2021-March Session-03-18-2021-shift-2

AI24BTECH11006 - Bugada Roopansha

69) In a machine shop, pins of 15 mm diameter are produced at a rate of 1000 per month, and the same is consumed at a rate of 500 per month. The production and consumption continue simultaneously till the maximum inventory is reached. Then inventory is allowed to reduce to zero due to consumption. The lot size of production is 1000. If backlog is not allowed, the maximum inventory level is
   a) 400
   b) 500
   c) 600
   d) 700

70) The net requirements of an item over 5 consecutive weeks are $50 - 0 - 15 - 20 - 20$. The inventory carrying cost and ordering cost are Rs ·1 per item per week and Rs ·100 per order respectively. The starting inventory is zero. Use the least unit cost technique to develop the plan. The cost of the plan ($inRs$) is
   a) 200
   b) 250
   c) 255
   d) 260

I. Common Data for Questions 71, 72, 73

A gear set has a pinion with 20 teeth and a gear with 40 teeth. The pinion runs at 30 rev/s and transmits a power of 20 kW. The teeth are on the 20° full-depth system and have a module of 5 mm. The length of the line of action is 19 mm.

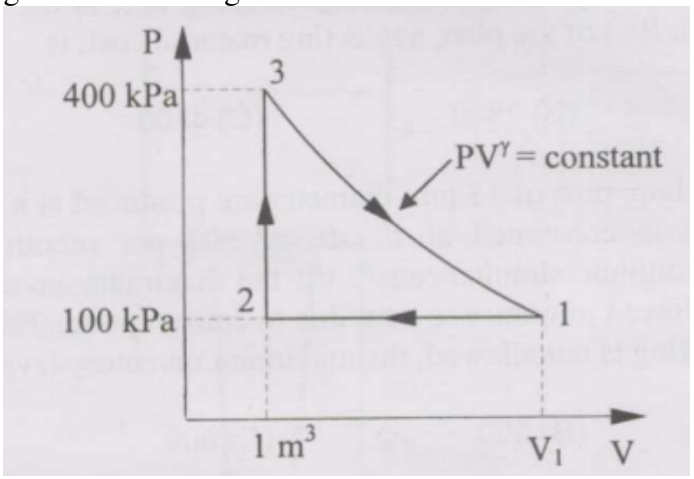
71) The center distance for the above gear set in mm is
   a) 140
   b) 150
   c) 160
   d) 170

72) The contact ratio of the contacting tooth is
   a) 1.21
   b) 1.25
   c) 1.29
   d) 1.33

73) The resultant force on the contacting gear tooth in N is
   a) 77.23
   b) 212.20
   c) 225.80
   d) 289.43

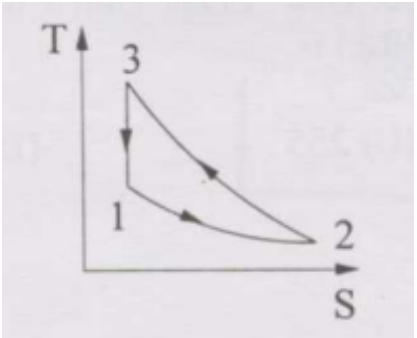
II. Common Data for Questions 74, 75

A thermodynamic cycle with an ideal gas as working fluid is shown below.

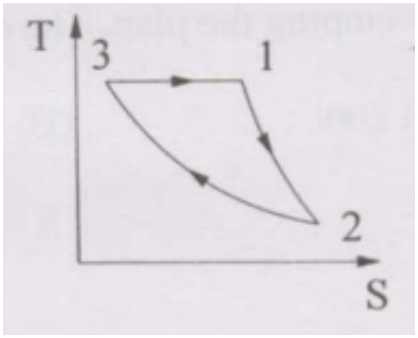


74) The above cycle is represented on T-S plane by

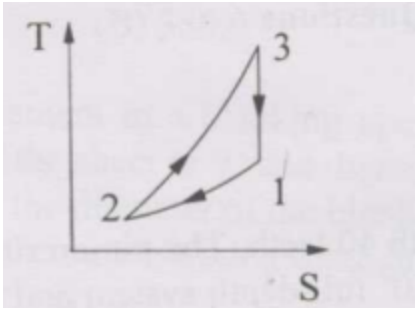
a)



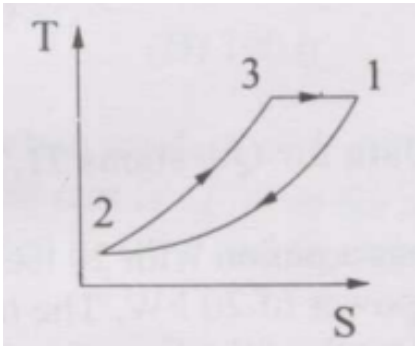
b)



c)



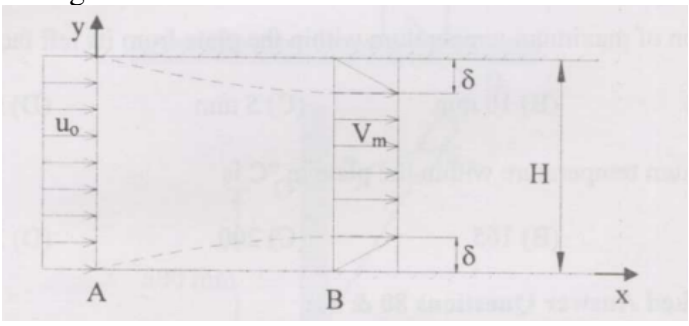
d)



75) If the specific heats of the working fluid are constant and the value of specific heat ratio y is 1.4, the thermal efficiency (%) of the cycle is
   a) 21
   b) 40.9
   c) 42.6
   d) 59.7

III. Statement for linked questions 76, 77

Consider a steady incompressible flow through a channel as shown below.



The velocity profile is uniform with a value of u_o at the inlet section A. The velocity profile at section B downstream is

$$u = \begin{cases} V_m \frac{y}{\delta} & \text{for} 0 \le y \le \delta \\ V_m & \text{for } \delta \le y \le H - \delta \\ V_m \frac{H-y}{\delta} & \text{for } H - \delta \le y \le H \end{cases}$$

76) The ratio $\frac{V_m}{u_o}$ is
   a) $\frac{1}{1-2\left(\frac{\delta}{H}\right)}$
   b) 1
   c) $\frac{1}{1-\left(\frac{\delta}{H}\right)}$
   d) $\frac{1}{1+\left(\frac{\delta}{H}\right)}$

77) The ratio $\frac{P_A - P_B}{\frac{1}{2}\delta {u_o}^2}$ where P_A and P_B are the pressures at section A and B, respectively, and δ is the density of the fluid is
   a) $\frac{1}{\left(1-\left(\frac{\delta}{H}\right)\right)^2} - 1$
   b) $\frac{1}{\left(1-\left(\frac{\delta}{H}\right)\right)^2}$
   c) $\frac{1}{\left(1-\left(\frac{2\delta}{H}\right)\right)^2} - 1$
   d) $\frac{1}{1+\left(\frac{\delta}{H}\right)}$

IV. Statment for linked question 78, 79

Consider steady one-dimensional heat flow in a plate of 20 mm thickness with a uniform heat generation of 80 MW/m^3. The left and right faces are kept at constant temperatures of 160°C and 120°C respectively. The plate has a constant thermal conductivity of 200 W/mK.

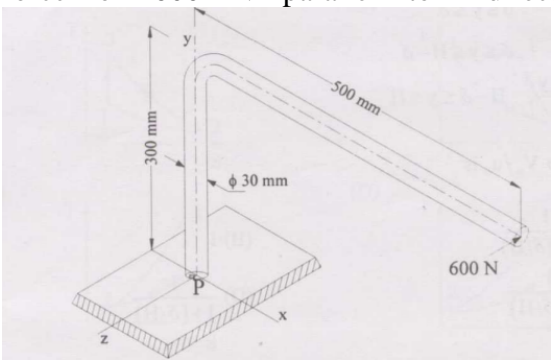
78) The location of maximum temperature within the plate from its left face is
   a) 15 mm
   b) 10 mm
   c) 5 mm
   d) 0 mm

79) The maximum temperature within the plate in °C is
   a) 160
   b) 165
   c) 200
   d) 250

V. Statment for linked question 80, 81

A machine frame shown in the figure below is subjected to a horizontal

force of 600 N parallel to z-direction.

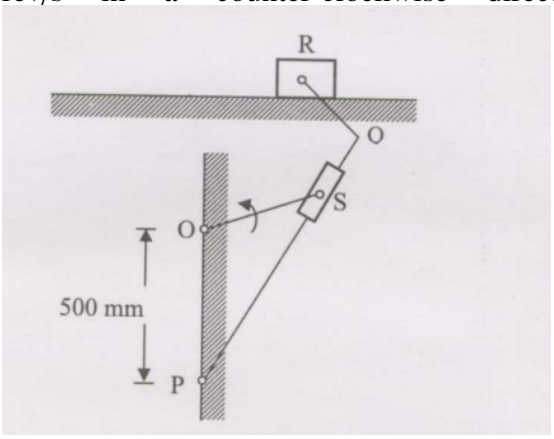


80) The normal and shear stresses in MPa at the point P are, respectively,
   a) 67.9 and 56.6
   b) 56.6 and 67.9
   c) 67.9 and 0.0
   d) 0.0 and 56.6

81) The maximum principal stress in MPa and the orientation of the corresponding principal plane in degrees are respectively
   a) -32.0 and -29.52
   b) 100.0 and 60.48
   c) 32.0 and 60.48
   d) 100.0 and -29.52

VI. Statement for linked questions82, 83

A quick return mechanism is shown below. The crank OS is driven at 2 rev/s in a counter-clockwise direction.



82) If the quick return ratio is 1 : 2, then the length of the crank in mm is
   a) 250
   b) $250\sqrt{3}$
   c) 500
   d) $500\sqrt{3}$

83) The angular speed of PQ in rev/s when the block R attains maximum speed during the forward stroke (*strokewithslowerspeed*) is
   a) $\frac{1}{3}$
   b) $\frac{2}{3}$
   c) 2
   d) 3

VII. Statement for linked questions84, 85

A low carbon steel bar of 147 mm diameter with a length of 630 mm is being turned with uncoated carbide insert. The observed tool lives are 24 min and 12 min for cutting velocities of 90 m/min and 120 m/min respectively. The feed and depth of cut are 0.2 mm/rev and 2 mm respectively. Use the unmachined diameter to calculate the cutting velocity.

84) When tool life is 20 min, the cutting velocity in m/min is
   a) 87
   b) 97
   c) 107
   d) 114

85) Neglect over-travel or approach of the tool. When tool life is 20 min, the machining time in min for a single pass is
   a) 5
   b) 10
   c) 15
   d) 20