GOVERNMENT POLYTECHNIC, GAYA

Mid Term Examination for 2^{nd} Semester Students

Course Name : Engineering Mathematics
Instructor: Mritunjay Kumar Singh
Date of Examination: 05 - 04 - 2019

Maximum Marks: 20
Time Allowed: $1\frac{1}{2}$ hours
Branch:Mech. + Electrical + C. S. E.

Notations have their usual meanings.

Section A

Attempt all problems. Each problem caries one mark.

1. For a one-one function $f(x)$, which of the following is true :
   (a) $f(x_1) \neq f(x_2) \implies x_1 = x_2$ (b) $f(x_1) = f(x_2) \implies x_1 = x_2$
   (c) $f(x_1) = f(x_2) \implies x_1 \neq x_2$ (d) None .

2. The value of $\lim\limits_{x\to 0} \frac{1}{x^2}$ is :
   (a) 1 (b) 0 (c) ∞ (d) Does not exist .

3. If $f(x) = x^3 \tan x$, then $f^{'}(0) =$
   (a) 1 (b) -1 (c) 0 (d) 2.

4. A coin is tossed. What is the probability of getting head :
   (a) $\frac{1}{2}$ (b) 1 (c) $\frac{2}{1}$ (d) 0.

5. The median of first 10 natural numbers is :
   (a) 6 (b) 5.5 (c) 11 (d) 5.

Section B

Solve any three problems. Each problem carries three marks.

6. Show that the function $f : \mathbb{R} \to \mathbb{R}$ given by $f(x) = x^3$ is injective.

7. Evaluate $\lim\limits_{x\to 0} \dfrac{\sin x - 2\sin 3x + \sin 5x}{x}$.

8. Show that $f(x) = |x|$ is not differentiable at $x = 0$.

9. Two dice are thrown simultaneously. Find the probability that the sum of the integers on them is 8.

10. If the mean of the following data is 20.2, find the value of k.

x_i	10	15	20	25	30
f_i	12	13	14	13	14

Section C

Solve any one problem. Each problem caries six marks.

11. Evaluate $\lim_{x\to 0} \dfrac{\sqrt{1+x^2}-\sqrt{1-x^2}}{x}$.

12. Find $\dfrac{dy}{dx}$, when $y = \left(x+\frac{1}{x}\right)^x + x^{\left(x+\frac{1}{x}\right)}$.

13. The point scored by a basket ball team in a series of matches are as follows:

$$16, 1, 6, 26, 14, 4, 13, 8, 9, 23, 47, 9, 7, 8, 17, 28$$

Find the median of the data.

14. Using **Bisection method**, find a real root of the equation $x^3 - x - 1 = 0$ upto second approximation.

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