Assignment 2

EE24Btech11024 - G. Abhimanyu Koushik

2-mark Single Correct

1) Consider the following two processes:
   a. A heat source at 1200 K loses 2500 kJ of heat to a sink at 800 K.
   b. A heat source at 800 K loses 2000 kJ of heat to a sink at 500 K.

   Which of the following statements is true?

   (CE 2009)

   a) Process I is more irreversible than process II.
   b) Process II is more irreversible than process I.
   c) Irreversibitlity associated in both processes are equal
   d) Both processes are reversible

2) A fin has 5 mm diameter and 100 mm length. The thermal conductivity of the fin material is 400 $Wm^{-1}K^{-1}$. One end of the fin is maintained at $130^{\circ}C$ and its remaining surface is exposed to ambient air at $30^{\circ}C$. If the convective heat transfer coefficient is 40 $Wm^{-2}K^{-1}$, the heat loss in (in W) from the fin is

   (CE 2009)

   a) 0.08 b) 5.0 c) 7.0 d) 7.8

3) A moist air sample has a dry bulb temperature of $30^{\circ}C$ and specific humidity of 11.5 g water vapour per kg dry air. Assume molecular weight of air as 28.93. If the saturation vapour pressure of water at $30^{\circ}C$ is 4.24 kPa and the total pressure is 90 kPa, then the relative humidity (in %) of air sample is

   (CE 2009)

   a) 50.5 b) 38.5 c) 56.5 d) 68.5

4) Two pipes of inner diameter 100 mm and outer diameter 110 mm each are joined by flash-butt welding using a 30 V power supply. At the interface, 1 mm of material melts from each pipe, which has a resistance of 42.4 Ω. If the unit melt energy is 64.4 MJm^{-3}, then the time required for welding (in s) is

   (CE 2009)

   a) 1 b) 5 c) 10 d) 20

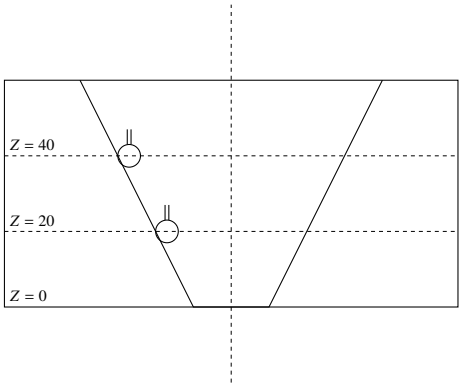
5) For tool A, Taylor's tool life exponent (n) is 0.45 and constant (K) is 90. Similarly for tool B, n = 0.3 and K = 60. The cutting speed (in m/min) above which tool A will have a higher tool life than tool B is

   (CE 2009)

   a) 26.7
   b) 42.5
   c) 80.7
   d) 142.9

6) A taper hole is inspected using a CMM with a probe of 2 mm diameter. At a height, Z = 10 mm from the bottom, 5 points are touched and a diameter of the circle (not compensated for probe size)

is obtained as 20 *mm*. Similarly, a 40 *mm* diameter is obtained at a height $Z = 40$ *mm*. The smaller diameter (in *mm*) of the hole at $Z = 0$ is



(CE 2009)

a) 13.334 b) 15.334 c) 15.442 d) 15.542

7) Annual demand for window frames is 10000. Each frame cost *Rs*. 200 and ordering cost it *Rs*. 300 per order. Inventory holding cost is *Rs*. 40 per frame per year. The supplier is willing to offer 2% discount if the order quantity is 1000 or more, and 4% if the order quantity is 2000 or more. If the total cost is to be minimized, the retailer should

(CE 2009)

a) order 200 frames every time
b) accept 2% discount
c) accept 4% discount
d) order Economic Order Quantity

8) The project activities, precedence, relationships and durations are described in the table. The critical path of the project is

Activity	**Precedence**	**Duration (in days)**
P	-	3
Q	-	4
R	P	5
S	Q	5
T	R,S	7
U	R,S	5
V	T	2
W	U	10

(CE 2009)

a) P-R-T-V b) Q-S-T-V c) P-R-U-W d) Q-S-U-w

Common Data Questions

1) In a steam power plant operating on the Rankine cycle, steam enters the turbine at 4 MPa, 350$^{\circ}C$ and exits at a pressure of 15 kPa. Then it enters the condenser and exits as saturated water. Next a pump feeds back the water to the boiler. The adiabatic efficiency of the turbine is 90%. The thermodynamic states of water and steam are given in the table.

State	$h\left(kJkg^{-1}\right)$		$s\left(kJkg^{-1}K^{-1}\right)$		$v\left(m^3kg^{-1}\right)$	
Steam: 4 MPa, 350°	3092.5		6.5821		0.06645	
Water: 15 kPa	h_f	h_g	s_f	s_g	v_f	v_g
	225.94	2599.1	0.7549	8.0085	0.001014	10.02

h is specific enthalpy, s is specific entropy and v is specific volume; subscripts f and g denote saturated liquid state and saturated vapour state.

a) The net work output $\left(kJ\ kg^{-1}\right)$ of the cycle is (CE 2009)

(a) 498 (b) 775 (c) 860 (d) 957

b) Heat supplied $\left(kJ\ kg^{-1}\right)$ to the cycle is (CE 2009)

(a) 2372 (b) 2576 (c) 2863 (d) 3092

2) Four jobs are to be processed on a machine as per data listed in the table

Job	Processing time (in days)	Due Date
1	4	6
2	7	9
3	2	19
4	8	17

a) If the Earliest DUe Date (EDD) rule is used to sequence the jobs, the number of jobs delayed is (CE 2009)

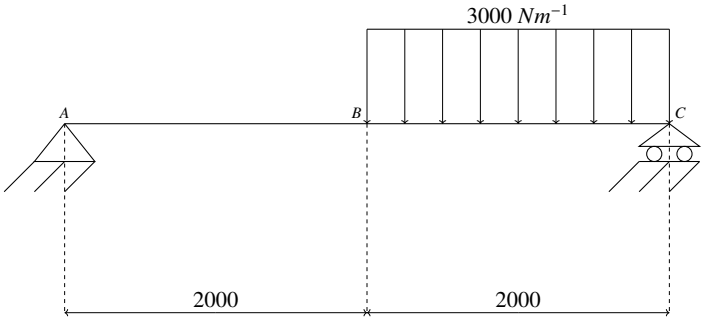
(a) 1 (b) 2 (c) 3 (d) 4

b) Using the Shortest Processing Time (SPT) rule, total tardiness is (CE 2009)

(a) 0 (b) 2 (c) 6 (d) 8

Linked Answer Questions

1) A massless beam has a loading pattern as shown in the figure. The beam is of rectangular cross-section with a width of 30 mm and height of 100 mm.



a) The maximum bending moment occurs at

(a) Location B
(b) 2675 *mm* to the right of *A*
(c) 2500 *mm* to the right of *A*
(d) 3225 *mm* to the right of *A*

b) The maximum magnitude of bending stress (in MPa) is given by

(a) 60.0 (b) 67.5 (c) 200.0 (d) 225.0