

GATE - 2016- CE

EE1030 : Matrix Theory
Indian Institute of Technology Hyderabad

Satyanarayana Gajjarapu
AI24BTECH11009

1 27 - 39

- 1) Pre-cursors to photochemical oxidants are
 - a) NO_x , VOCs and sunlight
 - b) SO_2 , CO_2 and sunlight
 - c) H_2S , CO and sunlight
 - d) SO_2 , NH_3 and sunlight

- 2) Crown corrosion in a reinforced concrete sewer is caused by:
 - a) H_2S
 - b) CO_2
 - c) CH_4
 - d) NH_3

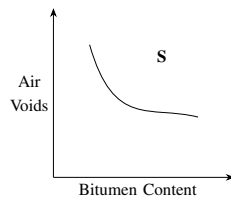
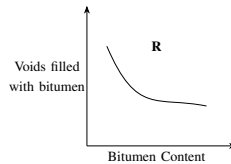
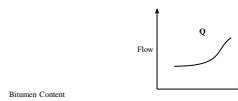
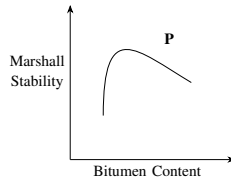
- 3) It was decided to construct a fabric filter, using bags of 0.45 m diameter and 7.5 m long, for removing industrial stack gas containing particulates. The expected rate of airflow into the filter is $10 \text{ m}^3/\text{s}$. If the filtering velocity is 2.0 m/min, the minimum number of bags (rounded to nearest higher integer) required for continuous cleaning operation is
 - a) 27
 - b) 29
 - c) 31
 - d) 32

- 4) Match the items in Group - I with those in Group - II and choose the right combination

Group - I	Group - II
P. Activated sludge process	1. Nitrifiers and denitrifiers
Q. Rising of sludge	2. Autotrophic bacteria
R. Conventional nitrification	3. Heterotrophic bacteria
S. Biological nitrogen removal	4. Denitrifiers

- a) P-3, Q-4, R-2, S-1
- b) P-2, Q-3, R-4, S-1
- c) P-3, Q-2, R-4, S-1
- d) P-1, Q-4, R-2, S-3

5) During a forensic investigation of pavement failure, an engineer reconstructed the graphs P, Q, R and S, using partial and damaged old reports.



Theoretically plausible correct graphs according to the 'Marshall mixture design output' are

- a) P, Q, R
- b) P, Q, S
- c) Q, R, S
- d) R, S, P

6) In a one-lane one-way homogeneous traffic stream, the observed average headway is 3.0 s. The flow (expressed in vehicles/hr) in this traffic stream is ____

- 7) The minimum number of satellites needed for a GPS to determine its position precisely is
- 2
 - 3
 - 4
 - 24
- 8) The system that uses the Sun as a source of electromagnetic energy and records the naturally radiated and reflected energy from the object is called
- Geographical Information System
 - Global Positioning System
 - Passive Remote Sensing
 - Active Remote Sensing
- 9) The staff reading taken on a workshop floor using a level is 0.645 m. The inverted staff reading taken to the bottom of a beam is 2.960 m. The reduced level of the floor is 40.500 m. The reduced level (expressed in m) of the bottom of the beam is
- 44.105
 - 43.460
 - 42.815
 - 41.145
- 10) Probability density function of a random variable X is given below

$$f(x) = \begin{cases} 0.25 & \text{if } 1 \leq x \leq 5 \\ 0 & \text{otherwise} \end{cases}$$

$P(X \leq 4)$ is

- $\frac{3}{4}$
 - $\frac{1}{2}$
 - $\frac{1}{4}$
 - $\frac{1}{8}$
- 11) The value of

$$\int_0^{\infty} \frac{1}{1+x^2} dx + \int_0^{\infty} \frac{\sin(x)}{x} dx$$

is

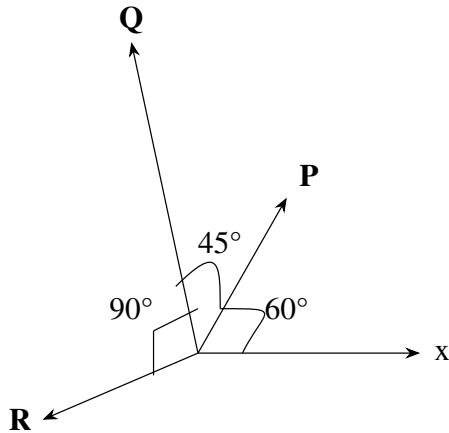
- $\frac{\pi}{2}$
- π
- $\frac{3\pi}{2}$
- 1

- 12) The area of the region bounded by the parabola $y = x^2 + 1$ and the straight line

$x + y = 3$ is

- a) $\frac{59}{6}$
- b) $\frac{9}{2}$
- c) $\frac{10}{3}$
- d) $\frac{7}{6}$

- 13) The magnitudes of vectors **P**, **Q** and **R** are 100 kN, 250 kN and 150 kN, respectively as shown in the figure.



The respective values of the magnitude (in kN) and the direction (with respect to the x-axis) of the resultant vector are

- a) 290.9 and 96.0°
- b) 368.1 and 94.7°
- c) 330.4 and 118.9°
- d) 400.1 and 113.5°