# GOVERNMENT POLYTECHNIC, GAYA

## Mid Term Examination for $1^{st}$ Semester Students

Course Name : Basic Mathematics
Instructor: Mritunjay Kumar Singh
Date of Examination: 08 - 11 - 2019

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

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Notations have their usual meanings.

## Section A

Attempt all problems. Each problem caries one mark.

1. If the degree of numerator $N(x)$ is equal or greater than the degree of denominator $D(x)$, then the fraction is called :
   (a) Proper (b) Improper
   (c) Neither proper nor improper (d) Both proper nor Improper .

2. A matrix $A = [a_{ij}]_{m\times n}$ is a square matrix if :
   (a) $m < n$ (b) $m > n$ (c) $m = n$ (d) None of these.

3. The binomial coefficients of terms in the expansion of $(x + a)^n$ equidistant from the beginning and the end are :
   (a) equal (b) 0 (c) equal but opposite sign (d) Never equal.

4. If $\tan\alpha = \dfrac{x}{x+1}$ and $\tan\beta = \dfrac{1}{2x+1}$, then $\alpha + \beta$ is :

   (a) 0 (b) $\dfrac{\pi}{4}$ (c) $\dfrac{\pi}{3}$ (d) $\dfrac{\pi}{2}$.

5. How many numbers of 3 distinct digits can be formed from $1, 2, 3, 4, 5$ ?
   (a) 10 (b) 15 (c) 01 (d) None of these.

## Section B

Solve any three problems. Each problem carries three marks.

6. Express $\dfrac{8x-4}{3x^2-2x-1}$ in partial fractions.

7. Find Inverse matrix $(A^{-1})$ of the matrix

$$A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}.$$

8. Find the values of $a, b, c$ and $d$ from the following equation:

$$\begin{bmatrix} 2a+b & a-2b \\ 5c-d & 4c+3d \end{bmatrix} = \begin{bmatrix} 4 & -3 \\ 11 & 24 \end{bmatrix}.$$

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9. The number of permutations of 10 differents things taken $r$ at a time is 151200. Find $r$.

10. Find the middle term in the expansion of $\left(2x^2 + \frac{1}{x}\right)^{31}$.

## Section C

Solve any one problem. Each problem caries six marks.

11. Using Matrix method of Cramer rule solve the following system of linear equations:

$$\begin{aligned} 2x - y + 3z &= 9, \\ x + y + z &= 6, \\ x - y + z &= 2. \end{aligned}$$

12. Find the term independent of $x$ in $\left(\frac{3}{2}x^2 - \frac{1}{3x}\right)^9$.

13. In how many ways can a team of 3 boys and 3 girls be selected from 5 boys and 4 girls?

***Best of Luck!***