ADAMAS UNIVERSITY
END-SEMESTER EXAMINATION (JULY 2020)
(Academic Session: 2019 – 20, Semester Term: Jan. 2020 – May 2020)

Name of the Program: B.Tech　　　　　　　　　　　　Semester: IV
Stream: ME
PAPER TITLE: HEAT TRANSFER　　　　　　　　　　PAPER CODE: EME42102
Maximum Marks: 40　　　　　　　　　　　　　　　　Time duration: 3 hours
Total No of questions: 08　　　　　　　　　　　　　Total No of Pages:

Instruction to the candidate:

1) At top sheet, clearly mention Name, University Roll No, Enrolment No, Paper Name & Code, Date of Exam.
2) All parts of a Question should be answered consecutively. Each answer should start from a fresh page.
3) Assumptions made if any, should be started clearly at the beginning of your answer.

Answer all the Groups
Group A
(Answer all the questions)

$$5 \times 1 = 5$$

1. **a)** Define and state the physical interpretation of the Biot number.
   b) State the condition which must be satisfied to treat the temperature distribution in a fin as one dimensional.
   c) What is a lumped System?
   d) Two fluids, with different properties, flow with equal free stream velocities parallel to a flat plate. What property of the fluid determines whether the velocity boundary layer of one is thicker than the other?
   e) Define overall heat transfer coefficient.

Group B
(Answer any three questions)

$$3 \times 5 = 15$$

2. What is Logarithmic mean area for hollow cylinder? A steel pipe with 50mm Odis covered with a 6.4mm asbestos insulation (k=0.166w/mk) followed by a 25mm layer of fiber-glass insulation (k=0.0485w/mk). The pipe wall temperature is 393k and the outside insulation temperature is 311k. Calculate the interface temperature between the asbestos and fiber-glass. (1+4)

3. Describe the various types of Fins with neat sketch. It is required to heat oil to about 300°C for frying purpose. A ladle is used in the frying. The section of the handle is 5mmx18mm. The surrounding is 30°C.The conductivity of the material is 205w/m°C. If the temperature at a distance of 380mm from the oil should not reach 40°C, determine the convective heat transfer coefficient. (3+2)

4. Derive the expression of Critical thickness of insulation for sphere. Calculate the critical radius of insulation for asbestos (k=0.172w/mk) surrounding a pipe and exposed to room air at 300k with h=2.8w/mk. Calculate the heat loss from a 475k, 60mm diameter pipe covered the critical radius of insulation and without insulation. (2+3)

5. Describe the Lumped parameter analysis for a Transient heat transfer. Derive the expression of

$$\frac{\theta}{\theta_i} = \frac{t - t_a}{t_i - t_a} = e^{-BiF_o}$$ (3+2)

Group C
(Answer any two questions)

$$2 \times 10 = 20$$

6. a) Describe the Stefan-Boltzman law of Radiation heat transfer. (2)
   b) Derive the general heat conduction equation in Cartesian coordinates with the following boundary condition is applied- heat flow in 1dimension, Steady state and no heat generation in the system. (8)

7. a) Write a short note on the following-Fourier Number (Fo), Grashof Number (Gr). (4)
   b) The pressure difference dP in a pipe of diameter D and length l due to turbulent flow depends on the velocity V, Viscosity μ, density ρ and roughness k. Using Buckingham's π theorem, obtain an expression for dP. (6)

8. a) Describe the Fourier's laws of heat conduction and its assumption. (4)
   b) An exterior wall of a house may be approximated by a 0.1m layer of common brick (k=0.7w/m°C) followed by a 0.04m layer of gypsum plaster (k=0.48w/m°C) what thickness of loosely packed rock wood insulation (k=0.065w/m°) should be added to reduce the heat loss or gain through the wall by 80%. (6)

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SCHOOL OF ENGINEERING AND TECHNOLOGY
END-SEMESTER EXAMINATION: JULY 2020

Name of the Program: B. Tech   Semester: IV
Stream: ME
PAPER TITLE: MANUFACTURING PROCESS   PAPER CODE: EME42104
Maximum Marks: 40   Time duration: 3 hours
Total No of questions: 08   Total No of Pages: 02

Instruction for the Candidate:
1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
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Answer all the Groups
Group A
Answer all the questions of the following   **5 × 1 = 5**

1.   a) What is the purpose of a Riser?

b) Classify Welding

c) Define Extrusion process

d) State Chovirnov's equation for solidification time of a casting

e) Two cubical castings of the same metal and sizes of 2 cm side and 4 cm side are moulded in green sand. If the smaller casting solidifies in 2 mins, calculate the expected time of solidifications of large casting.

GROUP –B
(Short Answer Type Questions)
Answer *any three* of the following   **3 × 5 = 15**

2.   Discuss different types of allowances in pattern

3.   Explain closed die forging process with proper diagram

4.   State the differences between hot working and cold working of metals

5.   Determine the dimensions of a cylindrical riser to be used for casting an Aluminum cube of side 15cm, the volume shrinkage of Aluminum during solidification is 6.5%.

6. i) Classify metal forming processes
ii) In a sand casting operation, the total liquid head is maintained constant such that it is equal to the mould height. The time taken to fill the mould with a top gate is t_A . If the same mould is filled with a bottom gate, then the time taken is t_B . Ignore the time required to fill the running and frictional effects. Assume atmospheric pressure at the top molten metal surfaces. Establish the relation between and t_A and t_B.   [5+5]

7. i) Explain the Progressive forming process.
ii) Discuss about various types of flames used in Gas welding.   [4+6]

8. i) In a sand casting process, a sprue of 10mm base dia and 250mm height leads to a runner which fills a cubical mold cavity of 100mm side. Estimate the volume flow rate in mm^3/s and the mould filling time in sec.
ii) Draw a neat sketch of Gating system in moulding and mention the uses of various elements. [3+7]

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END-SEMESTER EXAMINATION: JULY 2020

Name of the Program: B. Tech   Semester: IV
Stream: ME
PAPER TITLE: Solid Mechanics   PAPER CODE: EME42106
Maximum Marks: 40   Time duration: 3 hours
Total No of questions: 08   Total No of Pages: 02

Instruction for the Candidate:
1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
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Answer all the Groups
Group A
Answer all the questions of the following   **5 × 1 = 5**

1. **a)** In a tension test, gage diameter= 10 mm, gage length =50 mm, and the maximum load reported as 300 KN. What will be the ultimate tensile strength?

   b) In a Tensile test strain of 0.0025 against the stress of 145 MPa of a material within its elastic range. Calculate elastic Modulus (in GPa)?

   c) A steel bar of 8 mm is heated from 25° C to 50° C and it is free to expand. The bar Will induce which kind of stress. Give your comment.

   d) Define stress and strain in brief.

   e) Differentiate between beam and column. Define buckling.

GROUP –B
(**Short Answer Type Questions**)
Answer *any three* of the following   **3 × 5 = 15**

2. Draw the schematic of the stress-strain graph for mild steel and indicate the ultimate strength, elastic modulus, yield strength, proportional limit on the graph.

3. A steel bar of stepped cross section is carrying a number of axial forces as shown in the figure 1. The diameter of portions AB, BC and CD are 20 mm, 30 mm and 20 mm respectively. Determine (i) magnitude of load P for equilibrium, (ii) normal stress and strain in each portion and (iii) total change in length of the bar. Take E = 2.1 x 10^5 N/mm^2 .
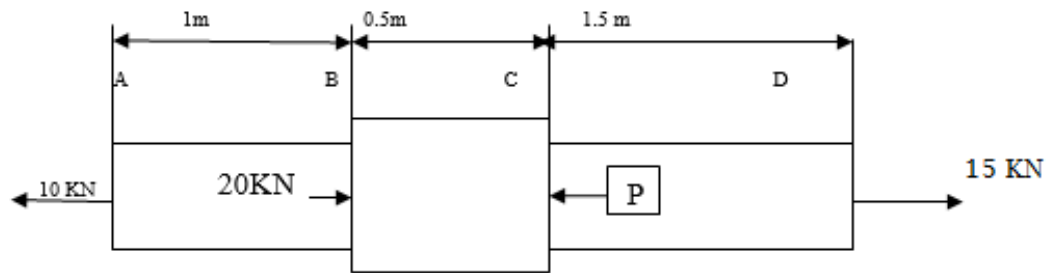
Figure 1

4. Derive the deflection equation $M = \dfrac{d^2y}{dx^2}$,with usual notations.

5. Derive the Torsion equation $\dfrac{T}{J} = \dfrac{\tau}{r} = \dfrac{G\theta}{l}$ with usual notations.

GROUP –C
(**Long Answer Type Questions**)
Answer *any two* of the following $2 \times 10 = 20$

6. Explain (i) Shear stress, (ii) Poisson's ratio, (iii) Modulus of elasticity, (iv) Bulk modulus (v) Volumetric strain, (vi) Thermal stress

7. Define bulk modulus and hence deduce the relation $E = 3K(1 - 2\mu)$ where *E, K* and μ are the Young's modulus, Bulk modulus and Poisson's ratio respectively.

8. Prove that:
(i)   Rate of change of shear force is equal to intensity of loading.
(ii)   Rate of change of bending moment is equal to shear force.

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Name of the Program: B. Tech   Semester: IV
Stream: ME
PAPER TITLE: Characterisation and Performance of Engineering Materials PAPER CODE: EME42108
Maximum Marks: 40   Time duration: 3 Hours
Total No of questions: 08   Total No of Pages: 1

Instruction to the Candidate:
1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

Answer all the Groups
Group A
Answer all the questions of the following   **5 × 1 = 5**

1.   **a)** Define Endurance limit.
     b) What is fatigue limit of a material?
     c) What are super alloys?
     d) Define glass transition temperature.
     e) What is stress corrosion cracking?

GROUP –B
(**Short Answer Type Questions**)
Answer *any three* of the following   **3 × 5 = 15**

2.   Explain why thicker sections are more susceptible to cracking during hardening heat treatment.
3.   What is tempered glass and how can it be produced?   2+3
4.   Mention important characteristics of thermoplastics. Point out whether they can be processed into different required shapes at elevated temperatures or low temperatures.   2+3
5.   Explain, with examples, why materials for machine parts and structural components used at elevated temperatures must be creep-resistant.

GROUP –C
(**Long Answer Type Questions**)
Answer *any two* of the following   **2 × 10 = 20**

6.   Explain different wear Mechanisms. How can galvanic corrosion be prevented?   6+4
7.   For refractory ceramic materials, cite three characteristics that improve with and two characteristics that are adversely affected by increasing porosity. Why are borosilicate glasses and fused silica resistant to thermal shock?   5+5
8.   What are the general differences in strengthening mechanism between large-particle and dispersion strengthened particle-reinforced composites? For a polymer-matrix fiber-reinforced composite, i) compare the desired mechanical characteristics of matrix and fiber phases and ii) mention two reasons why there must be a strong bond between fiber and matrix at their interface.   4+6

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Name of the Program: BCA/ BTECH   Semester: IV
Stream: CSE/ECE/EE/ME/CE
PAPER TITLE: HSS IV (Economics for Engineers)
PAPER CODE: HEC42180
Maximum Marks: 40   Time duration: 3 Hours
Total No of questions: 12   Total No of Pages: 02

Instruction to the Candidate:
1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

Section A

*(Answer any **FIVE** of the following questions)*   **Marks: 5*2=10**

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1. State the Law of Demand.

2. What do you mean by Perfectly Elastic demand?

3. What do you mean by Opportunity Cost?

4. What do you mean by Income effect?

5. Explain two features of Perfectly Competitive market.

6. Why does an investor want to hold a portfolio?

Section B

*(Answer any **TWO** of the following questions)*   **Marks: 2*5=10**

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7. State and explain the features of Monopolistic Competition.

8. Distinguish between Cardinal and Ordinal utility theory. Mention any two exceptions to the law of

   demand.   (2+3)

9. Suppose due to adequate rainfall, there has been a good harvest for mangoes. How will the equilibrium price and quantity demanded change under the new situation? Explain diagrammatically.

Section C

*(Answer any **TWO** of the following questions)*   **Marks: 2*10=20**

10. Discuss the common characteristics of infrastructure assets.

11. What do you mean by Own Price, Cross Price and Income Elasticity of demand? Explain with examples.

12. Distinguish between Increase in demand and Extension of demand. What do you mean by Giffen goods?   (8+2)

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END-SEMESTER EXAMINATION: JULY 2020

Name of the Program: B. Tech   Semester: IV
Stream: MECHANICAL ENGINEERING
PAPER TITLE: Numerical Algorithm and Convergence   PAPER CODE: SMA42104
Maximum Marks: 40   Time duration: 3 hours
Total No of questions: 08   Total No of Pages: 01

Instruction for the Candidate:
1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, Date of Exam.
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Answer all the Groups
Group A
Answer all the questions of the following   **$5 \times 1 = 5$**

1. **a)** Show that $E = (1 - \nabla)^{-1}$
    b) Write a short note on Truncation error.
    c) Round off the number $\pi = 3.141592654$ to five, four and three significant digits.
    d) For an equation $f(x) = 0$, what is the condition that a root must lie in $[a, b]$.
    e) Is Newton's Forward and Backward method useful for all situation ? Justify.

GROUP –B
(Short Answer Type Questions)
Answer *any three* of the following   **$3 \times 5 = 15$**

2. Solve the equation $x^3 + x^2 - 100 = 0$ using Bisection method correct upto 3 significant digits.
3. If the curve $y = f(x)$ takes the value $f(0) = 3, f(3) = 18, f(9) = 896$, find $f(2)$.
4. Find the difference table using Newton's divided difference formula

x	0	1	4	5
y	-1	7	26	124

5. Solve $\frac{dy}{dx} = y - x$, $y(0) = 1$ at $x = 0.2$ by Picard's Method.

GROUP –C
(Long Answer Type Questions)
Answer *any two* of the following   **$2 \times 10 = 20$**

6. Solve the following system $\begin{array}{l} 2x - y + z = 3 \\ x + y + z = 6 \\ 3x + y - z = 2 \end{array}$ by LU factorization method.

7. Using Runge-Kutta method of order 4, solve the ODE $\frac{dy}{dx} = 2x + y$, $y(0) = 1$ at $x = 1.2$ and 1.4

8. Evaluate the integration $\int_0^1 \frac{dx}{1+x^2}$ by Trapezoidal and Simpson's 3/8 rule and calculate the value of π in both cases.