

University of Mumbai
Examination 2020 under cluster 4 (PCE)

Program: BE Mechanical Engineering
 Curriculum Scheme: Rev2016
 Examination: Third Year Semester V
 Course Code: MEC503 and Course Name: Heat Transfer

Time: 1 hour

Max. Marks: 50

Note to the students:- All the Questions are compulsory and carry equal marks .

Q1.	A hollow sphere of inner radius 5 cm and outer radius 8 cm . temperature of inner surface is 363K and outer surface is 315K. The conductivity of sphere material is 2.48 W/mK Its heat transfer rate is:
Option A:	180 W
Option B:	200 W
Option C:	100 W
Option D:	150 W
Q2.	A sphere ($k = 12 \text{ W/mK}$) with mean diameter of 4 cm and initially at 25 deg C is placed in a boilingwater for 4 minutes. Biot number is 0.0694. The heat transfer coefficient is
Option A:	145 W/m ² K
Option B:	165 W/m ² K
Option C:	134 W/m ² K
Option D:	125 W/m ² K
Q3.	In a infinitely long fin, base temperature is 300 deg C, ambient temperature is 30 deg C, heat transfer coefficient is 30.17 W/mK, perimeter is 0.046 m, cross section is $9 \times 10^{-5} \text{ m}^2$, temperature at a distance of 0.38 m is
Option A:	40 deg C
Option B:	50 deg C
Option C:	58 deg C
Option D:	62 deg C
Q4.	There are two thermal resistances. The equivalent total thermal resistances when connected in parallel is 0.147 and when connected in series 1.066. The individual values of these resistances would be
Option A:	0.176 and 0.89.
Option B:	0.234 and 0.58
Option C:	0.415 and 0.22
Option D:	0.125 and 0.25
Q5.	Conductive resistance 0.142 K/W in a 10 cm thick wall what is conductivity if surface area is unity?
Option A:	0.085 W/mK
Option B:	0.07 W/mK
Option C:	0.09 W/mK

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Option D:	0.1 W/mK
Q6.	Sun's heat reaching the earth is an example of
Option A:	Convection
Option B:	Conduction
Option C:	Radiation
Option D:	Interference
Q7.	A room air temperature 300K. The outside air temperature is 313 K. The inside as well as outside convection coefficient is $10\text{W/m}^2\text{K}$. The heat transfer rate through the wall per unit area is: 16.49 W/m^2 . (Take thickness of the wall as 30 cm). The conductivity of brick materials is
Option A:	0.85 W/mK
Option B:	0.51 W/mK
Option C:	0.32 W/mK
Option D:	0.10 W/mK
Q8.	The critical radius of insulation for a cylinder equal to ? k = thermal conductivity in W/m-K , h = heat transfer coefficient in $\text{W/m}^2\text{K}$
Option A:	$2kh$
Option B:	$2k/h$
Option C:	k/h
Option D:	$2h/k$
Q9.	In a lumped parameter analysis at a particular instant body temperature is 305.62 K Biot number is 0.007143, ambient temperature is 20 deg C. The initial temperature 363 K, Fourier number is nearest to
Option A:	312
Option B:	451
Option C:	240
Option D:	402
Q10.	A 300 mm diameter sphere of conductivity 42 W/mK is exposed to an air flow (convection coefficient $120\text{W/m}^2\text{K}$) In this case which of the following is correct
Option A:	$Bi < 0.1$ and Lumped parameter is applicable
Option B:	$Bi > 0.1$ and Lumped parameter is not applicable
Option C:	$Bi < 0.1$ and Lumped parameter is not applicable
Option D:	Lumped parameter is not applicable irrespective of Bi
Q11.	Copper has high thermal conductivity because of
Option A:	Free electrons
Option B:	Phonons
Option C:	Transparency
Option D:	density

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Q12.	The thermal entry length of the tube with the Re 1000 and diameter 0.015m Prandtl number 3.91, is
Option A:	entry length is 2.9m
Option B:	entry length is 1m
Option C:	entry length is 0.1 m
Option D:	entry length is 0.2 m
Q13.	Water at 20 deg C flows through the pipe of diameter 0.01m at uniform velocity 0.5 m/s. Length of the pipe is 6.3 m. What constant heat flux to be applied over the pipe to heat the water to 80 deg C:
Option A:	80kW/m ²
Option B:	62kW/m ²
Option C:	50kW/m ²
Option D:	100kW/m ²
Q14.	In a flow over a flat plate of surface area 9m ² is maintained at constant temperature 140 deg C, the ambient temperature is 20 deg C , Re=7x 10 ⁵ and Pr=0.7154. Nusselt number for a laminar flow is given by $0.664Re^{0.5}Pr^{0.33}$ and for a turbulent flow is given by $0.037Re^{0.8}Pr^{0.33}$. Take conductivity as 0.02953 W/mK and length as 1.59 m.The heat loss rate is:
Option A:	10 kW
Option B:	500W
Option C:	1kW
Option D:	31.5 kW
Q15.	fluid having temperature equal to that of surface over which it is flowing
Option A:	Will have no hydrodynamic boundary layer
Option B:	Will have no thermal boundary layer
Option C:	Will have thermal boundary layer developing after the hydrodynamic
Option D:	Will have thermal boundary layer always greater than hydrodynamic
Q16.	Nusselt number is a function of
Option A:	Prandtl number in free convection
Option B:	Prandtl number and Reynolds number in Free convection
Option C:	Raleigh number in Free convection
Option D:	Grashof number and Prandtl number in forced convection
Q17.	Ratio of Reflected radiation to irradiation
Option A:	Reflectivity
Option B:	Absorptivity
Option C:	Transmissivity
Option D:	Emissivity

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Q18.	Emissive power of a body is proportional to
Option A:	Volume
Option B:	Fourth power of its pressure
Option C:	Density
Option D:	Fourth power of its absolute temperature
Q19.	If emissivity is one then the surface is called as
Option A:	opaque body
Option B:	black body
Option C:	grey body
Option D:	white body
Q20.	According to weins law product of maximum wavelength and absolute temperature is
Option A:	5.57 mK
Option B:	0.0029 mK
Option C:	2900 mK
Option D:	4.965 mK
Q21.	Correction is applied to LMTD for _____ flow
Option A:	Parallel
Option B:	counter
Option C:	cross
Option D:	multiphase
Q22.	For same inlet and outlet temperature of hot and cold fluids the LMTD is
Option A:	Greater for parallel flow than counter flow
Option B:	Greater for counter flow than parallel flow
Option C:	Same for both parallel flow and counter flow
Option D:	Depends on properties of fluid
Q23.	If boiler NTU is 2.133 its effectiveness is
Option A:	0.66
Option B:	0.77
Option C:	0.88
Option D:	0.56
Q24.	NTU of heat exchanger is (if overall heat transfer coefficient is 100 W/m ² K. Area is 48 m ² , C _{min} =4400)
Option A:	2.1
Option B:	1.09
Option C:	3.2
Option D:	2.3

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Q25.	Scale heat transfer coefficient is
Option A:	Reciprocal of fouling factor
Option B:	Reciprocal of over all heat transfer coefficient of dirty pipe
Option C:	Reciprocal of diffusivity of the scaling
Option D:	Equal to difference of over all heat transfer coefficient of clean pipe and dirty pipe

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Question	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	C
Q2.	D
Q3.	A
Q4	A
Q5	B
Q6	C
Q7	B
Q8.	C
Q9.	C
Q10.	B
Q11.	A
Q12.	A
Q13.	C
Q14.	D
Q15.	B
Q16.	C
Q17.	A
Q18.	D
Q19.	B
Q20.	B
Q21.	C
Q22.	B
Q23.	C
Q24.	B

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Q25.	A
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