

**MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)**

(Affiliated to JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD)  
Gundlapochampally (H), Maisammaguda (V), Medchal (M), Medchal-Malkajgiri (Dist), Hyderabad

**II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, MAY-2019**Subject: Thermodynamics

Branch: ME

Time: 3 hours

Max. Marks: 75

**PART – A****I.** Answer **ALL** questions of the following**5x1Mark=5 Marks**

1. Explain briefly about the Zero<sup>th</sup> Law of Thermodynamics
2. Explain the term “Availability”?
3. What will be the entropy change for an ideal gas in a rigid tank if the temperature remains constant due to heat transfer?
4. Define the term Enthalpy
5. When do the DBT, WBT and DPT become equal?

**II.** Answer **ALL** questions of the following**10x2Marks=20 Marks**

1. What is the difference between Heat and Internal energy?
2. What is meant by Mechanical equilibrium?
3. Explain about thermal reservoir.
4. Define Entropy.
5. Define specific heat at constant pressure and write down its formula?
6. Write short notes on internal energy.
7. What are the Assumptions made in air standard cycle Analysis?
8. Explain about cut-off ratio.
9. Define Degree of Saturation.
10. What is Dew point temperature?

**PART-B**Answer **ALL** questions of the following**5x10 Marks= 50Marks**

1. a) Prove that Internal energy is a property of a thermodynamic system.  
b) A stationary mass of gas is compressed without friction from an initial state of  $0.3\text{m}^3$  and  $0.105\text{MPa}$  to final state of  $0.15\text{ m}^3$ , pressure remaining constant during the process. There is a transfer of  $37.6\text{kJ}$  of heat from gas during the process. How much does the Internal energy of gas change.

**OR**

2. a) Explain about Quasi static process?  
b) A Fluid system undergoes a non flow frictionless process from  $v_1 = 0.2\text{ m}^3$  and  $v_2=0.06\text{ m}^3$  in accordance with  $v = 1.05/(p-1)$  where  $p$  is in bar. During the process, the fluid system rejects  $12\text{kJ}$  of heat. Determine the change in enthalpy.

3. a) What is meant by heat engine? Explain in detail.  
 b) Two reversible heat engines are hooked up in a series so that the heat rejected by the first engine is absorbed by the second heat engine. The upstream engine receives 400 KW of heat from the source at 875 K, while the downstream engine rejects heat to the sink at 275 K. If the work output rate of upstream engine is twice as much as that of the downstream one, determine: i) the thermal efficiency of both engines ii) the heat rejection by the downstream engine iii) the temperature of the intermediate reservoir.

OR

4. a) Explain the difference between the maximum useful work and useful work as concerned to the availability of a closed system?  
 b) 2500 kg of oil per hour is cooled from 150°C to 50°C using 5000kg of water per hour at 21°C. If the specific heat of oil is 2.5 kJ/kg-°C, find the net change in entropy and available energy for a sink temperature of 21°C.
5. a) Derive Clausius - Clapeyron equation for pure substances. State its significance.  
 b) 2kg of Wet steam at 7bar was injected in a barrel type of calorimeter. The total mass of water and water equivalent of the calorimeter was 60kg at 15°C. The final condition of the mixture from the condensation of steam was 35°C. Calculate the dryness fraction of the sample of steam. Assume specific heat of water,  $C = 4.2 \text{ KJ/Kg K}$ .

OR

6. a) Explain the term "quality of steam". Differentiate between wet, dry saturated and superheated steam.  
 b) If a certain amount of steam is produced at a pressure of 8 bar and dryness fraction 0.8, Calculate, (i) external work done during evaporation and (ii) The latent heat of steam
7. a) By making use of P-V (pressure-volume) and T-S (temperature-entropy) diagrams distinguish Atkinson and Otto cycles. **4M**  
 b) Determine the efficiency of an ideal Atkinson cycle for a compression ratio of 6 & with a maximum pressure of  $2 \times 10^6 \text{ Pa}$ . The condition of air before isentropic compression can be taken as  $10^5 \text{ Pa}$  & 27°C. **6M**

OR

8. a) Explain Otto cycle with neat diagram?  
 b) In an Otto cycle, the pressure limits of  $100 \text{ kN/m}^2$  and  $2000 \text{ kN/m}^2$ . The compression ratio is 4. Calculate, (i) The thermal efficiency (ii) Mean effective Pressure
9. a) Draw a PH diagram of a steam cycle. **2M**  
 b) With neat schematic and T-s diagrams explain simple aircraft refrigeration system. **4M**  
 c) Compare ideal and actual vapour compression cycles with P-h diagrams and for each process explain the reason for its deviation. **4M**

OR

10. a) Explain the terms used in Psychometry?  
 b) In an air conditioning plant  $600 \text{ m}^3/\text{min}$  of recirculated air at 25°C DBT and 60% R.H. is mixed with  $200 \text{ m}^3/\text{min}$  of fresh air at 35°C DBT and 26°C WBT. The mixed air is further cooled to 20°C DBT maintaining specific humidity constant. Find the condition of air after mixing and capacity of cooling coil in tones of refrigeration.

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**II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, MAY-2019**Subject: Metallurgy and Materials Science

Branch: ME

Time: 3 hours

Max. Marks: 75

**PART – A****I.** Answer ALL questions of the following**5x1Mark=5 Marks**

1. What is the difference between ordered solid solution and disordered solid solution?
2. Write eutectoid reaction general equation.
3. What material is best for damping?
4. What is mean by tempering?
5. Define matrix in composites?

**II.** Answer ALL questions of the following**10x2Marks=20 Marks**

1. What are the intermediate alloy phases?
2. Explain Hume-Rothery rules for Solid Solution
3. Define phase rules.
4. What is the difference between  $\alpha$ -iron and ferrite?
5. Define Tool steel.
6. Write composition & applications of white cast iron
7. What is the use of TTT diagram?
8. What are the advantages of Titanium alloys
9. Define the term ceramics. Give examples for different traditional ceramics
10. Properties and applications of cermets

**PART-B**

Answer ALL questions of the following

**5x10 Marks= 50Marks**

1. What is solid solution? Explain in detail about the types of solid solutions with Examples?  
**OR**
2. What are the different types of bonding systems in solids?
3. Draw the equilibrium diagram of iron-carbon system and discuss the transformations that take place from melting point to room temperature for 0.8%, 2% and 4.3% of carbon  
**OR**
4. Explain different transformations in the solid state with example.
5. Explain the structure, composition and properties of gray cast iron.  
**OR**
6. Give the composition, properties and uses of
  - i) White cast iron
  - ii) Nodular iron
  - iii) Malleable cast iron
7. Draw the TTT diagram for eutectoid steel & explain the different micro structure obtained at various cooling rates.  
**OR**
8. Mention the types of heat treatment processes. Explain with a suitable sketch the full annealing process.
9. Explain the following for production of FRP. a) Spray lay-up process b) Pultrusion process  
**OR**
10. State merits of composite materials over the alloys based up on applications & processing methods?



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**II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, MAY-2019**Subject: Mechanics of Solids

Branch: ME

Time: 3 hours

Max. Marks: 75

**PART – A****I.** Answer ALL questions of the following**5x1Mark=5 Marks**

1. Define the term elasticity.
2. Write the relation between rate of change of bending moment with shear force at any section.
3. Define section modulus
4. Briefly explain the theory of pure torsion.
5. How do you distinguish between thin and thick pressure shells?

**II.** Answer ALL questions of the following**10x2Marks=20 Marks**

1. Derive the formula for the elongation of a circular rod under the action of axial load.
2. Draw the neat sketch of stress - strain diagram of mild steel and all points.
3. What is the maximum bending moment S.S.B of length L carrying UDL w/ unit run over the entire Span?
4. What are the main types of supports? Distinguish between roller and hinged supports.
5. Explain the limitations of flexure equation.
6. Write and state the bending equation
7. What is a deficient frame and redundant frame?
8. State any three assumptions made in the theory of simple torsion.
9. Explain the method of joints to analysis a frame and its limitations.
10. What is meant by perfect frame?

**PART-B**

Answer ALL questions of the following

**5x10 Marks= 50Marks**

1. Prove that Poisson's ratio for the material of a body is 0.5, if its volume does not change when stressed. Prove also that Poisson's ratio is zero when there is no lateral deformation when a member is axially stressed.

**OR**

2. A steel bar of cross sectional area  $60 \text{ cm}^2$  is rigidly connected to a copper bar of  $40 \text{ cm}^2$  cross sectional area. Both the bars are 1.5 metres in length when the temperature of compound bar is raised by  $2000^\circ\text{C}$ , calculate the stresses in the two material. Take  $E_s=20 \times 10^4 \text{ N/mm}^2$ ,  $E_c = 12 \times 10^4 \text{ N/mm}^2$ ,  $\alpha_s=12 \times 10^{-6}/^\circ\text{C}$ ,  $\alpha_c= 18 \times 10^{-6}/^\circ\text{C}$ .
3. A simply supported beam of length 8m rest on supports 6m apart, the right hand end is overhanging by 2m. The beam carries a uniformly distributed load of  $1500 \text{ N/m}$  over the entire length. Draw Shear Force and Bending moment diagrams for the beam and find the point of contra flexure.

**OR**

4. a) How do you classify loads? Give examples  
b) A simply supported beam of length 5m carries a uniformly increasing load of  $800 \text{ N/m}$  run at one end to  $1600 \text{ N/m}$  run at the other end. Draw the SF and BM diagrams for the beam

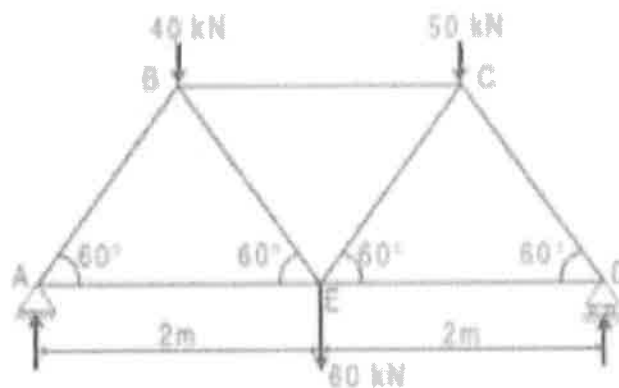
5. A rectangular beam 6m long possess section 400mmx 250mm the section modulus about the neutral axis is  $1444200 \text{ mm}^3$  and self weight of the beam is 822N/m run. Find the maximum bending stress set up in the beam material.

OR

6. A beam of I section 400 mm x 180 mm has a web and flange thickness 20 mm. Calculate the maximum intensity of shear stress across the section and sketch the shear stress distribution across the section of the beam, it carries a shearing force of 300KN at a section.
7. A horizontal beam of symmetrical simply supported at the ends, carries a load whose intensity varies uniformly from 10 kN/m at one end to 72 kN/m at the other end. Find the central deflection, if the span is 6m and the section is 450mm deep and maximum bending stress is  $90 \text{ N/mm}^2$ . Take  $E = 2 \times 10^5 \text{ N/mm}^2$ .

OR

8. A hollow shaft with diameter ratio  $3/5$  is required to transmit 450 KW at 120 rpm with uniform twisting moment. The shear stress in the shaft must not exceed 60 MPa and the twist in a length of 2.5 m must not exceed one degree. Calculate the maximum external diameter of the shaft satisfying these conditions. Take the modulus of rigidity,  $G = 80 \text{ GPa}$ .
9. Determine the forces in all the members of the truss shown in Fig. and indicate the magnitude and nature of forces on the diagram of the truss. All inclined members are at  $60^\circ$  to horizontal and length of each member is 2m.



OR

10. The air vessel of torpedo is 530 mm external diameter and 10mm thick, the length being 1830 mm. Find the change in the external and the length changed to  $10.5 \text{ N/mm}^2$  internal pressure take  $E = 2.1 \times 10^5 \text{ N/mm}^2$  and the Poisson's ratio = 0.3.

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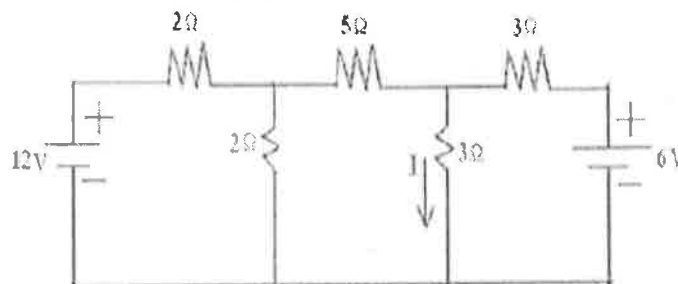
1. State Reciprocity Theorem
2. Which material is used for the better operation of the Transformer?
3. What is synchronous speed?
4. Define cut-in voltage for a diode.
5. Define deflection.

**II. Answer ALL questions of the following****10x2Marks=20 Marks**

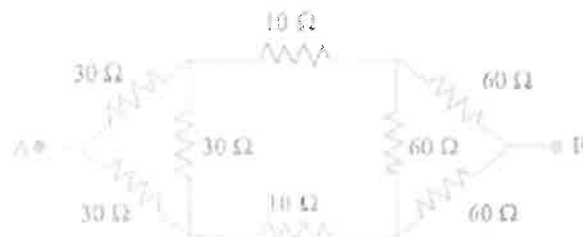
1. Two  $1.2\text{ k}\Omega$  resistors are in series and this series combination is in parallel with a  $3.3\text{ k}\Omega$  resistor. Find the total resistance?
2. Two resistors with  $50\text{ ohms}$  resistance are connected in parallel to a voltage source of  $50\text{ volts}$ , find current in each resistor.
3. Write the equations for hysteresis and Eddy current losses in a transformer.
4. Define various types of losses in a transformer
5. What is significance of Back EMF in a Dc machine?
6. Write expression for back emf in DC motor
7. Differentiate between power amplifier and voltage amplifier?
8. Explain working of a Zener diode
9. How do you obtain feedback in Colpitts oscillator?
10. How to measure frequency using CRO?

**PART-B****Answer ALL questions of the following****5x10 Marks= 50Marks**

1. Find the current **I** in the circuit shown below

**OR**

2. Find the resistance between the terminals A and B for the network shown in Fig.



3. Explain the principle and operation of a transformer with neat diagrams and necessary equations.

**OR**

4. a) Explain SC tests on transformer in detail  
b) In a no-load test of a single phase transformer, the following test data were obtained. Primary voltage: 220 V, Secondary voltage: 110V, Primary current: 0.5A Power input: 30W. Find (i) the magnetizing component of no load current (ii) the iron loss component of no load current. The resistance of primary winding is  $0.6\Omega$ .
5. A DC motor is connected to a 460V supply takes an armature current of 120A on full load. If the armature has resistance of 0.25 Ohm, calculate back emf.

**OR**

6. A 250V shunt motor takes a total current of 20A. The shunt field and armature resistances are  $200\Omega$  and  $0.3\Omega$  respectively. Determine a) Value of back emf b) Gross mechanical power in the armature.
7. Explain the bridge rectifier with neat circuit diagram and draw the wave forms.

**OR**

8. a) Explain the SCR operation and its applications.  
b) Explain the operation of NPN transistor with neat diagram
9. Explain the construction and working of a Wein bridge Oscillator.

**OR**

10. a) Explain the principle and operation of an oscillator.  
b) Write short notes about the essentials of transistor oscillator.



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Time: 3 hours

Max. Marks: 75

**PART – A**

5x1Mark=5 Marks

**I.** Answer **ALL** questions of the following

1. Define Probability density function
2. Write the finite population correction factor.
3. If arrival rate is 3 per hour service rate is 5 per hour then find traffic intensity.
4. Define markov chain.
5. Write Rank Correlation formula.

**II.** Answer **ALL** questions of the following

10x2Marks=20 Marks

1. If X and Y are two discrete random variables, then prove that  $E(X+Y) = E(X) + E(Y)$  provided  $E(X) E(Y)$  exist.
2. If  $f(x) = kxe^{-\lambda x}$ ,  $\lambda > 0$ ,  $x > 0$   
= 0, otherwise find K
3. Write regression lines for three variables.
4. Define the statistically independence of two jointly distributed random variables.
5. What is the value of correction factor if  $n=5$  and  $N=200$ .
6. Define null hypothesis and alternative hypothesis.
7. Describe M/M/1 Models.
8. Write the relations between  $L_q$ ,  $L_s$ ,  $W_q$ , and  $W_s$  in (M/M/1) : ( $\infty$ /FIFO) model.
9. Write any two classifications of Markov chain.

10. Is the matrix  $\begin{bmatrix} \frac{1}{2} & -\frac{1}{2} \\ \frac{1}{4} & \frac{3}{4} \end{bmatrix}$  stochastic?

**PART-B**Answer **ALL** questions of the following

5x10 Marks= 50Marks

1. Fit a binomial distribution to the following data

X	2	4	6	8	10
f	1	4	6	4	1

OR

2. Fit a poisson distribution to the following data

X	0	1	2	3	4	5
f	142	156	69	27	5	1

3. In a partially destroyed laboratory data, only the equations giving the two lines of regression are available and are  $7x - 16y + 9 = 0$  and  $5y - 4x - 3 = 0$ . Calculate the coefficient of correlation and the means of X and Y.

OR

4. Calculate Karl Pearson's correlation co-efficient for the following data.

x	38	45	46	38	35	38	46	32	36	38
y	28	34	38	34	36	26	28	29	25	36

5. Pumpkins were grown under two experimental conditions. Two random samples of 11 and 9 pumpkins, show the Sample standard deviations of their weights as 0.8 and 0.5 respectively. Assuming that the weight distribution is normal, test hypothesis that the true variances are equal.

OR

6. A sample of 100 electric bulbs produced by manufacturer A showed a mean life time of 1190 hours and a standard deviation of 90 hours. A sample of 75 bulbs produced by manufacturer B showed a mean life time of 1230 hours with a standard deviation 120 hours. Is there a significant difference between the mean life time of two brands at a significance level of (i) 0.05 (ii) 0.01
7. A one person barber shop has six chairs to accommodate people waiting for haircut. Assume that customers who arrive when all the six chairs are full leave without entering the shop. Customers arrive at the average rate of 3 per hour and spend an average of 15 minutes for service. Find
- The probability that a customer can get directly in to the barber chair upon arrival.
  - Expected number of customers waiting for a haircut.
  - Effective arrival rate.

OR

8. A car park contains 5 cars. The arrival of cars is poisson with a mean rate of 10 per hour. The length of time each car spends in the car park has negative exponential distribution with mean 2 hours. How many cars are in the car park on average and what is the probability of newly arriving customer finding the car park full and having to park his car elsewhere?
9. A market survey is made on two brands of breakfast foods A & B. Every time a customer purchases, he may buy the same brand or switch to another brand. The transition matrix is given below

TO

		A	B
From	A	0.8	0.2
	B	0.6	0.4

At present, it is estimated that 60% of the people buy brand A and 40% buy brand B. Determine the market shares of brand A and brand B in the steady state.

OR

10. a) Define the types of stochastic process with an example

- b) The transition probability matrix of a markov chain is given by  $\begin{bmatrix} 0.3 & 0.7 & 0 \\ 0.1 & 0.4 & 0.5 \\ 0 & 0.2 & 0.8 \end{bmatrix}$  is this matrix irreducible?
- c) Define regular matrix with an example