GATE ASSIGNMENT 5
EE1030 : Matrix Theory
## Indian Institute of Technology Hyderabad

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1) Q.1 Writing too many things on the _____ while teaching could make the students get _____.

   a) bored / board   b) board / bored   c) board / board   d) bored / bored

2) Which one of the following is a representation (not to scale and in bold) of all values of x satisfying the inequality $2 - 5x \leq -\frac{6x-5}{3}$ on the real number line?
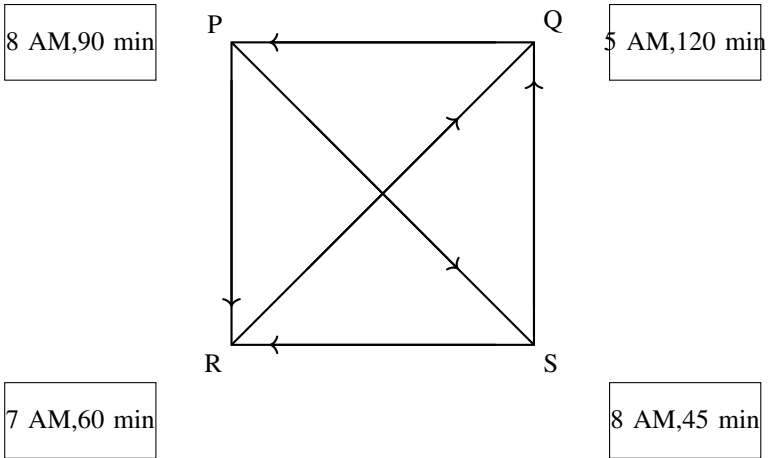
   a)

   b)

   c)

   d)
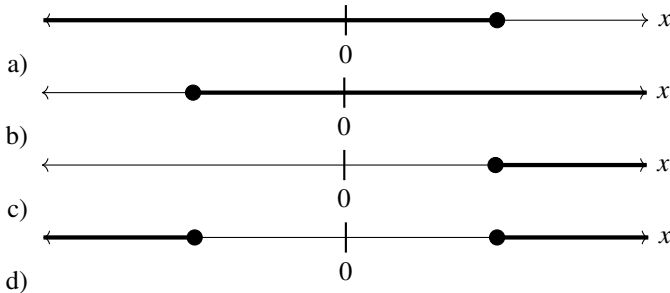
3) If $f(x) = 2\ln(\sqrt{e^x})$, what is the area bounded by $f(x)$ for the interval $[0, 2]$ on the x-axis?

   a) $\frac{1}{2}$ b) 1   c) 2   d) 4

4) The point of maximum entropy on a Fanno-curve in a Temperature-Entropy (T-s) diagram represents the

   a) maximum flow Mach number   c) sonic Mach number
   b) minimum flow Mach number   d) normal shock in the flow

5) A three-member committee has to be formed from a group of 9 people. How many such distinct committees can be formed? (tikz)

a) 27   b) 72   c) 81   d) 84

6) Fish belonging to species S in the deep sea have skins that are extremely black (ultra-black skin). This helps them not only to avoid predators but also sneakily attack their prey. However, having this extra layer of black pigment results in lower collagen on their skin, making their skin more fragile.

Which one of the following is the CORRECT logical inference based on the information in the above passage?

a) Having ultra-black skin is only advantageous to species S
b) Species S with lower collagen in their skin are at an advantage because it helps them avoid predators
c) Having ultra-black skin has both advantages and disadvantages to species S
d) Having ultra-black skin is only disadvantageous to species S but advantageous only to their predators

7) For the past m days, the average daily production at a company was 100 units per day. If today's production of 180 units changes the average to 110 units per day, what is the value of m?

a) 18   b) 10   c) 7   d) 5

8) Consider the following functions for non-zero positive integers, p and q.

$$f(p, q) = \underbrace{p \times p \times p \times \cdots \times p}_{q \text{ terms}} = p^q; \quad f(p, 1) = p$$

$$g(p, q) = p^{p^{p^{p^{p^{\cdot^{\cdot}}}}}} \overset{\text{Upto } q \text{ terms}}{} \quad ; \quad g(p, 1) = p$$

Which one of the following options is correct based on the above?

a) $f(2, 2) = g(2, 2)$ c) $g(2, 1) \neq f(2, 1)$

b) $f(g(2, 2), 2) < f(2, g(2, 2))$ d) $f(3, 2) > g(3, 2)$

9) Four cities P, Q, R and S are connected through one-way routes as shown in the figure. The travel time between any two connected cities is one hour. The boxes beside each city name describe the starting time of first train of the day and their frequency of operation. For example, from city P, the first trains of the day start at 8 AM with a frequency of 90 minutes to each of R and S. A person does not spend additional time at any city other than the waiting time for the next connecting train. If the person starts from R at 7 AM and is required to visit S and return to R, what is the minimum time required?

8 AM,90 min

P   Q

5 AM,120 min

R   S

7 AM,60 min

8 AM,45 min

a) 6 hours 30 minutes   c) 4 hours 30 minutes
b) 3 hours 45 minutes   d) 5 hours 15 minutes

10) Equal sized circular regions are shaded in a square sheet of paper of 1 cm side length. Two cases, case M and case N, are considered as shown in the figures below. In the case M, four circles are shaded in the square sheet and in the case N, nine circles are shaded in the square sheet as shown. What is the ratio of the areas of unshaded regions of case M to that of case N?
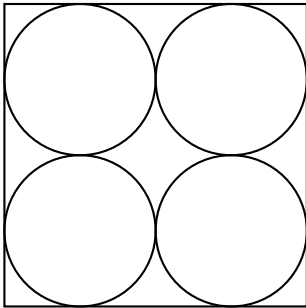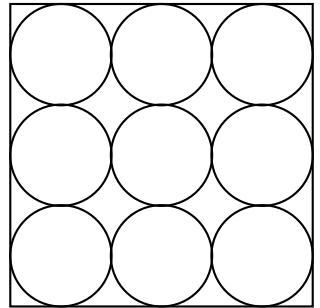
case M   case N

a) 2 : 3   b) 1 : 1   c) 3 : 2   d) 2 : 1

11) The equation of the straight line representing the tangent to the curve $y = x^2$ at the point $(1, 1)$ is

a) $y = 2x - 2$ b) $x = 2y - 1$ c) $y - 1 = 2(x - 1)$ d) $x - 1 = 2(y - 1)$

12) Let $\hat{\imath}$, $\hat{\jmath}$, and $\hat{k}$ be the unit vectors in the x, y and z directions, respectively. If the vector $\hat{\imath} + \hat{\jmath}$ is rotated about positive $\hat{k}$ by $135°$, one gets

a) $-\hat{i}$ b) $-\hat{j}$ c) $-\frac{1}{\sqrt{2}}\hat{j}$ d) $-\sqrt{2}\hat{i}$

13) Let x be a real number and $i = \sqrt{-1}$. Then the real part of $\cos(ix)$ is

    a) $\sinh x$ b) $\cosh x$ c) $\cos x$ d) $\sin x$