

Q.17 Find the component statements of the following statements and check whether they are true or not

- i) A square is a quadrilateral and its four sides are equal
- ii) $\sqrt{3}$ is a rational number or an irrational number.

Q.18 Solve the following linear programming problem (LPP):

Maximise : $Z = 5x + 3y$

Subject to the constraints:

$$3x + 5y \leq 15, 5x + 2y \leq 10, x \geq 0, y \geq 0$$

Section-C

Note: Long answer type questions. Attempt any one question out of two questions. (1x10=10)

Q.19 If $A = \begin{bmatrix} 7 & -1 & 4 \\ -3 & -6 & 7 \\ -1 & 8 & -2 \end{bmatrix}$, find A^{-1} .

Q.20 Find the equation of the tangent to the curve

$$y = \frac{x-7}{(x-2)(x-3)} \text{ at the point where it cuts the } x\text{-axis.}$$

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Subject : Applied Mathematics-II

Time : 2 Hrs.

M.M. : 50

Section-A

Note: Multiple Choice questions. All questions are compulsory. (10x2=20)

Q.1 A relation R in a set A is called universal relation, if each element of A is not related to every element of A. (True/False)

Q.2 The relation R in the set of real numbers, defined by $R = \{(a,b) : a \leq b^2\}$ is a _____ relation.

- (a) Reflexive (b) Symmetric
- (c) Transitive (d) None of these

Q.3 What is the degree of the differential equation

$$\left(\frac{d^2s}{dt^2}\right)^2 - \left(\frac{ds}{dt}\right)^4 = y^3 ?$$

- (a) 2 (b) 3
- (c) 4 (d) None of these

Q.4 Fill in the blank:

The function $f(x) = |x|$ is a _____ function at $x=0$

Q.5 Fill in the blank:

$$\frac{d}{dx}(\operatorname{cosec} x) = \underline{\hspace{2cm}}$$

Q.6 Fill in the blank:

$$\int \sec^2 x \, dx = \underline{\hspace{2cm}}$$

Q.7 A vector whose magnitude is unity is called a _____ vector.

- (a) unit (b) zero
(c) coinitial (d) collinear

Q.8 The vector sum of the three sides of a triangle taken in order is equal to

- (a) $\vec{0}$ (b) \vec{i}
(c) 180° (d) None of these

Q.9 Write the negation of the following statement

The sum of 4 and 6 is 10.

Q.10 Linear function $Z = ax + by$, where a & b are constants, which has to be maximised or minimized is called a linear _____.

(Objective function/decision variables)

Section-B

Note: Short answer type questions. Attempt any four questions out of eight questions. (4x5=20)

Q.11 Find AB if $A = \begin{bmatrix} 2 & 0 & -1 \\ -2 & 3 & -3 \\ 4 & 2 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -3 \\ 2 & -2 \\ 3 & -1 \end{bmatrix}$.

Q.12 Let $Y = \{n^2 : n \in N\} \subset N$. Consider $f : N \rightarrow Y$ such that $f(n) = n^2$. Show that f is invertible and find the inverse of f .

Q.13 Prove that $\cos^{-1}\left(\frac{12}{13}\right) + \sin^{-1}\left(\frac{3}{5}\right) = \sin^{-1}\left(\frac{56}{65}\right)$

Q.14 Evaluate $\int_0^{\pi/2} \frac{\sin^4 x}{\sin^4 x + \cos^4 x} \, dx$

OR

From a differential equation by eliminating arbitrary constants a and b from $y = e^{2x}(a + bx)$

Q.15 If $\vec{a} = 5\hat{i} - \hat{j} - 3\hat{k}$ and $\vec{b} = \hat{i} + 3\hat{j} - 5\hat{k}$, then show that the vectors $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ are perpendicular.

Q.16 Show that the lines $\frac{x-5}{7} = \frac{y+2}{-5} = \frac{z}{1}$ and $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ are perpendicular to each other.