

2009-ME-'49-60'

AI24BTECH11006 - Bugada Roopansha

49) What are the upper and lower limits of the shaft represented by $60 f_8$?

Use the following data:

- Diameter 60 lies in the diameter step of 50–80 mm.
- Fundamental tolerance unit, i , in $\mu\text{m} = 0.45(D^{1/3}) + 0.001D$, where D is the representative size in mm.
- Tolerance value for $IT8 = 25i$.
- Fundamental deviation for ' f ' shaft = $-5.5D^{0.41}$.

- a) Lower limit = 59.924 mm, Upper limit = 59.970 mm
- b) Lower limit = 59.954 mm, Upper limit = 60.000 mm
- c) Lower limit = 59.970 mm, Upper limit = 60.016 mm
- d) Lower limit = 60.000 mm, Upper limit = 60.046 mm

50) Match the items in Column I and Column II.

Column I	Column II
Metallic Chills	Support for the core
Metallic Chaplets	Reservoir of the molten metal
Riser	Control cooling of critical sections
Exothermic Padding	Progressive solidification

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

I. COMMON DATA FOR QUESTIONS 51 AND 52:

The inlet and outlet conditions of steam for an adiabatic steam turbine are as indicated in the figure. The notations are as usually followed.

- $h_1 = 3200 \frac{\text{kJ}}{\text{kg}}$
- $V_1 = 160 \frac{\text{m}}{\text{s}}$
- $Z_1 = 10 \text{ m}$
- $P_1 = 3 \text{ MPa}$
- $h_2 = 2600 \frac{\text{kJ}}{\text{kg}}$
- $V_2 = 100 \frac{\text{m}}{\text{s}}$
- $Z_2 = 6 \text{ m}$

- $P_2 = 70 \text{ kPa}$

51) If mass flow rate of steam through the turbine is $20 \frac{\text{kg}}{\text{s}}$, the power output of the turbine (in MW) is

- a) 12.157
- b) 12.941
- c) 168.001
- d) 168.785

52) Assume the above turbine to be part of a simple Rankine cycle. The density of water at the inlet to the pump is $1000 \frac{\text{kg}}{\text{m}^3}$. Ignoring kinetic and potential energy effects, the specific work (in $\frac{\text{kJ}}{\text{kg}}$) supplied to the pump is

- a) 0.293
- b) 0.351
- c) 2.930
- d) 3.510

II. COMMON DATA FOR QUESTIONS 53 AND 54:

Radiative heat transfer is intended between the inner surfaces of two very large isothermal parallel metal plates. While the upper plate (*designated as plate1*) is a black surface and is the warmer one being maintained at 727°C , the lower plate (*plate2*) is a diffuse and gray surface with an emissivity of 0.7 and is kept at 227°C . Assume that the surfaces are sufficiently large to form a two-surface enclosure and steady-state conditions to exist. Stefan-Boltzmann constant is given as $5.67 \times 10^{-8} \frac{\text{W}}{\text{m}^2 \text{K}^4}$.

53) The irradiation (in $\frac{\text{kW}}{\text{m}^2}$) for the upper plate (*plate1*) is

- a) 2.5
- b) 3.6
- c) 17.0
- d) 19.5

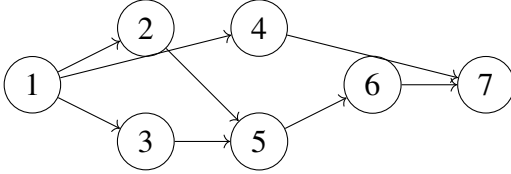
54) If plate 1 is also a diffuse and gray surface with an emissivity value of 0.8, the net radiation heat exchange (in $\frac{\text{kW}}{\text{m}^2}$) between plate 1 and plate 2 is

- a) 17.0

- b) 19.5
c) 23.0
d) 31.7

III. COMMON DATA FOR QUESTIONS 55 AND 56:

Consider the following PERT network:



The optimistic time, most likely time, and pessimistic time of all the activities are given in the table below:

Activity	Optimistic time (days)	Most likely time (days)	Pessimistic time (days)
1-2	1	2	3
1-3	5	6	7
1-4	3	5	7
2-5	5	7	9
3-5	2	4	6
5-6	4	5	6
4-7	4	6	8
6-7	2	3	4

- 55) The critical path duration of the network (indays) is
- a) 11
b) 14
c) 17
d) 18
- 56) The standard deviation of the critical path is
- a) 0.33
b) 0.55
c) 0.77
d) 1.66

IV. STATEMENT FOR LINKED ANSWER QUESTIONS 57 AND 58:

In a machining experiment, tool life was found to vary with the cutting speed in the following manner:

- 57) The exponent (n) and constant (k) of the Taylor's tool life equation are
- a) $n = 0.5$ and $k = 540$
b) $n = 1$ and $k = 4860$

Cutting speed ($\frac{m}{min}$)	Tool life (minutes)
60	81
90	36

- c) $n = -1$ and $k = 0.74$
d) $n = -0.5$ and $k = 1.155$

- 58) What is the percentage increase in tool life when the cutting speed is halved?
- a) 50%
b) 200%
c) 300%
d) 400%

V. STATEMENT FOR LINKED ANSWER QUESTIONS 59 AND 60

- 59) A 20° full depth involute spur pinion of 4 mm module and 21 teeth is to transmit 15 kW at 960 rpm. Its face width is 25 mm.
- 60) The tangential force transmitted (inN) is
- a) 3552
b) 2611
c) 1776
d) 1305
- 61) Given that the tooth geometry factor is 0.32 and the combined effect of dynamic load and allied factors intensifying the stress is 1.5; the minimum allowable stress (inMPa) for the gear material is
- a) 242.0
b) 166.5
c) 121.0
d) 74.0