**

(a) Evaluate : $\lim_{\theta \to \frac{\pi}{2}} \left(\frac{1-Cos4\theta}{Sin2\theta}\right)$.

(b) If $y = \frac{1}{Tan\, x} - \frac{1}{Cot\, x}$, then find $\frac{dy}{dx}$.

(c) Find the critical points of $f(x) = x^3 + x^2 - 8x + 1$.

(d) Test the existence of function $f(x) = |x|$ at $x = 0$.

(e) Evaluate: $\int \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right)^2 dx$

(f) Evaluate: $\int_0^{\frac{\pi}{2}} \frac{Sinx}{1+Cos^2 x} dx$

(g) Solve $\log \frac{dy}{dx} = x - 2y$

(h) Find Order and Degree of given differential equation

$$\left(\frac{d^3y}{dx^3}\right)^2 - 3\left(\frac{d^2y}{dx^2}\right)^3 + 2x\frac{dy}{dx} + 6y = 0$$

(i) A bag contains 10 mangoes out of which 4 are rotten. Two mangoes are taken out together. If one of them is found to be good, find the probability that other is also good.

(j) State Rolle's Theorem.

SECTION-B

2 Attempt Any **Three** Parts of the following : **(10×3=30)**

(a) Differentiate: $y = sin\sqrt{x + \log(tanx)}$

(b) Examine the continuity of $f(x)$ at $x = 0$.

$$f(x) = \begin{cases} \frac{sin2x}{x} & , when\ x \neq o \\ 1 & , when\ x = 0 \end{cases}$$

(c) Find the area bounded by curves $y = |x - 1|$, $y = 0$ and $|x| = 2$.

(d) Solve: $cos^2x\frac{dy}{dx} + y = tanx$.

(e) A bag contains 5 white, 7 red and 8 black balls. If four balls are drawn one by one with replacement, what is the probability that (i) none is white ? (ii) only two are white ? (iii) one is white ?

SECTION-C

Note : Attempt Any **Two** Parts from each question of this section : **[(2×5)×5=50]**

3 (a) Differentiate: $y = tan^{-1}\sqrt{\frac{1-cosx}{1+cosx}}$.

(b) Evaluate: $\lim_{x\to 0}\left(\frac{e^x+e^{-x}-2}{x^2}\right)$.

(c) Find the slope of curve $y = 3x^4 - 4x^2 + 6$ at $(1,-1)$and $(-1,2)$.

4 (a) Find $\frac{dy}{dx}$, if $y = (\cos x)^{(\cos x)^{\cos x \ldots\ldots\infty}}$.

(b) Find the percentage error in calculating the area of ellipse, when error of $+1\%$ is made in measuring the major and minor axis.

(c) Find the Maxima and Minima for the function $f(x) = x + sin2x$ in interval $0 \le x \le 2\pi$.

5 (a) Evaluate: $\int \frac{2x}{(x^2+1)(x^2+2)}\,dx$.

(b) Evaluate: $\int_0^{\pi} \frac{xtanx}{secx+cosx}\,dx$.

(c) Find the Area of curve bounded by parabola $y^2 = 4ax$ and a line $y = mx$

6 (a) Solve

$3e^x \tan y\, dx + (1 + e^x)\sec^2 y\, dy = 0; given\ y(0) = \frac{\pi}{4}.$

(b) If

$y = A\cos nx + B\ \sin nx, then\ prove\ that\ \frac{d^2y}{dx^2} + n^2y = 0.$

(c) Solve: $\frac{dy}{dx} = e^{x-y} + x^2e^{-y}.$

7 (a) Two cards are drawn at random from a pack of 52 cards. What is the probability that The drawn cards are both aces?

(b) A speaks truth 4 out of 5 times. A die is tossed. He reports that there is a six. What is The chance that actually there was a six?.

(c) If E and F are events such that $P(E) = 0.4, P(F) = 0.8\ and\ P\left(\frac{F}{E}\right) = 0.6, then$

Find $P(\frac{E}{F})$?