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YMCA UNVERSITY OF SCIENCE & TECHNOLOGY,FARIDABAD

B.Tech VIth Sem EXAMINATION [redacted] 2016

Heat and Mass Transfer (Paper No.: MU-306)

Time: 3hrs | Maximum Marks: 60

Note: Part I: Question no 1 is of short answer type question and is compulsory.
Part II: Attempt any four questions out of six questions.

	Part I	
Que. 1	a) Give few examples where conduction plays a major role. b) State the effect of impurities on the thermal conductivity of a metal. c) Under what conditions does the fin efficiency become nearly 100%? d) What do you understand by term boundary layer thickness? e) Define lamberts cosine law of radiation? f) Define emissivity. What are different types of emissivity? g) Explain the phenomenon of heat transfer by forced convection. Cite suitable examples to illustrate your answer. h) What do you understand by nucleation in nucleate boiling? i) What is meant by fouling factor? How does it affect the performance of a heat exchanger? j) What is mass transfer? Give few examples of mass transfer.	2×10= 20
	Part II	
Que. 2	Derive 3 dimensional heat conduction equations for steady state heat flow, with no internal heat generation in spherical coordinates.	10
Que. 3	A turbine blade 5cm long, 4.5 cm^2, cross-sectional area and 10cm perimeter is made of stainless of thermal conductivity 100kJ/m-hr-deg. The temperature at the root of blade is 500°C and it is exposed to products of combustion passing through the turbine at 850°C. Determine the temperature at the middle of blade and the rate of heat flow from it. The film coefficient between the blade and the combustion gases is 1100kJ/m^2-hr-deg. The blade may be treated as a fin losing heat at the tip.	10
Que. 4	In a certain pharmaceutical process, castor oil at 35°C flows over plate at 6cm/s. The plate is 6m long, is heated uniformly and maintained at a surface temperature of 95°C. Make calculations (a) hydrodynamic and thermal boundary layer thicknesses at the trailing edge of the plate, (b) total drag per unit width on one side of the plate, (c) local heat transfer coefficient at the end of the plate (d) total heat flux from the surface per unit width. At the mean film 60°C fluid properties are $\alpha=7.2\times10^{-3}$ m^2/s, k=0.213W/mK, $v=0.65\times10^{-4}$m^2/s, $\rho=956.8$kg/m^3	10
Que. 5	Saturated steam at a temperature of 65°C condenses on a vertical surface at 55°C. Determine the thickness of the condensate film at locations 0.2, 0.4, 0.6, 0.8, 1 m from the top. Also determine the condensate flow, the film Reynolds number, the local and average values of convective heat transfer coefficients at these locations.	10
Que. 6	a) Define intensity of radiation and prove that the intensity of normal radiation is $1/\pi$ times the total emissive power. b) It has been observed that when the sun is overhead the earth's surface on a clear day, the radiation received by the earth's surface is 1 kW/m^2 and an additional 0.3 kW/m^2 is absorbed by the earth's atmosphere. Assuming the sun to be black body, determine the temperature of the sun. Given: dia of sun = 1.39×19^9m; dia f earth 12.6×10^6m; distance between the sun and earth = 1.5×10^{11}m	04 06
Que. 7	a) State and explain the different modes of Mass transfer. b) Give an expression for LMTD in the case of a counter flow double tube heat exchanger when both the fluids have same value for the heat capacity.	04 06