Question Bank

ESME-401

Elements of Mechanical Engineering

For UG Programme

Prepared by: Dr. Anil Kumar Singla

DEPARTMENT OF MECHANICAL ENGINEERING

SANT LONGOWAL INSTITUTE OF ENGINEERING & TECHNOLOGY,

LONGOWAL (*Deemed to-be University*)

1. **A system that can neither exchange matter nor energy with the surroundings is called_____**
a) Open system
b) Isolated system
c) Closed system
d) Ideal system
Ans: b

2. **An isolated system is one, _____**
a) Which can transfer neither matter nor energy to and from its surroundings
b) Which can transfer both energy and matter
c) Which can transfer matter only
d) Which can transfer energy only
Ans: a

3. **Thermodynamics is based on a study of ..... of the system**
a) microscopic properties
b) macroscopic properties
c) physical properties
d) chemical properties
Ans: b

4. **Boiling tea in a tea pot which is not closed is example of _____**
a) open system
b) closed system
d) homogenous system
c) isolated system
Ans: a

5. A system is used to be in thermodynamic equilibrium when_____
a) the temperature of the system is nonuniform and different from the temperature of the surrounding
b) the mechanical properties are nonuniform throughout the system
c) the state functions of the system do not change with time
d) only pressure of the reaction is at equilibrium
Ans: c

6. **Which of the following is intensive property?**
a) Molarity
b) Temperature
c) Density
d) All are correct
Ans: d

7. When the composition of the system does not change with time, then the system is in _____ equilibrium.
a) chemical
b) physical
c) mole
d) thermal

Ans: a

8. **temperature and heat are_____**
a) Extensive properties
b) Intensive properties
c) Intensive and extensive properties respectively
d) Extensive and intensive properties respectively
Ans: c

9. **Mark the false statement regarding thermodynamic processes**
a) a reversible change is a change in which the pressure remains constant
b) an adiabatic change is a change in which the system is completely isolated in the thermal sense.
c) in an isochoric process, the volume of the system remains constant
d) all the natural processes are irreversible process
Ans: A

10. **In adiabatic process,**
a) q(+) ve
b) q 1
C) q=0
d) q-ve
Ans : c

11. **Find out incorrect statement,**
a) irreversible process is rapid
b) maximum work is obtained from
reversible process
c) reversible process is natural process
d) there is large difference between acting and opposing force in irreversible process
Ans: c

12. **The process accompanied by no change in internal energy is _____**
a) isothermal
b) adiabatic
c) cyclic
d) both a and c
Ans : d

13. **The process in which size of system remains constant is known as _____**
a) Isothermal
b) Adiabatic
c) Isochoric process
d) Isobaric process
Ans : c

14. Which of the following is not a state function?
a) Internal energy
b) enthalpy
c) Work
d) volume

Ans : c

15. **For an adiabatic expansion**
a) ΔU = -ve
b) W= + ve
c) ΔU= 0
d) ΔT=0
Ans: a

16. **Which of the following properties is independent of the path followed during the change?**
a) Work
b) Heat
c) change in enthalpy
d) both a and b
Ans: c

17. A process in which no heat change takes place is remains_____
a) an isothermal process
b) an adiabatic process
c) an isobaric process
d) an isochoric process
Ans : b

18. **Which of the following is not a statement of law of thermodynamics**
a) Enegy can neither be created nor be destroy
b) The total energy of the universe remains constant
c) Enthalpy change depends only upon initial and final state
d) It is impossible to construct a perpetual motion machine.
Ans: c

19. Which of the following is correct expression of the first law of thermodynamics?
a) q= Δ H - W
b) Δ H=q+W
c) Δ U= q+ W
d) Δ U= Δ H +P Δ V
Ans: b

20. **The first law of thermodynamics fails to decide_____**
a) the direction of the process
b) the extent of conversion of one form of energy to another
c) both these
d) none of these
Ans: c

21. **The first law of thermodynamics is also known as,**
a) law of mass action
b) law of conservation of mass
c) law of conservation of energy
d) law of conservation of mass and energy
Ans: c

22. **First law of thermodynamics in isochoric process is mathematically expressed as,**_____
a) q= Δ U- P Δ V
b) Δ U=q+ W
c) q= P Δ V - Δ U
d) q= Δ U
Ans : d

23. **Which of the following statement is correct?**
a) Internal energy is a state function but work is not
b) Work is a state function but internal energy is not
c) Both internal energy and work are state functions
d) Neither internal energy nor work is a state function
Ans:a

24. In a change from state A to state B, which is correct?
a) q depends only on the initial and final state
b) w depends only on the initial and final state
c) ΔU depends only on the initial and final state
d) ΔU depends upon the path adopted by A to change into B
Ans: c

25. In a chemical reaction, system absorbs 500 J of heat and does work. The change in internal energy is 250 J. The work done will be_____
a) +250J
b)+750 J
c)-250 J
d) 750 J
Ans : c

26. **How internal energy will change due to removal of heat and work from the system?**
a) decrease
b) increase
c) remain same
d) none
Ans:a

27. **A kinematic pair consists of**

a) Two links
b) Three links
c) Four links
d) Any number of links

Ans:a

28. **Which of the following forms a higher pair?**

a) Sliding pair
b) Turning pair
c) Rolling pair
d) Turning pair

Ans:c

29. **A lower pair has**
a) Surface contact
b) Line contact
c) Point contact
d) All of the above
Ans:a

30. Ball bearing is an example of
a) Rolling pair
b) Sliding pair
c) Turning pair
d) Spherical pair
Ans:a

31. A rigid body in space has ___ degrees of freedom.
a) Two
b) Three
c) Six
d) Eight
Ans:c

32. In four bar kinematic chain, the relation between the number of pairs (p) and number of links (L) is given by
a) L=2p-4
b) L=4p-2
c) L=3p-2
d) L=2p-3
Ans:a

33. Which of the following is not a type of constrained motions?
a) Completely
b) Incompletely
c) Successfully
d) Unsuccessfully
Ans:d

34. The Grubler's equation is
a) F=3(n-1)-2j
b) F=3(n-1)-j
c) F=2(n-1)-3j
d) F=2(n-1)-j

Where, F=degrees of freedom, n=number of links and j=number of joints
Ans:a

35. Mechanism is a kinematic chain in which
a) None of the link is fixed
b) One link is fixed
c) Two links are fixed
d) None of the above
Ans:b

36. A four bar kinematic chain has ____ turning pairs
a) One
b) Two
c) Three
d) Four
Ans:d

37. A link which makes complete revolution is known as
a) Level
b) Connecting rod
c) Frame
d) Crank
Ans:d

38. The fixed link is known as ___ of the mechanism.
a) Level
b) Connecting rod
c) Frame
d) Crank
Ans:c

39. _____ is the force applied to a machine
(a) Effort
(b) load
(c) fulcrum
(d) none
Ans:a

40. **In type I lever, the fulcrum lies _____**
(a) Between the load and effort
(b) Between the effort and load
(c) both (a) and (b)
(d) none
Ans:c

41. **_____ is the fixed point in a lever**
(a) fulcrum
(b) load
(c) effort
(d) none

Ans:a

42. **Machines made of iron should be painted to avoid _____**
(a) Friction
(b) rusting
(c) dust
(d) all
Ans:d

43. **Efficiency of machine will _____ if you forget the oil and grease**
(a) decrease
(b) increase
(c) be no. effect
(d) none
Ans:a

44. **The efficiency of machines used by us is always _____ than 100%.**
(a) less than
(b) more than
(c) equal to
(d) none
Ans:a

45. **_____ are used to split or pierce materials.**
(a) Wedge
(b) Wheel and axle
(c) Screw
(d) lever
Ans:a

46. **Bicycles, sewing machine, typewriter are the example of**
(a) Wedge
(b) The wheel and axle
(c) screw
(d) lever
Ans:b

47. **Nut cracker is an example of _____ lever**
(a) Type 2
(b) Type 1
(c) Type 3
(d) none
Ans:a

48. **Examples of third lever are**
(a) Bottle opener
(b) fire tongs and human forearm
(c) wheel – barrow, mango cutter
(d) all of these.
Ans:b

49. **_____ lever have the load between the effort and the fulcrum**
(a) Type 2
(b) Type 1
(c) both (a) and (b)
(d) type 3
Ans:a

50. **_____ multiplies the speed**
(a) Type 3 lever
(b) Type 1 lever
(c) Type 2 lever
(d) both (a) and (b)
Ans:a

51. **Fishing rod is the example of _____.**
(a) lever
(b) screw
(c) inclined plane
(d) wedge
Ans:a

52. **Examples of complex machines are**
(a) a tractor, bicycle
(b) a knife
(c) a pulley
(d) pair of scissors
Ans:a

53. **The arrangement of load, effort and fulcrum is _____ in _____ type of levers**
(a) same, same
(b) different, different
(c) different, same
(d) same, different
Ans:b

54. **In type _____ lever, effort is in between the load and fulcrum**
(a) 1
(b) 2
(c) 3
(d) none of these
Ans:c

55. **_____ is a sloping surface**
(a) An inclined plane
(b) screw
(c) lever
(d) wedge
Ans:a

56. **Complicated machines are made up of number of _____ machines**
(a) Simple
(b) Complex
(c) both (a) and (b)
(d) none of these
Ans:a

57**. Chisels, axes, pins, nail are the example of**
(a) Wheel and axle
(b) Screw
(c) Wedge
(d) Inclined plane
Ans:c

58. **Crow bar is a _____ type lever**
(a) 1
(b) 2
(c) 3
(d) 4
Ans:a

59. **Work done by a machine is**
(a) input energy
(b) output energy
(c) efficiency
(d) effort
Ans:b

60. **Levers are _____**
(a) Simple machine
(b) Complex machines
(c) wheel and axle
(d) pulley
Ans:a

61. **Which of the following parameters can be obtained by tension test of a standard specimen?**
a) Proportional Limit
b) Yield Strength
c) Percentage Reduction in area
d) All of the mentioned

Ans: a

62**. Yield strength is defined as the maximum stress at which a marked increase in elongation occurs without increase in_____**
a) Load
b) Strength
c) Toughness
d) Hardness

Ans: a

63. **Which of the following are true about plasticity?**
a) Permanent Deformation
b) Ability to retain deformation under load or after removal of load
c) Plastic deformation is greater than elastic deformation
d) All of the mentioned

Ans: d

64. **Which of the following is** a **measure of stiffness?**
a) Modulus of elasticity
b) Modulus of plasticity
c) Resilience
d) Toughness

Ans: a

65. **Which of the following facts are true for resilience?**
a) Ability of a material to absorb energy when deformed elastically
b) Ability to retain deformation under the application of load or after removal of load
c) Ability of material to absorb energy when deformed plastically
d) None of the mentioned

Ans: a

66. **Modulus of resilience is defined as**
a) Strain energy per unit volume
b) Strain energy per unit area
c) Independent of strain energy
d) None of the mentioned

Ans: a

67. **Hardness is**
a) Surface property
b) Resistance to abrasion
c) Depends upon resistance to plastic deformation of the material
d) All of the mentioned

Ans:d

68. **Up to which point on the stress-strain curve is Hooke's law valid?**
a) Elastic limit
b) Yield point
c) Proportionality limit
d) Fracture point

Ans: c

69. **Which of the following is found out by calculating the area under the stress strain graph?**
a) Toughness
b) Hardness
c) Endurance
d) Strength

Ans: a

70. **Which of the following is the property because of which a material can be drawn into wires?**
a) Ductility
b) Elasticity
c) Malleability
d) Strength

Ans: a

71. **Which of the following class of engineering ceramics generally includes lubricant materials?**
a) Metalloids
b) Intermetallics
c) Sulphides
d) Carbides

Ans: c

72. **How is the creep strength of ceramics when compared to other materials?**
a) Low
b) High
c) Excellent
d) Zero

Ans: c

73. **Which of the following materials are usually used for Electrolysis?**
a) Silicon, antimony
b) Silver, tin
c) Zinc, cadmium
d) Aluminium, nickel

Ans: b

74. **Which of these is not a function of alloy steels?**
a) Improves ductility
b) Improves machinability
c) Increases strength
d) Reduces cost

Ans: d

75. **How does the Vickers's hardness test differ from Brinell's?**
a) Type of indenter
b) Materials to be tested
c) Load applied
d) Duration of indentation

Ans: a

76. **High conductivity copper is used _____**
a) To raise softening temperature
b) In electrical engineering
c) To manufacture semiconductor elements
d) To reduce porosity

Ans: b

77. **Which brass alloy is suitable for high-speed machining?**
a) High tensile brass
b) Gilding metal
c) Muntz metal
d) Leaded brass

Ans: d

78. **Which of the following polymer additive is used to remove parts from moulds?**
a) Reinforcements
b) Lubricants
c) Stabilizers
d) Plasticizers

Ans: b

79. **Which of the following carbides are used for cutting tools?**
a) Chromium carbide
b) Silicon carbide
c) Tungsten carbide
d) Vanadium carbide

Ans: c

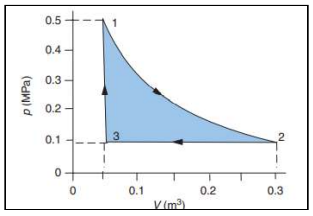
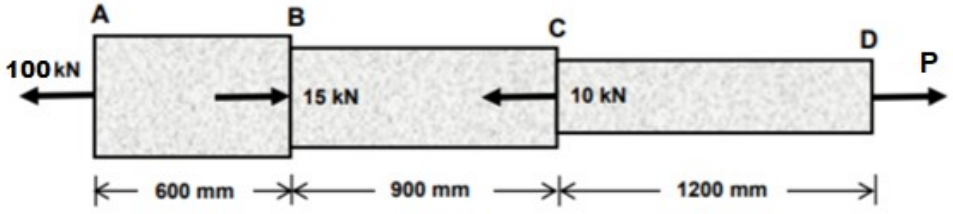
80. **Which of the following is not a characteristic trait of polymer materials?**
a) Low density
b) Resistant to chemical attack
c) Low cost
d) High strength

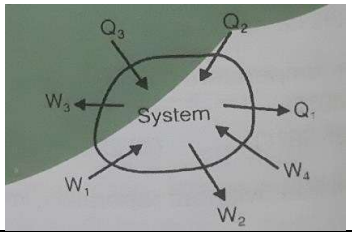
Ans: d

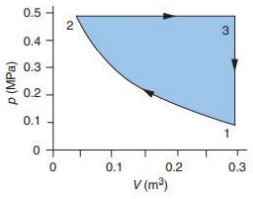
Short Answer Types Questions:

1	Describe zeroth law of thermodynamics with an example.
2	Describe first law of thermodynamics .
3	What is internal energy and its types?
4	What is thermal equilibrium?
5	What is thermodynamic equilibrium?
6	What is thermodynamic system and state?
7	What is thermodynamic process and cycle?
8	Discuss types of thermodynamic systems with example?
9	State the assumption and drive the expression for polytropic specific heat.
10	Derive the expression for displacement work in case of polytropic process. Use suitable diagram.
11	State the kelvin-Planck and Clausius statements of the second law of thermodynamics.
12	Establish the equivalence between kelvin-Planck and Clausius statements
13	What is the mass of air contained in a room 6 m × 10 m × 4 m if the pressure is 100 kPa and the temperature is 25◦C? For air R=0.287 kJ/kg.K
14	A tank has a volume of 0.5 m3 and contains 10 kg of an ideal gas having a molecular mass of 24. The temperature is 25◦C. What is the pressure?
15	What is the difference between load, pressure and stress?
16	What is Hooke's law?
17	What is bulk modulus of elasticity? Derive its expression.
18	Sketch stress-strain diagram for ductile material and explain its salient features.
19	How does stress strain curve for brittle materials differ from ductile material. Explain?
20	What is necking?
21	Derive expression for elongation in case of load under self weight.
22	Derive expression for elongation in case of impact loading.
23	What are composite bars?
24	What are thermal stresses? Comment on its nature.
25	What is MA and velocity ratio?
26	Define kinematic pair and discuss types of constrained motion with neat sketch?
27	What are mechanism and its inversions?
28	What is the difference between mechanism and structure?
29	What is the difference between mechanism and machine?
30	List all the inversions of double slider crank chain and single slider crank chain
31	Draw two inversions of four bar chain with neat sketch
32	Draw pulley arrangement for MA =4.
33	A machine raised a load of 360 N through a distance of 200 mm. A force of 60 N moved 1.8 m during the process. Calculate mechanical advantage, velocity ratio, and efficiency of machine.
34	Write classification of materials. List various properties of material. Discuss any two of them.
35	List all the mechanical properties of materials.

Long answer types Questions

1.	A closed system consisting of an unknown gas undergoes a cycle consisting of three quasi-static processes as shown in Figure Process 1–2 is adiabatic and its energy change is −50 kJ. Process 2–3 is at constant pressure. Process 3–1 is at constant volume. a. Find the work of the gas in each stage. b. Find the work of the system for the complete cycle. c. Find the heat interaction for the complete cycle. 
2.	Air of mass 0.5 kg as an ideal gas executes a Carnot cycle having a thermal efficiency of 50%. The heat transfer to the air during the isothermal expansion is 40 kJ. At the beginning of the isothermal expansion the pressure is 7 bar and volume is 0.12 m^3. Determine (a) The maximum and minimum temperature for the cycle (b) The volume at the end of the isothermal expansion (c) The work and heat transfer for each of the four processes
3.	A steel bar containing three segments with varying cross sections (left segment AB with diameter of 45 mm, middle section BC with diameter of 35 mm and right segment CD with diameter of 25 mm) is subjected to force as shown in Figure. Determine the total elongation of the bar. Assume the modulus of elasticity for steel bar is 210 GPa. 
4.	Derive the mathematical relation between E, C and μ.
5.	A mass of 1.5 kg of air is compressed in a quasi-static process from 0.1 MPa to 0.7 MPa for which PV = constant using piston cylinder arrangement. The initial density of air is 1.16 kg/m^3. Find the work done by the piston to compress the air.
6.	A fluid, contained in a horizontal cylinder fitted with a frictionless leak proof piston, is continuously agitated by means of a stirrer passing through the cylinder cover. The cylinder diameter is 0.40 m. During the stirring process lasting 10 minutes, the piston slowly moves out a distance of 0.485 m against the atmosphere (Atmosphere pressure as 101325 N/m^2). The contribution of fluid in net work done on the piston during the process is 2 kJ. The speed of the electric motor driving the stirrer is 840 rpm. Determine the torque in the shaft and the power output of the motor.
7.	3 kg of air kept at an absolute pressure 100 kPa and temperature 300 K is compressed polytropically until the pressure and temperature become 1500 kPa and 500 K respectively. Evaluate the polytropic exponent, the final volume, the work of compression and the heat interaction. Take gas constant R = 287 J/kgK.
8.	In a centrifugal compressor, the suction and delivery pressures are 100kPa and 550 kPa, respectively. The compressor draws 15m^3/min of air which has a specific volume of 0.77 m^3/kg. At delivery point,

	the specific volume is 0.20 m^3/kg. The compressor is driven by a 40kW motor and during passage of air through the compressor, the heat lost to the surroundings is 30 kJ/kg of air. Neglecting changes in the potential and kinetic energy, make calculations for increase in internal energy per kg of air.
9.	A reversible heat engine operates between 875 K and 310 K and drives a reversible refrigerator operating between 310 K and 255 K. The engine receives 2000 kJ of heat and the net work output from the arrangement equals 350 kJ. Make calculations for the cooling effect.
10.	A tank containing a fluid is stirred by a paddle wheel. The work input to the paddle wheel is 5090 kJ. The heat transfer from the tank is 1500 kJ. Consider the tank and the fluid inside a control surface and determine the change in internal energy of this control mass.
11.	Air (ideal gas with $\gamma = 1.4$) at 1 bar and 300K is compressed till the final volume is one-sixteenth of the original volume, following a polytropic process $Pv^{1.25}$ = const. Calculate (a) the final pressure and temperature of the air, (b) the work done and (c) the energy transferred as heat per mole of the air.
12.	A system is undergoing a cycle that consists of three processes. During the first process the work is 5 kJ and the heat is 23 kJ. In the second process no work takes place and the heat interaction is −50 kJ. The third process is adiabatic. a. Find the energy change in each process. b. Find the work in the third process
13.	A cylinder contains 2 kg of gas and is covered by a piston. The gas expands from an initial state of 0.020 m^3 and 7 bar to a final pressure of 1 bar. Find the work done by the gas if during the expansion a. pV = constant. b. pV^2 = constant. c. pV^n = constant.
14.	A reversible heat engine receives heat inputs of 300KJ and 200 KJ from two thermal reservoirs at 1000 K and 800 K, respectively. The engine rejects heat Q to a reservoir at 300 K. Calculate the value of Q and work delivered by engine.
15.	Internal energy of following system is If Q_2=100 KJ, Q_1=100 KJ, Q_3=150 KJ, W_1=100 KJ, W_4=150 KJ, W_3=50 KJ and W_2=100 KJ. 
16.	A closed system of an unknown gas goes through a cycle of three quasistatic processes as shown in Figure. Process 1–2 is adiabatic and its energy change is 50 kJ. Process 2–3 is at constant pressure. Process 3–1 is at constant volume. a. Find the work of the gas in each stage.

	b. Find the work and heat interactions of the system for the complete cycle. 
17.	Air flows steadily at the rate of 0.5 kg/s through an air compressor, entering at 7 m/s velocity, pressure 100 kPa and 0.95 m3/kg volume and leaving at 5 m/s, 700 kPa and 0.19 m3/kg. The internal energy of the air leaving is 90 kJ/kg greater than that of the air entering. Cooling water in the compressor jackets absorbs heat from the air at the rate of 58 kW. (a) Compute the rate of shaft work input to the air in kW (b) Find the ratio of the inlet pipe diameter to outlet pipe diameter
18.	In a steady flow apparatus, 135 kJ of work is done by each kg of fluid. The specific volume of the fluid, pressure and velocity at the inlet are 0.37 m3/kg, 600 kPa and 16 m/s. The inlet is 32 m above the floor, and the discharge pipe is at floor level. The discharge conditions are 0.62 m3/kg, 100 kPa and 270 m/s. The total heat loss between the inlet and discharge is 9 kJ/kg of fluid. In flowing through this apparatus, does the specific internal energy increase or decrease, and by how much?
19.	In a steam power station, steam flows steadily through a 0.2 m diameter pipeline from the boiler to the turbine. At the boiler end, the steam conditions are found to be: P=4 Mpa, t= 400°C, h= 3213.6 kJ/kg, and v=0.073 m3/kg. At the turbine end, the conditions are found to be: P=3.5 Mpa, t=392oC , h= 3202.6 kJ/kg and v=0.084 m3/kg. There is a loss of 8.5 kJ/kg from the pipeline. Calculate the steam flow rate.
20.	A certain water heater operates under steady flow conditions receiving 4.2 kg/s of water at 75oC temperature, enthalpy 313.93 kJ/kg. The water is heated by mixing with steam which is supplied to the heater at temperature 100.2oC and enthalpy 2676 kJ/kg. The mixture leaves the heater as liquid water at temperature 100oC and enthalpy 419 kJ/kg. How much steam must be supplied to the heater per hour.
21.	In a gas turbine the gas enters at the rate of 5 kg/s with a velocity of 50 m/s and enthalpy of 900 kJ/kg and leaves the turbine with a velocity of 150 m/s and enthalpy of 400 kJ/kg. The loss of heat from the gases to the surroundings is 25 kJ/kg. assume for gas R= 0.285 kJ/kg K and Cp = 1.004 kJ/kg K and the inlet conditions to be at 100 kPa and 27oC . Determine the power output of the turbine and the diameter of the inlet pipe.
22.	A cyclic heat engine operates between a source temperature of 800oC and sink temperature of 30oC. What is the least rate of heat rejection per kW net output of the engine.
23.	A domestic food freezer maintains a temperature of -15oC. The ambient air temperature is 30oC. If heat leaks into the freezer at the continuous rate of 1.75 kJ/s . What is the least power necessary to pump this heat out continuously.
24.	A reversible heat engine operates between two reservoirs at temperature of 600°C and 40°C. The engine drives a reversible refrigerator which operates between reservoirs at temperature of 40°C and -20°C. The heat transfer to the heat engine is 2000kJ and the net work output of the combined engine refrigerator plant is 360 kJ. (a) Evaluate the heat transfer to the refrigerator and the net heat transfer to the reservoir at 40°C (b) Reconsider (a) given that the efficiency of the heat engine and the COP of the refrigerator are each 40% of their maximum possible values.
25.	A Carnot engine absorbs 200 J of heat from a reservoir at the temperature of the normal boiling point of water and rejects heat to a reservoir at the temperature of the triple point of water. Find the heat rejected, the work done by the engine and the thermal efficiency.

26.	Air of mass 0.5 kg as an ideal gas executes a Carnot cycle having a thermal efficiency of 50%. The heat transfer to the air during the isothermal expansion is 40 kJ. At the beginning of the isothermal expansion the pressure is 7 bar and volume is 0.12 m^3. Determine (a) The maximum and minimum temperature for the cycle (b) The volume at the end of the isothermal expansion (c) The work and heat transfer for each of the four processes.
27.	A 30m length of railway is to be so laid that there is no stress in the rails at 10°C. Determine the stress induced in the rails at 60°C if I. There is no allowance for expansion II. There is an expansion allowance of 8 mm per rail III. What should be the expansion allowance if the stress in the rail is to be zero at 60oC temperature IV. What is the maximum allowable temperature to have no stress in the rails if expansion allowance is 12 mm per rail. Take E=2x10^5 N/mm^2 and α= 12x10^{-6} per °C
28.	A circular bar of length 400 mm and tapering uniformly from 50 mm to 25 mm diameter is held between rigid supports at the ends. Calculate the maximum and minimum stress developed in the bar when the temperature is raised by 30°C. Take E=2x10^5 N/mm^2 and α= 12x10^{-6} per °C.
29.	A steel bar of rectangular section 50 mm x 30 mm and length 1.5 m is subjected to a gradually applied load of 150 kN. Find the strain energy stored in the bar. If the elastic limit of the material of the bar is 150 N/mm^2, proceed to determine the proof resilience and modulus of resilience. Take E=2x10^5 N/mm^2
30.	Two elastic bars of the same material and length absorb the same amount of energy delivered due to gradually applied axial forces. One of the bars is of circular cross-section with diameter 25 mm, and the other is of square cross-section with each side 25 mm. Determine the ratio of stress induced and the loads applied.
31.	During compression test, a metallic bar 50 mm x 50 mm in cross-secton was subjected to an axial compressive load of 500kN. Measurements showed that there was 0.04 mm increase in the thickness and 0.5 mm contraction in length over a gauge length of 200 mm. Determine the values of Poisson's ratio and modulus of elasticity.
32.	A vertical circular copper bar 20 mm diameter and 3 m long carries a tensile load of 200kN. Calculate the elongation, decrease in the diameter and volumetric strain.Take E = 2x 10^5 N/mm^2 and μ = 0.25.
33.	A bar, 12 mm in diameter, is acted upon by an axial load of 20 KN. The value of the modulus of rigidity is 80 GPa. Determine Modulus of Elasticity and Bulk modulus.
34.	Drive the relationship between elastic constants E, G and, K?
35.	An axial pull of 35000 N is acting on a bar consisting of three lengths as shown below. If the Young's Modulus is 2.1 x 10^5 N/mm^2. Determine (i) Stresses in each section, and; (ii) Total extension of the bar.