

Model Question Paper-1/2 with effect from 2021(CBCS Scheme)

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7th Semester B.E. Degree Examination Subject Title Conjugate Heat Transfer

TIME: 03 Hours

Max. Marks: 100

- Note: 01. 02. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.
03. Assume missing data suitably
04. Use of heat transfer data handbook is permitted

Module -1			*Bloom's Taxonomy Level	COs	Marks
Q.01	a	Discuss the history of Conjugate Heat transfer	L1	CO1	05
	b	Discuss a problem of conjugate heat transfer	L2	CO1	05
	c	What is body domain? Discuss it's key aspects	L3	CO2	10
OR					
Q.02	a	What are meant by initial, boundary and conjugate conditions	L3	CO2	10
	b	Write a short note on conjugate heat transfer applications	L3	CO1	10
	c				
Module-2					
Q. 03	a	State and Explain Fourier law of heat conduction	L1	CO1	05
	b	Derive expression for temperature distribution for a fin and it's general solution	L3	CO3	05
	c	What is lumped heat analysis. Derive an expression for temperature distribution for lumped heat analysis	L4	CO3	10
OR					
Q.04	a	Thin fins of brass whose $k=75\text{W/m}^\circ\text{C}$ are welded longitudinally on a 5cm diameter brass cylinder which stands vertically and is surrounded by air at 20°C . The heat transfer coefficient from metal surface to air is $17\text{W/m}^2\text{-C}$. IF 16 uniformly spaced rectangular fins are used each 0.8mm thick and extending 1.25cm from the cylinder, what is rate of heat transfer from the cylinder per meter length to air when the cylinder surface maintained at 150°C .	L3	CO3	10
	b	What is thermal resistance? Explain	L2	CO1	05
	c	A steel rod of diameter $D=2\text{cm}$, length $L=25\text{cm}$ and thermal conductivity $k=50\text{W/m-k}$ is exposed to ambient air at $T_\infty=20^\circ\text{C}$ with a heat transfer coefficient $h=64\text{W/m}^2\text{k}$. If one end of the rod is maintained at a temperature of 120°C . Calculate the heat loss from the rod considering it as (i) long fin (ii) insulated end fin	L3	CO3	05
Module-3					
Q. 05	a	Explain multiphase flow heat transfer? What is Phase change heat transfer?	L2	CO1	05
	b	Write down empirical equations for forced convection heat transfer for five different cases	L1	CO2	05

	c	Water in a tank at 30°C is heated by passing through a vertical pipe 50cm long and 5cm outer diameter. If the pipe surface is maintained at 80°C, determine the time required to heat 100 liters of water to 50°C.	L3	CO3	10
OR					
Q. 06	a	Explain with examples what is static and dynamic heat transfer	L2	CO2	10
	b	Explain with neat sketch development of thermal boundary layout for pipe flow	L2	CO2	05
	c	Air at 25°C and atmospheric pressure flows across a heated cylinder of diameter 7.5cm. If the velocity of air flow is 1.2m/s and the cylinder surface is maintained at 95°C, compute the rate of heat transfer	L3	CO3	05
Module-4					
Q. 07	a	Write short note on radiation heat transfer	L1	CO1	05
	b	What is black and gray bodies explain	L2	CO1	05
	c	Explain (i) Stefan Boltzmann Law (ii) Planck's Law	L1	CO2	10
OR					
Q. 08	a	What is LMTD. Write it for (i) parallel flow (ii) counter flow heat exchanger	L3	CO2	05
	b	A heat exchanger has effectiveness of 0.5 when the flow is counter and the thermal capacity of one fluid is twice that of other fluid. Calculate Effectiveness of the exchanger if the direction of flow of one of the fluid is reversed with the same mass flow rates as before	L3	CO3	10
	c	What is NTU method? Explain	L3	CO2	05
Module-5					
Q. 09	a	Construct a general solution of heat conduction equation	L4	CO3	10
	b	What is factor of conjugation? Explain	L2	CO1	05
	c	What is Harmonic and inverse harmonic law of oscillation? Explain	L2	CO1	05
OR					
Q. 10	a	What are meant by (i) Nucleate boiling (ii) Film boiling? Explain with a Sketch	L1	CO2	10
	b	A horizontal condenser is to be designed to condense 225Kg of steam per hour at a pressure of 0.15 bar. A square array of 400 tubes, each of 6mm in diameter is available, if the surface temperature is to be maintained at 26°C. Find the length of the tube	L3	CO3	05
	c	Explain (i) Dropwise and (ii) Filmwise condensation	L2	CO2	05

*Bloom's Taxonomy Level: Indicate as L1, L2, L3, L4, etc. It is also desirable to indicate the COs and POs to be attained by every bit of questions.