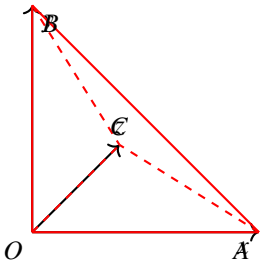
2024-GATE-ME-27-37

EE24BTECH11028 - Jadhav Rajesh

1) A rigid massless tetrahedron is placed such that vertex O is at the origin and the other three vertices a,B, and C lie on the coordinate axes as shown in the figure.The body is acted on by three point loads, of which one is acting at A along x-axis and another at point B along y-axis. For the body to be in equilibrium, the third point load acting at point o must be



a) along z-axis

b) in $x-y$ plane but not along x or y axis

c) in $y-z$ plane but not along y or z axis

d) in $z-x$ plane but not along z or x axis

2) The phases present in pearlite are

a) austenite and ferrite

b) cementite and austenite

c) ferrite and cementite

d) martensite and ferrite

3) The ”Earing” phenomenon in metal forming is associated with

a) deep drawing

b) rolling

c) extrusion

d) forging

4) The grinding wheel used to provide the best surface finish is

a) $A36L5V$

b) $A54L5V$

c) $60L5V$

d) $80L5V$

5) The allowance provided to a pattern for easy withdrawal from a sand mold is

a) finishing

b) shrinkage allowance

c) distortion allowance

d) shake allowance

6) The most suitable electrode material used for joining low alloy steels using Gas Metal Arc Welding ($GMAW$)

a) copper

b) cadmium

c) low alloy steel

d) tungsten

7) The preparatory function in computer numerical controlled (CNC) machine programing are denoted by the alphabet

a) G

b) M

c) P

d) O

8) A set of job U,V,W,X,Y,Z arrive at time $t = 0$ to a production line consisting of two workstations in series. Each jo must be processed by both workstations in sequence

(*i.e.*, *the first followed by the second*). The process time (*in minutes*) for each job on each workstation in the production line are given below.

The sequence in which the jobs must be processed by the production line if the total makespan of production is to be minimized is

Job	**U**	**V**	**W**	**X**	**Y**	**Z**
Workstation 1	5	7	3	4	6	8
Workstation 2	4	6	6	8	5	7

a) $W - X - Z - V - Y - U$

b) $W - X - V - Z - Y - U$

c) $W - X - Z - V - Y - X$

d) $U - Y - V - Z - X - W$

9) A queueing system has one single server workstation that admits an infinitely long queue. The rate of arrival of job to the queueing system follows the poisson distribution with a mean of 5 jobs/hour. The service time of the server is exponentially distributed with a man of 6 minutes. In steady state operatation of the queueing system, the probability that the server is not busy at any point in time is

a) 0.20

b) 0.17

c) 0.50

d) 0.83

10) The matrix $\begin{pmatrix} 1 & a \\ 8 & 3 \end{pmatrix}$ (*where* $a > 0$) has a negative if a is greater than

a) $\frac{3}{8}$

b) $\frac{1}{8}$

c) $\frac{1}{4}$

d) $\frac{1}{5}$

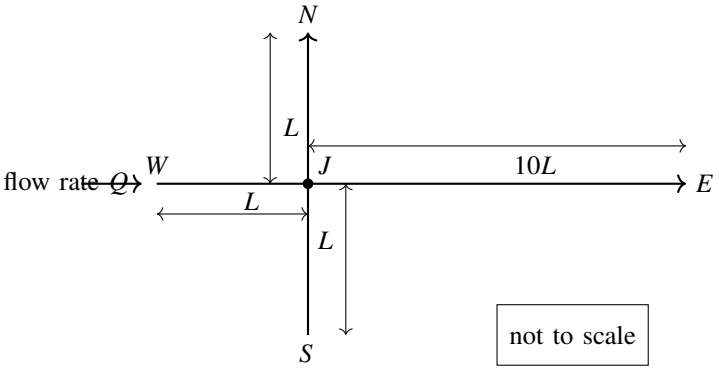
11) In the pipe network shown in the figure, all pipes have the same cross-section and

can be assumed to have the same friction factor. The pipes connecting points W, N, and S with point J have an equal length L. The pipe connecting points J and E has a length $10L$. The pressures at the ends N, E, and S are equal. The flow rate in the pipe connecting W and J is Q. Assume that the fluid flow is steady, incompressible, and the pressure losses at the pipe entrance and junction are negligible. Consider the following statements:

I : The flow rate in pipe connecting J and E is $Q/21$.

II: The pressure difference between J and N is equal to the pressure difference between J and E.

Which one of the following options is CORRECT?



a) I is True and II is False

b) I is False and II is True

c) Both I and II are True

d) Both I and II are False

12) A company orders gears in conditions identical to those considered in the economic order quantity (EOQ) model in inventory control. The annual demand is 8000 gears, the cost per order is 300 rupees, and the holding cost is 12 rupees per month per gear. The company uses an order size that is 25% more than the optimal order quantity determined by the EOQ model. The percentage change in the total cost of ordering and holding inventory from that associated with the optimal order quantity is

a) 2.5

b) 5

c) 0

d) 12.5

13) At the current basic feasible solution $(bfs)\, v_0 \left(v_0 \in R^5\right)$, the simplex method yields the following form of a linear programming problem in standard form. minimize
$z = -x_1 - 2x_2$
s.t $x_3 = 2 + 2x_1 - x_2$
$x_5 = 3 - x_1$
$x_1, x_2, x_3, x_4, x_5 \geq$ Here the objective function is written as a function of the non-basic variables. If the simplex method moves to the adjacent bfs $v_1 \left(v_1 \in R^5\right)$ that best improves the objective function, which of the following represents the objective function at v_1, assuming that the objective function is written in the same manner as above?

a) $z = -4 - 5x_1 + 2x_2$

b) $z = -3 + x_5 + 2x_2$

c) $z = -4 - 5x_1 + 2x_4$

d) $z = -6 - 5x_1 + 2x_3$