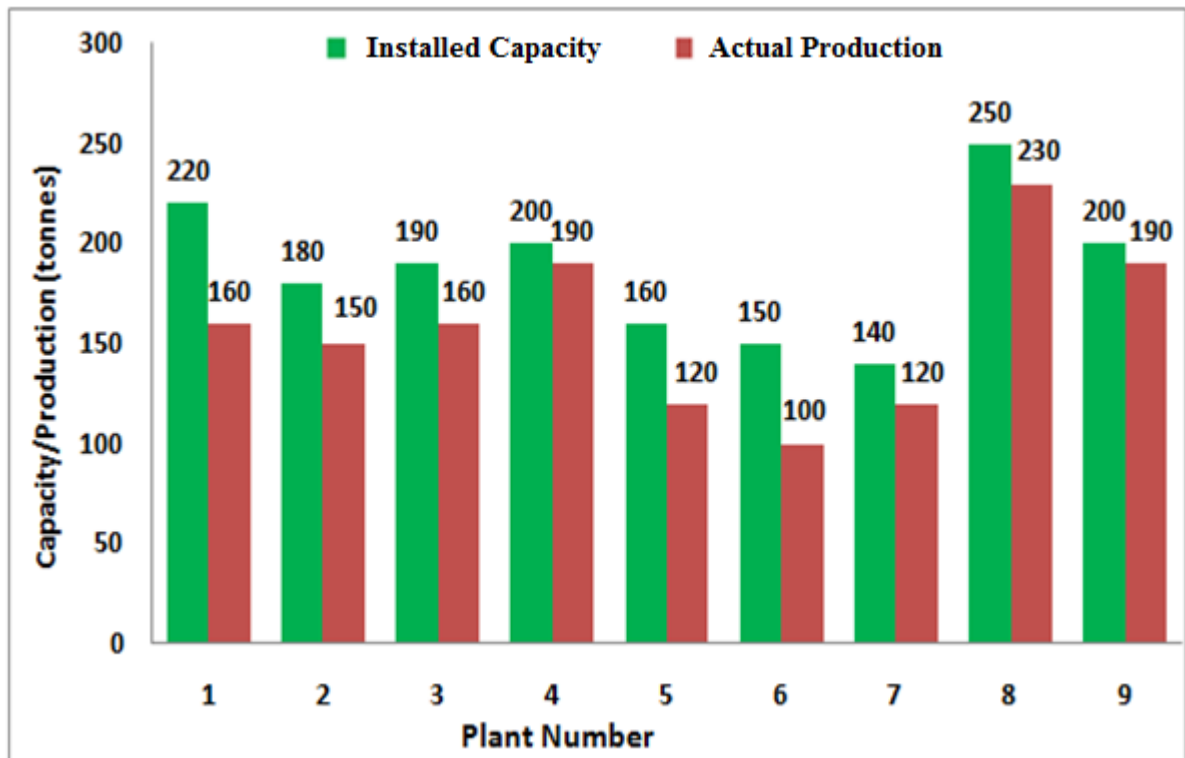


Q. 1 – Q. 5 carry one mark each.

- Q.1 The chairman requested the aggrieved shareholders to _____ him.
- (A) bare with (B) bore with (C) bear with (D) bare
- Q.2 Identify the correct spelling out of the given options:
- (A) Managable (B) Manageable (C) Mangaible (D) Managible
- Q.3 Pick the odd one out in the following:
- 13, 23, 33, 43, 53
- (A) 23 (B) 33 (C) 43 (D) 53
- Q.4 R2D2 is a robot. R2D2 can repair aeroplanes. No other robot can repair aeroplanes.
- Which of the following can be logically inferred from the above statements?
- (A) R2D2 is a robot which can only repair aeroplanes.
- (B) R2D2 is the only robot which can repair aeroplanes.
- (C) R2D2 is a robot which can repair only aeroplanes.
- (D) Only R2D2 is a robot.
- Q.5 If $|9y-6|=3$, then $y^2 - 4y/3$ is _____.
- (A) 0 (B) +1/3 (C) -1/3 (D) undefined

Q. 6 – Q. 10 carry two marks each.

- Q.6 The following graph represents the installed capacity for cement production (in tonnes) and the actual production (in tonnes) of nine cement plants of a cement company. Capacity utilization of a plant is defined as ratio of actual production of cement to installed capacity. A plant with installed capacity of at least 200 tonnes is called a large plant and a plant with lesser capacity is called a small plant. The difference between total production of large plants and small plants, in tonnes is _____.



- Q.7 A poll of students appearing for masters in engineering indicated that 60 % of the students believed that mechanical engineering is a profession unsuitable for women. A research study on women with masters or higher degrees in mechanical engineering found that 99 % of such women were successful in their professions.

Which of the following can be logically inferred from the above paragraph?

- (A) Many students have misconceptions regarding various engineering disciplines.
- (B) Men with advanced degrees in mechanical engineering believe women are well suited to be mechanical engineers.
- (C) Mechanical engineering is a profession well suited for women with masters or higher degrees in mechanical engineering.
- (D) The number of women pursuing higher degrees in mechanical engineering is small.

A : ENGINEERING MATHEMATICS (COMPULSORY)**Q. 1 – Q. 7 carry one mark each.**

- Q.1 A company records heights of all employees. Let X and Y denote the errors in the average height of male and female employees respectively. Assume that $X \sim N(0, 4)$ and $Y \sim N(0, 9)$ and they are independent. Then the distribution of $Z = (X + Y)/2$ is
- (A) $N(0, 6.5)$ (B) $N(0, 3.25)$ (C) $N(0, 2)$ (D) $N(0, 1)$
- Q.2 The volume of the solid obtained by revolving the curve $y^2 = x$, $0 \leq x \leq 1$ around y -axis is
- (A) π (B) 2 (C) $\frac{\pi}{2}$ (D) $\frac{\pi}{5}$
- Q.3 Let $y(x)$ be the solution of the initial value problem $\frac{dy}{dx} + 2xy = x$; $y(0) = 0$. Find the value of $\lim_{x \rightarrow \infty} y(x)$.
- Q.4 Which of the following is a quasi-linear partial differential equation?
- (A) $\frac{\partial^2 u}{\partial t^2} + u^2 = 0$
- (B) $\left(\frac{\partial u}{\partial t}\right)^2 + \frac{\partial u}{\partial x} = 0$
- (C) $\left(\frac{\partial u}{\partial t}\right)^2 - \left(\frac{\partial u}{\partial x}\right)^2 = 0$
- (D) $\left(\frac{\partial u}{\partial t}\right)^4 - \left(\frac{\partial u}{\partial x}\right)^3 = 0$
- Q.5 Let $P(x)$ and $Q(x)$ be the polynomials of degree 5, generated by Lagrange and Newton interpolation methods respectively, both passing through given six distinct points on the xy -plane. Which of the following is correct?
- (A) $P(x) \equiv Q(x)$
- (B) $P(x) - Q(x)$ is a polynomial of degree 1
- (C) $P(x) - Q(x)$ is a polynomial of degree 2
- (D) $P(x) - Q(x)$ is a polynomial of degree 3

Q.6 The Laurent series of $f(z) = 1/(z^3 - z^4)$ with center at $z = 0$ in the region $|z| > 1$ is

- (A) $\sum_{n=0}^{\infty} z^{n-3}$ (B) $-\sum_{n=0}^{\infty} \frac{1}{z^{n+4}}$ (C) $\sum_{n=0}^{\infty} z^n$ (D) $\sum_{n=0}^{\infty} \frac{1}{z^n}$

Q.7 The value of the surface integral $\iint_{\Gamma} \vec{F} \cdot \mathbf{n} \, dS$ over the sphere Γ given by $x^2 + y^2 + z^2 = 1$, where $\vec{F} = 4x \hat{i} - z \hat{k}$, and \mathbf{n} denotes the outward unit normal, is

- (A) π (B) 2π (C) 3π (D) 4π

Q. 8 – Q. 11 carry two marks each.

Q.8 A diagnostic test for a certain disease is 90% accurate. That is, the probability of a person having (respectively, not having) the disease tested positive (respectively, negative) is 0.9. Fifty percent of the population has the disease. What is the probability that a randomly chosen person has the disease given that the person tested negative?

Q.9 Let $M = \begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}$. Which of the following is correct?

- (A) Rank of M is 1 and M is not diagonalizable
 (B) Rank of M is 2 and M is diagonalizable
 (C) 1 is the only eigenvalue and M is not diagonalizable
 (D) 1 is the only eigenvalue and M is diagonalizable

Q.10 Let $f(x) = 2x^3 - 3x^2 + 69$, $-5 \leq x \leq 5$. Find the point at which f attains the global maximum.

Q.11 Calculate $\int_{C_1} \vec{F} \cdot d\vec{r} - \int_{C_2} \vec{F} \cdot d\vec{r}$, where $C_1: \vec{r}(t) = (t, t^2)$ and $C_2: \vec{r}(t) = (t, \sqrt{t})$, t varying from 0 to 1 and $\vec{F} = xy \hat{j}$.

END OF THE QUESTION PAPER