3E1207

Roll No. _____ [Total No. of Pages : 2

3E1207

B.Tech. III sem. (Main) Examination, April/May - 2022

Automobile Engineering

3AE3-04 Engineering Mechanics

AE, ME

Time : 2 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all ten questions From Part A, All five Questions from Part B and three questions out of five questions from Part C .

Schematic diagram must be shown wherever necessary. Any data missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting materials is permitted during examination (As mentioned in form No. 205).

Part - A(Word limit 25)

1. What's the difference between a moment and a couple?
2. Why to Provide Redundant Members in trusses?
3. Define radius of gyration.
4. What is the difference between worm and worm wheel?
5. What is importance of friction in our daily life?
6. Why is crowning on a pulley?
7. Define projectile motion with example.
8. Why is D Alembert's principle used?
9. What do you mean by work energy principle?
10. What is the relation between momentum and impulse? **(10×2=20)**

PART - B (Word limit 100)

1. From the truss in Figure 1, determine the force in members BC, CE, and EF. Solve by using method of sections.

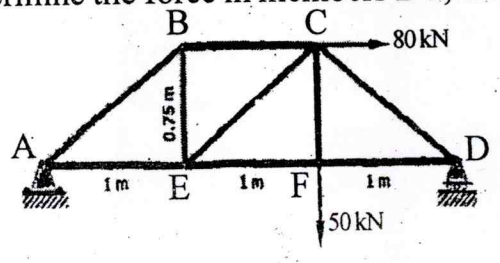

Figure: 1

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2. Explain the Law of machine and using following table shows observations on a certain machine. Find the law of machine equation and maximum Mechanical advantage.

Load	Effort
100 N	10 N
200 N	14 N

3. Derive the tension ration equation of flat belt drive.
4. Define and explain Newton's law of motion for rotational motion.
5. Explain the principle of work and energy and derive an expression for the same.

(5×4=20)

PART - C (Any three)

1. Given the forces $F1 = 2.91N$, $F2 = 2.67\ N$, $F3 = 2.47\ N$ *and* $F4 = 2.23\ N$ and the angles $\alpha = 60^o$ and $\beta = 30^o$, calculate the resultant force R and its angle γ with the x-axis.

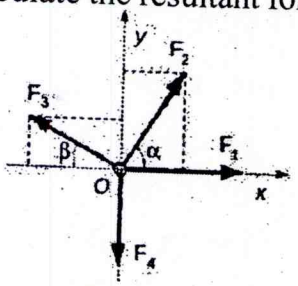

Figure: 2

2. Find the moment of inertia about the vertical and horizontal axis passing through the centroid of the section shown in figure - 3.

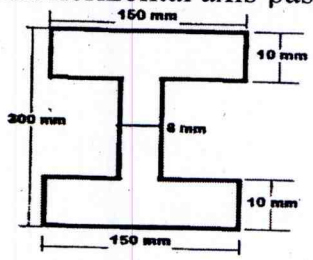

Figure: 3

3. A ladder of weight 390 N and 6m long is placed against a vertical wall at an angle of 30° with wall. The co-efficient of friction between the ladder and the wall is 0.25 and that between ladder and floor is 0.38. Find how high a man of weight 1170 N can ascend, before the ladder begins to slip.
4. A balloon weighing 'W' newton descend with acceleration of 'a'. If weight 'w' is removed from the balloon has upward acceleration of 'a'. Show that $w' = \frac{2aW}{a+g}$.
5. A pile hammer of 250 kg mass is made to fall freely on a pile from a height of 6 m. If the hammer come to rest in 0.012 sec, determine
   i) The change in momentum,
   ii) Impulse and
   iii) Average force.

(3×10=30)

3E1208

Roll No. _____ [Total No. of Pages : 3

3E1208

B.Tech. III Sem. (Main) Examination, April/May - 2022
Automobile Engineering
3AE4-05 Engineering Thermodynamics
AE, ME

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all ten questions From Part A, All five Questions from Part B and three questions out of five questions from Part C .

Schematic diagram must be shown wherever necessary. Any data missing may suitably be assumed and states clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination (As mentioned in form No. 205).

PART - A (Word limit 25) **(10×2=20)**

1. What is thermodynamic equilibrium? **(2)**
2. What is triple point of a substance? **(2)**
3. Explain clausius statement? **(2)**
4. Explain the principle of entropy increase? **(2)**
5. What is a pure substance? **(2)**
6. Explain Gibbs Dalton law. **(2)**
7. In Otto, Diesel and dual cycle, with same operating conditions which cycle has the maximum thermal efficiency? **(2)**
8. What are the thermodynamic variables? **(2)**
9. What are the properties of Ideal working fluid in vapour power cycle? **(2)**
10. What do you mean by Regeneration in a cycle. **(2)**

PART - B (Word limit 100) **(5×4=20)**

1. 0.3 Kg of nitrogen gas of 100 kpa and 40°C is contained in a cylinder. The piston is moved compressing or Nitrogen until 1 MPa. at this point the temperature is 160°C. The work done during the process is 30 KJ. Calculate the heat transfer from the Nitrogen.

   To the surroundings take C_v = 0.75 KJ/kg K. for Nitrogen. **(4)**

2

2. Explain the concept of Entropy and Irreversibility and prove

$$ds \geq \frac{\delta\theta}{T}$$ **(4)**

3. A vessel of 0.03m³ capacity contains gas at 3.5 Bar pressure and 35°C temperature. Determine the mass of the gas in the vessel. If the pressure of this gas is increased to 10.5 Bar while the volume remain constant, What will be the temperature of the Gas? For the gas take R = 290 J/kg K **(4)**

4. A) Prove that the equation for enthalphy is given by: all nomenclature have usual meaning.

$$dh = C_p dT + \left\{ v - T\left(\frac{\partial v}{\partial T}\right)_P \right\} dP$$ **(2)**

B) Prove that thermal efficiency of an Otto cycle is given by: $\left\{\eta = 1 - \frac{1}{r^{\gamma-1}}\right\}$.

Where all nomenclature have usual meaning. **(2)**

5. A) Explain vapour power cycle with a neat Diagram. **(2)**

B) What are the various effect of operating conditions on the efficiency of vapour power cycle? **(2)**

PART - C (Any three) **(3×10=30)**

1. A) The specific heat capacity of the system during a certain process is given by:

$$C_n = (0.4 + 0.004T)\, KJ/kg\ ^oC$$

If the mass of the gas is 6 kg and its temperature changes from 25°C to 125°C find:

i) Heat transferred

ii) Mean specific heat of gas. **(5)**

B) Comment whether the following quantities can be called as properties or not.

i) $\int Pdv$ ii) $\int vdP$ iii) $\int Pdv + vdP$ **(5)**

2. Air at 20°C and 1.05 bar occupies 0.025m³, the air is heated at constant volume until the pressure is 4.5 Bar, and then cooled at constant pressure.

Back to original temperature. Calculate.

i) Net heat flow from the air.

ii) Net entropy change. Sketch the process on T-S diagram. **(10)**

3. Write short notes on

   A) P-V-T Surface

   B) Dryness fraction

   C) Super heated Steam

   D) Latent heat. **(10)**

4. For a perfect gas obeying Pv=RT show that C_V and C_P are independent of pressure. **(10)**

5. A turbine is supplied with steam at a pressure of 32 Bar and a temperature of 410°C. The steam then expands isentropically to a pressure of 0.08 Bar. Find the dryness fraction at the end of expansion and thermal efficiency of the cycle.

   If the steam is reheated at 5.5 Bar to a temperature of 395°C and then expanded isentropically to a pressure of 0.08 Bar, What will be the dryness fraction and thermal efficiency of the cycle? **(10)**

3E1209

Roll No. _____ [Total No. of Pages : 2

3E1209

B.Tech. III Sem. (Main) Examination, April / May - 2022
Automobile Engineering
3AE4-06 Materials Science and Engineering
AE, ME

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all ten questions From Part A, All five Questions from Part B and three questions out of five questions from Part C.

Schematic diagram must be shown wherever necessary. Any data missing May suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination (As mentioned in form No. 205).

PART - A (Word limit 25)

1. What is Re-Crystallization?
2. Define Miller Indices.
3. What is eutectic point? Explain characteristic of it.
4. What is Elastic deformation?
5. What is martensitic transformation?
6. Define Carburising.
7. What is solid solution?
8. What are Nano materials?
9. Discuss the general effects of tempering the steel.
10. Discuss mechanical properties of materials. **(10×2=20)**

PART - B (Word limit 100)

1. Explain with neat sketches, the various types of crystal imperfections.
2. What is phase transformation in the Iron carbon diagram?
3. Explain Nitriding process of heat treatment of Steps.
4. Explain the effects of addition of Si, Cr, Mo, V and W alloying elements on the properties of steel.
5. Explain Rockwell hardness testing method with sketch. **(5×4=20)**

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PART - C (Any three)

1. Draw neat labelled Iron carbon equilibrium diagram. Explain invariant reactions occur in this diagram.
2. What are properties and engineering applications of PMMA, ABS, PVC, PA and PTFE?
3. What do you understand by tempering of steel? What properties can be acquired by steel after tempering process? Classify various tempering processes.
4. Draw a neat sketch of the TTT diagram for a eutectoid steel and label the regions.
5. Differentiate hardness and hardenability. Explain the following transformation.
   i) Austenite to Bainite.
   ii) Austenite to parlite.

(3×10=30)

3E1210

Roll No. _____ [Total No. of Pages : 3

3E1210

B.Tech. III Sem. (Main) Examination, April/May - 2022
Automobile Engineering
3AE4-07 Mechanics of Solids
AE, ME

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

*Attempt **all ten** questions from **Part A**. All **five** questions from **Part B** and **three** questions out of **Five** questions from **Part C**.*

Schematic diagrams must be shown wherever necessary. Any data missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

PART - A (Words limit 25)

1. Draw stress-strain diagram (Tensile test diagram). **(10×2=20)**

2. Define the ultimate strength.

3. What is the Poisson's ratio?

4. Explain modulus of rigidity.

5. Write down the maximum shear stress theory.

6. Write down the maximum strain energy theory.

7. Write down the expression for equivalent twisting moment for shaft subjected to torsion and bending forces?

8. Write down the Rankine general formula for Columns.

9. Write the relationship among twisting moment, shear stress and torsional rigidity.

10. Write down the general bending moment equation having modulus of elasticity and moment of inertia.

PART - B (Words limit 100)

(5×4=20)

1. What are the "complimentary shear stresses"? Using Mohr circle, derive expression for normal and tangential stresses on a diagonal plane of a piece of material in pure shear.

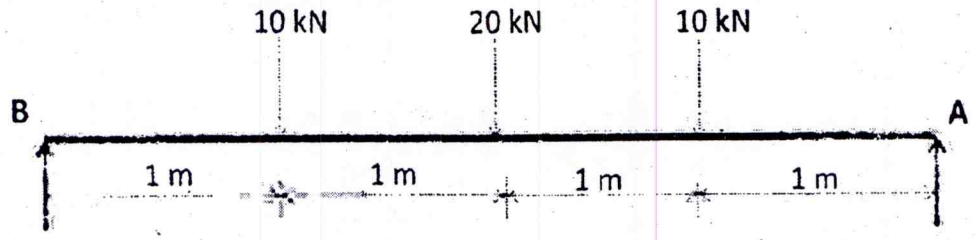
2. At a point in an elastic material under strain, there are normal stresses of 50N/mm^2 and 13 N/mm^2 respectively at right angles to each other with a shearing stress of 25 N/mm^2. Find the principal stresses and position of principal planes if:

   i) 50 N/mm^2 is tensile and 30 N/mm^2 is also tensile.

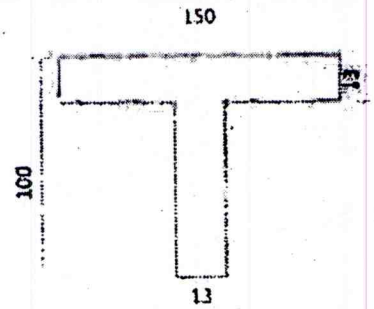
   ii) 50 N/mm^2 is tensile and 30 N/mm^2 is compressive.

   Find also the maximum shear stress and its plane in both the cases using mohr circle method.

3. Draw the shear force diagram and Bending moment diagram for following simply supported beam with point loads.



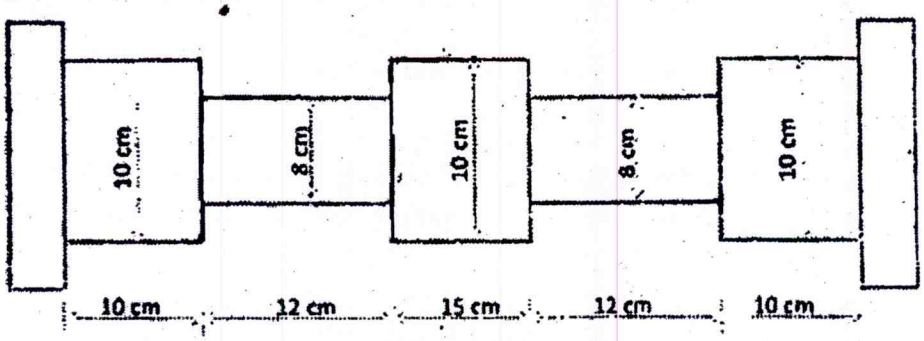
4. The cross section of a joist is a T section 150 mm × 200mm×13 mm with 150 mm side horizontal. Find the maximum intensity of shear stress and sketch the distribution of stress across the section if it has to resist a shear force of 80 kN.



5. A mild steel column is of hollow circular section with 120 mm external diameter and 90 mm internal diameter. The column is 3m long and hinged at both the ends. Calculate the maximum permissible load with an eccentricity of 20 mm if the maximum compressive stress is limited to 80 N/mm^2. Take E=2.05×10^5 N/mm^2

PART - C (Any three) **(3×10=30)**

1. A rod shown in the following fig. is subjected to a pull of 500 kN on the ends. Taking E = 205 kN/mm^2, find the extension of the rod.



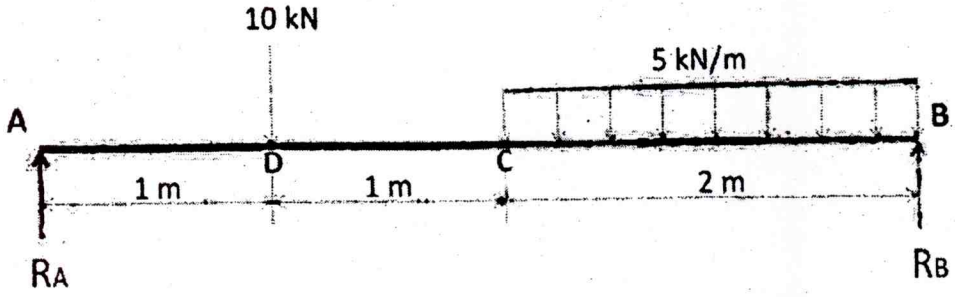
2. A beam AB of 4 metre span is simply supported at the ends and is loaded as shown in the following figure. Determine

   i) Deflection at point C,

   ii) Maximum deflection and

   iii) Slope at the end A.

   Take E= 2×10^5 N/mm^2 and I = 1000 cm^4.



3. A copper tube of 50 mm internal diameter, 1 m long and 1.25 mm thick has closed ends and is filled with the water under pressure. Neglecting any distortion of the end plates, determine the alteration of pressure when an additional volume of 3 cubic centimetres of water is pumped into the tube.

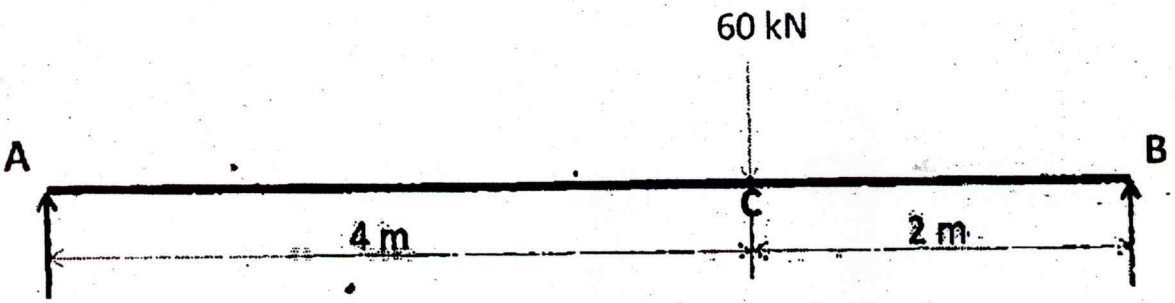
4. A hollow steel shaft 4 m long is to transmit 150 kW power at 150 R.P.M. The total angle of twist in this length is not to exceed 2.5 degree and the allowable shear stress is 60 N/mm^2. Determine the inside and outside diameters if N = 0.082×10^6 N/mm^2.

5. Using area moment method, compute

   i) Deflection at point C,

   ii) Slope at point B for the Beam AB as shown in the following figure.

   Take I = 1000 cm^4 and is E = 2×10^5 N/mm^2.



3E1116

Roll No. _____ [Total No. of Pages : 2

3E1116

B.Tech. III Sem. (Back) Examination, April/May - 2022

ESC Automobile Engineering

3AE3-04 Engineering Mechanics

AE,ME

Time : 2 Hours

Maximum Marks : 80
Min. Passing Marks : 28

Instructions to Candidates:

*Attempt **all five** questions from **Part A**, **four** questions out of **six** questions from **Part B** and **two** questions out of **three** from **Part C**.*
Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.
Use of following supporting material is permitted during examination (As mentioned in form No. 205).

PART - A

(Answer should be given up to **25** words only)

All questions are **compulsory** **(5×2=10)**

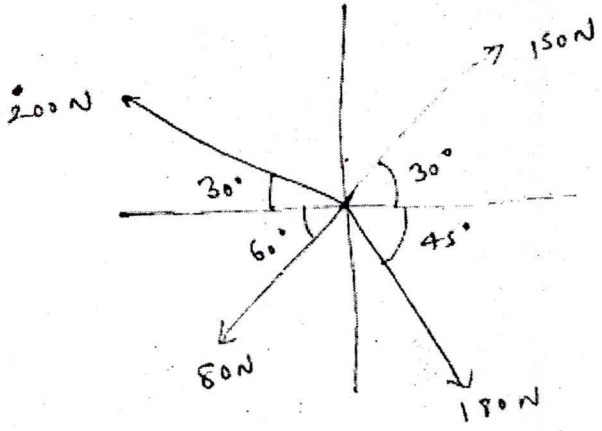
1. Define scalar and vector quantities?
2. State varignon's theorem.
3. What is principal moment of Inertia?
4. State law of conservation of momentum.
5. Distinguish between centroid and centre of gravity.

PART - B

(Analytical/Problem solving questions)

Attempt any **four** questions **(4×10=40)**

1. Determine the resultant of the concurrent force system shown in figure.



2. Draw neat sketch of first system of pulleys and obtain expression of mechanical advantage, velocity ratio and efficiency.

3. State the impulse momentum relation. A ball of 2 kg is thrown straight up into the air with an initial velocity of 15 m/sec. Calculate the time of flight of the ball using Impulse momentum theorem.

4. A flat belt transmits 20 KW power from a pulley of 100 cm diameter running at 300 rpm. The angle of lap on the pulley is 160°. Find the width of the belt if the maximum tension is limited to 200 N/cm. Take $\mu = 0.3$.

5. Derive an expression for the total length of the belt required for open belt drive.

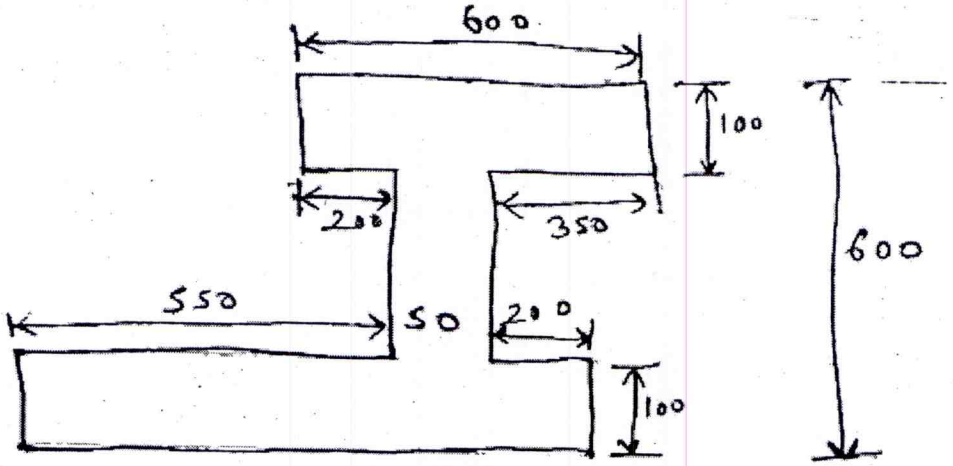
6. Explain different types of friction. State different laws of static and dynamic friction.

PART - C

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any **two** questions **(2×15=30)**

1. For the section shown in figure below, locate the horizontal and vertical centroidal axes.



2. In an open belt drive the sum of the diameters of two pulleys is 60 cm. They are running at 1500 and 3000 rpm. Determine the diameter of each pulley assuming the total slip of the system is 5%. The pulley running at 1500 rpm is the driver pulley.

3. A stone is allowed to fall from the top of the tower 100 meters in height and at the same time another stone thrown vertically upwards with a velocity of 25 m/s. Find where and when they will meet?

3E1117

Roll No. _____ [Total No. of Pages : 3

3E1117

B.Tech. III Sem. (Back) Examination, April/May - 2022
Automobile Engineering
3AE4-05 Engineering Thermodynamics
AE, ME

Time : 3 Hours

Maximum Marks : 120
Min. Passing Marks : 42

Instructions to Candidates:

*Attempt **all ten** questions from **Part A**, selecting **five** questions from **Part B** and **Four** from **Part C**.*

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are **compulsory** **(10×2=20)**

1. Define thermodynamic system.
2. What do you mean by availability?
3. What is the significance of air standard cycle?
4. Why is Carnot cycle not used as a standard of reference for steam power plants?
5. What is critical point?
6. State the difference between intensive and extensive property.
7. Define mean effective pressure.
8. What is the perpectual motion machine of second kind?
9. Define Gibb's and Helmholtz function.
10. Write the importance of binary vapour cycle.

PART - B

(Analytical/Problem solving questions)

Attempt any **Five** questions **(5×8=40)**

1. Explain and state the second law of thermodynamics with neat diagram.
2. Explain the Joule Thomson coefficient with the isenthalpic curves.
3. Derive an expression for the air standard efficiency for an Otto cycle in terms of compression ratio.
4. Derive the expression for reversible expansion process obeying the polytropic law,

   $Q_{1-2} = \frac{\gamma - n}{\gamma - 1} \times$ *polytropic work done.*

5. In an air standard Diesel cycle, the compression ratio is 16 and at the beginning of isentropic compression, the temperature is 15°C and the pressure is 0.1 MPa. Heat is added until the temperature at the end of the constant pressure process in 1480°C. Calculate :

   a. Cut of ratio.

   b. Heat supplied per kg of air.

   c. Cycle efficiency.

   d. Mean effective pressure.

6. It is design to compress 10 kg of gas from 1.5 m^3 to 0.3 m^3 at a constant pressure of 15 bar. During this compression process, the temperature rises from 20°C to 150°C and the increase in internal energy is 3250 kJ. Calculate the work done, heat interaction and change in enthalpy during the process. Also calculate average value of specific heat at constant pressure.
7. A steam power plant operates on the Rankine cycle with superheated steam entering the turbine at 4 MPa and 300°C. The steam is condensed in a condenser at 20 kPa. Determine the thermal efficiency of the cycle assuming ideal conditions.

PART - C

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any **Four** questions **(4×15=60)**

1. Derive an expression $C_p - C_v = \frac{Tv\beta^2}{K_T}$.
2. Sketch the layout of various components comprising the vapour compression refrigeration cycle, and explain its working.

3. Derive an expression for the air standard efficiency of a Dual cycle. Also derive an expression for the MEP of a Dual cycle.

4. A steam power plants operates on a theoretical reheat cycle. Steam at 25 bar pressure and 400°C is supplied to the high pressure turbine. After its expansion to dry state, the steam is reheated at constant pressure to its original temperature. Subsequent expansion occurs in the low pressure turbine to a condenser pressure of 0.04 bar. Considering feed pump work, calculate :

   a. Quality of steam at entry to condenser.

   b. Thermal efficiency.

   c. Specific steam consumption.

5. A reversible heat engine working between two thermal reservoirs at 875 K and 315 K drives a reversible refrigerator which operates between the same 315 K reservoir and a reservoir at 260 K. The engine is supplied 2000 kJ of heat and the net work output from the composite system is 350 kJ. Make calculation for the heat transfer to the refrigerator and the net heat interaction with the reservoir at 315 K temperature.

3E1118

Roll No. _____ [Total No. of Pages : 2

3E1118

B.Tech. III Sem. (Back) Examination, April/May - 2022
Automobile Engineering
3AE4-06 Materials Science and Engineering
AE, ME

Time : 3 Hours **Maximum Marks : 120**
Min. Passing Marks : 42

Instructions to Candidates:

*Attempt **all ten** questions from **Part A**, selecting **five** questions from **Part B** and **Four** from **Part C**. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

Part - A

(Answer should be given up to 25 words only)

All questions are **compulsory** **(10×2=20)**

1. Define a Burger Vector.
2. What do you mean by the term 'Unit Cell'?
3. Mention four simple heat treatment steps and their purpose.
4. What is Bauschinger effect.
5. What is work hardening.
6. Why harden - ability of alloy steel is better than C-steel.
7. Define Hume - Rothery rule.
8. What is Jominy end - quench test.
9. What is nano - structured materials.
10. What do you mean by the term 'ceramic'? Write its application.

Part - B

(Analytical/Problem solving questions)

Attempt any **five** questions **(5×8=40)**

1. What is the crystal structure? Mention different types of crystal systems. Show that the packing efficiency for FCC crystal structure is 0.74.
2. Classify engineering material from various view point. Differentiate between steel and iron, alloys and composite and ceramics and polymers.

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3. What is Gibb's phase rule? Define a phase, a component and degree of freedom.
4. Differentiate between edge and screw dislocation based on the (i) Burger' vector and (ii) Direction of movement of atoms with dislocation movement.
5. What is substitutional and interstitial solid solution. Why solubility of solute is limited in interstitial solid solution? Justify.
6. List down the steps involved in evaluating the Miller indices for crystallographic planes. Find the miller indices for planes AECG and AFGD shown in figure 1(a) and (b) respectively.

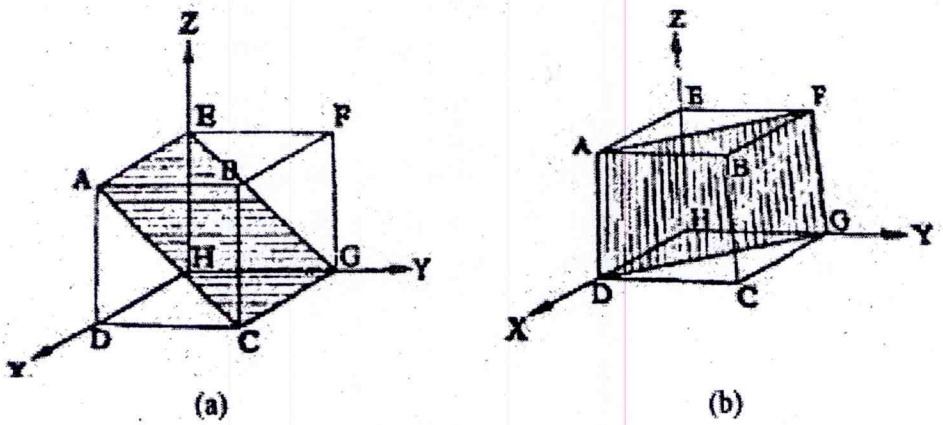


Figure 1

7. Explain in detail, the Pearlitic and Bainitic transformations uisng TTT diagram.

Part - C

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any **Four** questions **(4×15=60)**

1. Draw neat labeled Iron - Iron carbide equilibrium phase diagram. Explain invariant reactions occur in this diagram.
2. What are constituents, properties and engineering applications of PVC, PMMA, ABS, PTFE and PA?
3. Draw and explain the stress - strain curve for aluminium. Also, discuss impact test for the materials.
4. Explain briefly Annealing, Normalizing, Flame Hardening and cyaniding processes related to heat treatment of material.
5. Differenciate Tool Steel to Stainless Steel with respect to their properties. Explain the effects of addition of Si, Cr, Mo, V and W alloying elements on the properties of steel.

3E1119

Roll No. _____ [Total No. of Pages : 4

3E1119

B.Tech. III Sem. (Back) Examination, April/May - 2022
PCC Automobile Engineering
3AE4-07 Mechanics of Solids

Time : 3 Hours

Maximum Marks : 160
Min. Passing Marks : 56

Instructions to Candidates:

*Attempt **all ten** questions from **Part A, selecting five** questions from **Part B** and **Four from Part C**.*

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

PART - A

All questions are **compulsory** (10×3=30)

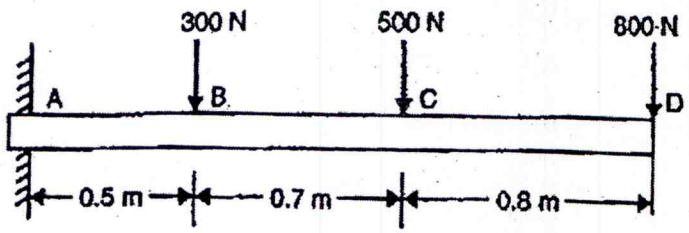
1. State Principle of Superposition with example. (3)
2. Define the terms lateral and linear strain and shows the relation between them. (3)
3. What are the modes of failure of a column? (3)
4. Draw the stress strain curve for mild steel and mention the properties evaluated by it. (3)
5. Enlist the theories of failure. (3)
6. Brief out types of Supports, beams and load. (3)
7. Write down the relationship between slope, deflection and radius of curvature. (3)
8. List the different column end conditions with their crippling load. (3)
9. Differentiate between principal stress and principal strain. (3)
10. What is the difference between a column and a strut. (3)

PART - B

Attempt any **five** questions (5×10=50)

1. Find the extension of a bar uniformly tapering from diameter 'd_1' at one end to diameter 'd_2' at the other end subjected to an axial tensile load P at both ends. Lenth of bar is taken as 'L'. (10)

2. A cantilever beam of length 2m carries the point loads as shown in fig. Draw the shear force and B.M. diagrams for the cantilever beam. **(10)**



3. a. A rectangular beam 200 mm deep and 300 mm wide is simply supported over a span of 8 m. What uniformly distributed load per meter the beam may carry, if the bending stress is not to exceed by 120 N/mm^2. **(5)**

   b. Explain the following : **(5)**

      i. Hogging and Sagging Bending Moment.

      ii. Contra flexure point.

4. a. A cylindrical thin drum 80 cm in diameter and 3 m long has a shell thickness of 1 cm. If the drum is subjected to an internal pressure of 2.5 N/mm^2, determine.

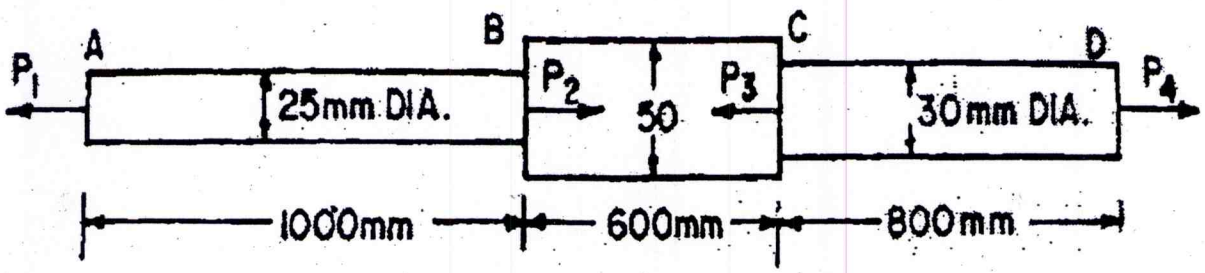
      i. change in diameter,

      ii. change in length and

      iii. change in volume. **(5)**

   b. Explain the theories of failure along with the failure criteria. **(5)**

5. a. A member ABCD is subjected to point loads P_1, P_2, P_3 and P_4 as shown in fig. Calculate the force P_2 necessary for equilibrium if $P_1 = 10$ kN, $P_3 = 40$ kN and $P_4 = 16$ kN. Taking modulus of elasticity as 2.05×10^5 N/mm^2, determine the total elongation of the member. **(5)**



   b. Derive equation for equivalent Twisting and bending moment. **(5)**

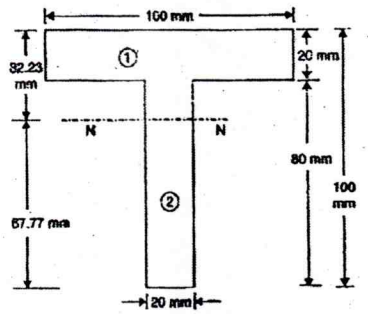
6. A timber beam of rectangular section is to support a load of 20 kN uniformly distributed over a span of 3.6 m, when the beam is simply supported. If the depth of section is to be twice the breadth and the stress in the timber is not be exceed 35 N/mm^2. Find the breadth and depth of the cross section. What is the cross section of the beam, if it carries a concentrated load of 20 kN at the mid span of the beam? **(10)**

7. A vertical round steel rod 1.82 meter long is securely held at its upper end. A weight can slide freely on the rod and its fall is arrested by a stop provided at the lower end of the rod. When the weight falls from a height of 30 mm above the stop the maximum stress reached in the rod is estimated to be 157 N/mm^2. Determine the stress in the rod if the load had been applied gradually and also the minimum stress if the load had fallen from a height of 47.5 mm. Take E = 2.1×10^5 N/mm^2. **(10)**

PART - C

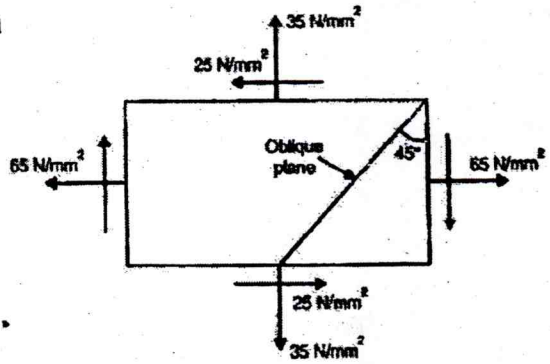
Attempt any **Four** questions **(4×20=80)**

1. a. A cast iron beam is of T - section as shown in fig. the beam is simply supported on a span of 8 m. The beam carries a uniformly distributed load of 1.5 kN/m length on the entire span. Determine the maximum tensile and maximum compressive stresses. **(10)**



b. What do you mean by pure torsion? What are the assumptions made in theory of pure torsion? Prove Relation - $\frac{\tau}{R}=\frac{T}{J}=\frac{C\theta}{L}$ (Torsional Equation). **(10)**

2. a. A point in a strained material is subjected to stresses shown in fig. using Mohr's circle method; determine the normal and tangential stresses across the oblique pla **(10)**



b. Derive the formula for bending equation. **(10)**

$M/I = \sigma/Y = E/R$

Where

M = Bending moment

I = Moment of inertia

E = Young's Modulus

Y = Distance From Neutral Axis.

R = Radius of Curvature.

σ = Stress.

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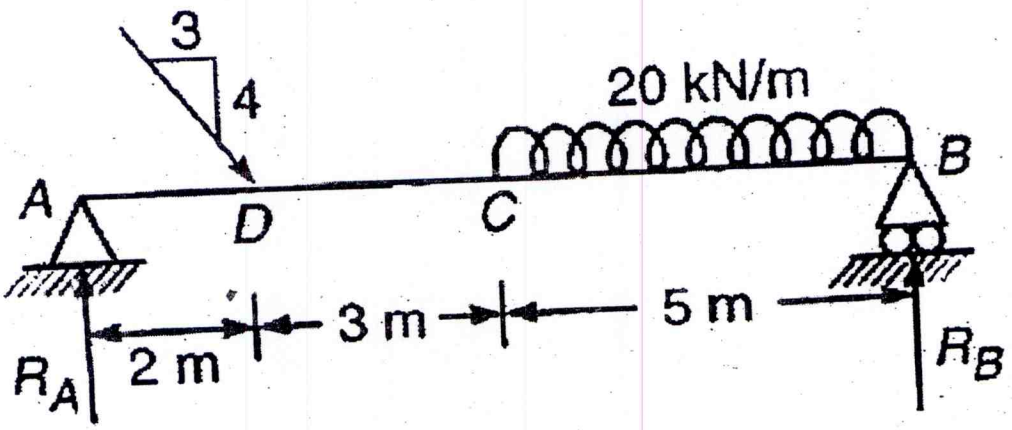
3. a. A Hollow shaft of diameter ratio 3/8 (Internal diameter to external diameter) is to transmit 375 kw power at 100 rpm. The max torque being 20% greater than the mean. The shear stress is not to exceed 60 N/mm^2 and twist in a length of 4 m not to exceed 2°. Calculate its external and internal diameter which would satisfy both the above conditions, Assume modules of rigidity $G = 0.85\times10^5$N/mm^2. **(10)**

b. Derive the expression for Euler's crippling load for a long column with both ends of column being hinged. **(10)**

4. a. Find the Euler's crushing load for a hollow cylindrical cast iron column 20 cm external diameter and 25 mm thick, if it is 6 m long and is hinged at both ends. Take E = 1.2×10^5 N/mm^2. Compare the load with the crushing load as given by the Rankine's formula, taking $\sigma_c = 550\,N/mm^2$ and a = 1/1600, for what length of the column would these two formulae give the same crushing load? **(10)**

b. Derive the expression for the torque transmitted by a circular solid shaft. **(10)**

5. a. A simply supported beam is loaded as shown in fig. Draw the S.F and B.M diagrams for the beam and determine the value of maximum bending moment. **(10)**



b. Compare the ratio of the strength of a solid steel column to that of a hollow of the same cross - sectional area. The internal diameter of the hollow column is 3/4 of the external diameter. Both the columns have the same length and are pinned at both ends. **(10)**

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3E1631

B.Tech. III Sem. (Old Back) Examination, April/May - 2022
Aeronautical Engineering
3AN1 Aeronautical Engineering
AE, ME, PI, AN

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks : 24

Instructions to Candidates:

*Attempt any **five** questions, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

Unit - I

1. a) Briefly explain : **(4×2=8)**
   i. Generalized Hooke's Law.
   ii. Poisson's Ratio.
   iii. Factor of Safety.
   iv. Viscoelastic Material.

   b) Determine the extension of a uniformly tapering horizontal bar of length 'L' subjected to axial tensile load 'P' at both ends. Diameter of the bar varies from 'd_1' to 'd_2' over the length 'L'. (Assume $d_1 > d_2$). **(8)**

(OR)

1. a) Explain the stress - strain diagram for an elastic ductile material. **(6)**

   b) A weightless rigid bar is suspended by three elastic wires, as shown in Fig. 1. For each wire; cross section area A = 70 mm², E = 230 GPa, and L = 5m. A force P = 5 kN is applied at the location shown in figure. Determine the load and deflection induced in individual wires. **(10)**

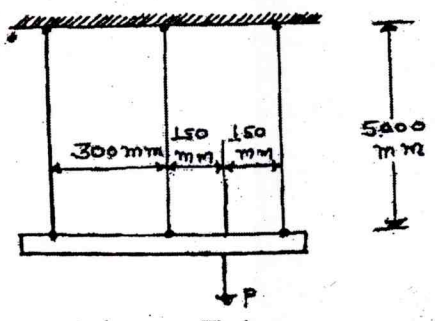

Fig.1

Unit - II

2. a) Explain the difference between Plane stress and Plane strain condition. **(6)**

   b) In a material subjected to stress, normal stresses at two mutually perpendicular planes are 20 N/mm^2 and 10 N/mm^2, both tensile. A shear stress of 20 N/mm^2 is also acting on these perpendicular planes. Determine the principal stresses and their respective planes. **(10)**

(OR)

2. a) Differentiate between the maximum shear stress theory of failure and the maximum normal stress theory of failure. **(6)**

   b) A point in a strained material is subjected to stress as shown in Fig. 2 Using the Mohr circle method; determine the normal and shear stress on the oblique plane A - B as shown in the figure. Also find the value of principal stresses for the given state of stress. **(10)**

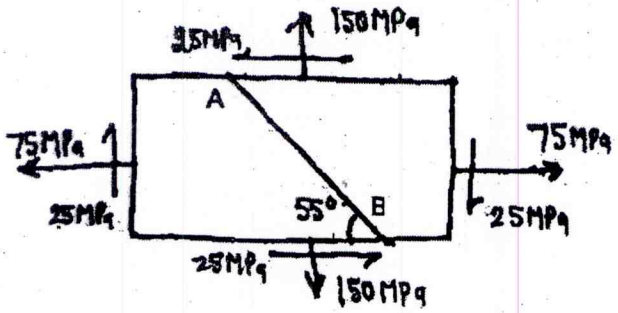

Fig.2

Unit - III

3. a) Determine the location of a moving load 'W' over the span of a simply supported beam of length 'L', for the beam to be subjected to maximum bending moment. **(8)**

   b) Evaluate the bending moment and shear force at the free and the fixed end of cantilever beam of length 'L', loaded as shown in Fig. 3. The load varies uniformly from 'W' kN/m at fixed end to 'zero' at the free end of the beam. **(8)**

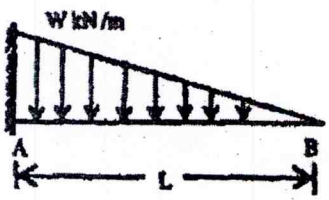

Fig.3

(OR)

3. Draw he shear force diagram and bonding moment diagram for the overhang beam shown in Fig. 4. Also locate the points of inflection, if any. (All distances are in m). **(16)**

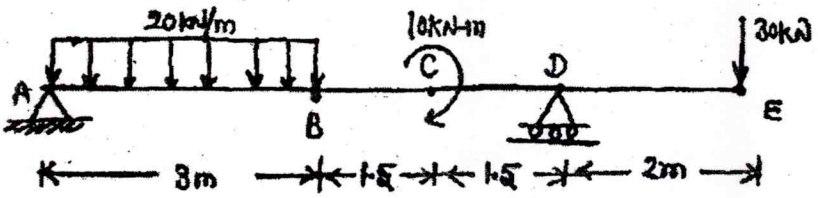

Fig. 4

Unit - IV

4. a) A thin cylindrical pressure vessel of 400 mm diameter is subjected to an internal pressure of 4 N/mm2. The thickness of vessel is 30 mm. Determine the hoop stress, longitudinal stress and the maximum shear stress for the vessel. **(08)**

   b) A simply supported beam of span 5 m has a square cross section of 3600 mm^2. If the beam is subjected to U.D.L. of 10 kN/m, find the maximum bending stress generated in the beam. **(08)**

(OR)

4. a) Derive the flexural formula for bending stresses in a beam :

$$\frac{M}{I}=\frac{\sigma}{y}=\frac{E}{R}.$$

   State the assumptions made in deriving flexural formula. **(8)**

   b) Draw and explain the transverse shear stress distribution over a beam with I - shape cross section. **(8)**

Unit - V

5. a) Derive the formulae for determining angle of twist in a circular shaft subjected to pure torsion. **(6)**

   b) A hollow circular shaft of diameter ratio (inner to outer) is used to transmit 400 kW power at 120 rpm. The maximum torque in the shaft is 20% greater than the mean torque. Shear stress in the shaft is not to exceed 70 N/mm^2 and angular twist in a length of 4 m is not to exceed 2°. Calculate the external and internal diameter of the shaft which would satisfy both the conditions required. (Assume for shaft material G = 0.9 N/mm^2). **(10)**

(OR)

5. a) Explain

   i. Concept of stability and buckling of a column. **(2×4=8)**

   ii. Limitations of Euler's Buckling load formula.

   b) Determine the crushing load for a hollow cylinder hinged at both ends using the Rankine's formula. The length of cylinder is 5 m and its inner and outer diameters are 100 mm and 140 mm respectively. Take E = 120 GPa, f = 550 N/mm^2 and Rankine constant. **(8)**

3E1633

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3E1633

B.Tech. III Sem. (Old back) Examination, April/May - 2022
Automobile Engineering
3AE3A Automobie Engineering
AE, ME, PI

Time : 3 Hours **Maximum Marks : 80**
Min. Passing Marks : 24

Instructions to Candidates:

*Attempt any **five** questions, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

UNIT - I

1. a) Explain the terms state, Path, process and cycle. **(4)**

   b) What do you understand by property of a system? Distinguish between intensive and extensive properties with example. **(4)**

   c) 2 kg of an ideal gas occupies a volume of 0.3 m^3 at 10 bar pressure and 500 K temperature. When this gas expands polytropically ($pV^{1.2} = C$) the internal energy decreases by 300 kJ. Presuming adiabatic exponent $\gamma = 1.4$, determine

      i. Specific gas constant.

      ii. Final temperature, pressure and volume of gas.

      iii. Heat and work interactions across the system boundary. **(8)**

(OR)

1. a) Define and explain the Zeroth Law of Thermodynamics. **(4)**

   b) Name the various processes for closed system and show them graphically of P-V and T-S diagrams. **(4)**

   c) Derive the steady flow energy equation and point out the significance of various terms involved. **(8)**

UNIT - II

2. a) State the kelvin - plank and clausius statements of the second law of thermodynamics. **(8)**

   b) Two kg of water at 80°C are mixed adiabatically with 3 kg of water at 30°C in a constant pressure process of 1 atmosphere. Find the increase in entropy of the total mass of water due to the mixing process (C_p of water = 4.187 kJ/kgK). **(8)**

(OR)

2. a) Explain concept of available and unavailable energy. Drive expression for availability in non - flow system. **(8)**

   b) Define irreversibility. Show that irreversibility of a process is given by the product of the temperature of surrounding and the net entropy change. **(8)**

UNIT - III

3. a) Explain the following terms :

   i. Saturated steam.

   ii. Dryness fraction.

   iii. Triple point.

   iv. Enthalpy of dry and saturated steam. **(8)**

   b) A rigid vessel of $2m^3$ volume is filled with superheated steam at 20 bar and 300°C. The vessel is cooled untill the steam is just dry saturated. Calculate the mass of steam in the vessel, the final pressure of steam and the amount of energy transferred as heat to the surroundings. Represent the process on T-S diagram. **(8)**

(OR)

3. a) Define the term reduced pressure and reduced volume. Express the vander waal's equation of state in terms of reduced parameters. **(8)**

   b) What is Datton's law of partial pressure? Explain Gibb's Dalton law. **(8)**

UNIT - IV

4. a) Derive first and second Tds equation. **(8)**

   b) Derive maxwell's relations and explain its importance in thermodynamics. **(8)**

(OR)

4. a) Derive an expression for air standard efficiency of diesel cycle. **(8)**

b) Consider on air standard Otto cycle that has a heat addition of 2800 kJ/kg of air, a compression ratio of 8 and a pressure and temperature at the beginning of compression process of 1 bar, 300 K. Determine.

a. The maximum pressure and temperature in the cycle.

b. The thermal efficiency.

c. The mean effective pressure. **(8)**

UNIT - V

5. a) Explain the Rankine cycle with neat sketch. Draw its P-V, T-S and h-S diagram. **(8)**

b) A steam power plant is proposed to operate between the pressure of 10 kPa and 2 MPa with a maximum temperature of 400°C. Determine the thermal efficiency of power plant. **(8)**

(OR)

5. a) List the requirement of an ideal working fluid for Rankine cycle. **(4)**

b) What is bleeding. How does it affect the cycle efficiency. **(6)**

c) What is meant by a reheat cycle? When is reheating of steam recommended in a steam power plant? **(6)**

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3E1634

B.Tech. III Sem. (Old Back) Examination, April/May - 2022
Automobile Engineering
3AE4A Automobile Engineering
AE, ME

Time : 3 Hours **Maximum Marks : 80**
Min. Passing Marks : 24

Instructions to Candidates:

*Attempt any **five** questions. Selecting one question from each unit. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.)*

Use of following supporting material is permitted during examination.

(Mentioned in form No.205)

Unit - I

1. a) Explain following: **(8)**

i) Pattern allowance

ii) Permeability test

iii) Pouring basin

iv) Runner & Riser

b) Explain casting and classified casting. **(8)**

(OR)

1. a) Define Pit mould and loan mould casting. **(8)**

b) Explain slush casting, also explain casting defects. **(8)**

Unit - II

2. a) Explain drop forging and press forging and its uses. **(8)**

b) Differentiate applications of Hot and Cold rolling. **(8)**

(OR)

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2. Explain the following: **(16)**

   a) Spinning

   b) Bulging

   c) Drawing operation

   d) Coining

Unit - III

3. Explain TIG and MIG welding with neat sketch. **(16)**

(OR)

3. Define welding and types of welding, also explain ultrasonic welding. **(16)**

Unit - IV

4. Explain powder manufacturing and advantages and application of Powder metallurgy. **(16)**

(OR)

4. Explain virtual Proto typing and its applications. **(16)**

Unit - V

5. Explain uses of Plastic technology in manufacturing Process. **(16)**

(OR)

5. Classified and explain plastics and explain ingredients of Moulding. **(16)**

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3E1635

3E1635

B.Tech. III Sem. (Old Back) Examination, April/May - 2022
Aeronautical Engg.
3AN5 Aeronautical Engg.
AE, ME, AN

Time : 3 Hours **Maximum Marks : 80**
Min. Passing Marks : 24

Instructions to Candidates:

*Attempt any **five** questions. Selecting one question from each unit. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.)*

Use of following supporting material is permitted during examination.

(Mentioned in form No.205)

Unit - I

1. What is inheritance? What are the different types of inheritance? Give an example of each. **(16)**

(OR)

1. What do you understand by polymorphism? Explain its types and how it is achieved in C++. Also discuss its advantages. **(16)**

Unit - II

2. What are classes and objects? Explain with suitable example the process of creating and destroying objects dynamically using "new" and "delete" operators. **(16)**

(OR)

2. a) Explain the concept of inline function in C++. How it is beneficial in programming? **(8)**

   b) Explain about arrays and pointers. **(8)**

Unit - III

3. a) What is a friend function? Write a program to define member function outside a class using scope resolution operator. **(8)**

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b) What is constructor? How many types of constructors are in C++? Describe with the help of a suitable example.

(OR)

3. a) What is virtual base class? When do we make a class virtual? Explain with example. **(8)**

b) What is visibility mode explain about public, private & protected. **(8)**

Unit - IV

4. What is template class and template function? Use suitable example to explain them. **(16)**

(OR)

4. a) Write a program to read a File. **(8)**

b) Write a program to copy contents of a File to another File. **(8)**

Unit - V

5. What do you mean by circular linked list. Also explain how we can delete a mode from circular linked list. **(16)**

(OR)

5. a) What do you mean by stack. Give the various operations of on stack. **(8)**

b) What do you mean by Queue operation, explain with example. **(8)**

3E1636

Roll No. _____ [Total No. of Pages : 3

3E1636

B.Tech. III Sem. (Old Back) Examination, April/May - 2022
Automobile Engineering.
3AE6A Automobile Engineering
AE, ME, PI

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks : 24

Instructions to Candidates:

*Attempt any **five** questions, selecting **one question** from **each unit**. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

Unit - I

1. a) Find the inverse Discrete Fourier transform of the sequence $\{D_0, D_1, D_2\} = \{0, 1, -\omega^2, 1, -\omega\}$. **(8)**

b) Find the fourier transform of $f(x) = \begin{cases} 1 & for\ |x| < 1 \\ 0 & for\ |x| > 1 \end{cases}$ Hence evaluate $\int_0^\infty \frac{\sin S}{S}\, dj$. **(8)**

(OR)

1. a) Find the fourier sine transform of $f(x) = \frac{e^{-ax}}{x}$. **(8)**

b) Solve $\frac{\partial u}{\partial t} = C^2 \frac{\partial^2 u}{\partial x^2}$; $x > 0; t > 0$ given that u(0,t) = f(t) and u(x,0) = 0. **(8)**

Unit - II

2. a) Evaluate

i. $L\{t^2 \cos at\}$. **(4)**

ii. $L\{t^2 e^{3t} \sin^4 t\}$. **(4)**

b) Apply convolution theorem to evaluate $L^{-1}\left\{\frac{s^2}{(s^2 + a^2)(s^2 + b^2)}\right\}$. **(8)**

(OR)

2. a) Find $L^{-1}\left\{\frac{3s+7}{s^2-2s-3}\right\}$. **(5)**

b) Evaluate $L^{-1}\left\{\log\left(\frac{s-1}{s}\right)\right\}$. **(5)**

c) Using Laplace transform solve $\frac{d^2x}{dt^2}+\frac{dx}{dt}=2$ given that x =3 at t =0 and $\frac{dx}{dt}=1$ at t = 0. **(6)**

Unit - III

3. a) We have two coins; the first is four and second two headed. We pick one of the coins at random, we toss it twice and head shows up both times. Find the probability that the coin picked is fair. **(5)**

b) Six dice one thrown 729 times. How many times do you expect at least three dice to show at 5 or a 6? **(5)**

c) Prove that the poisson distribution in the limiting case of the binomial distribution. **(6)**

(OR)

3. a) Define Binomial distribution. Find mean and variance of the distribution. **(5)**

b) If 2% of the books band at a certain library have defective bindings. Find the probability that five of 400 books found will have defective bindings. **(5)**

c) The distribution of weekly wages for 500 workers in a factory is approximately normal with the mean and standard deviation of Rs. 75 and Rs. 15. Find the number of workers who receives weekly wages :

i. More than Rs. 90

ii. Less than Rs. 45. **(6)**

Unit - IV

4. a) Apply lagrange's interpolation formula to find the value of y when x = 2 given that **(8)**

x :	0	1	3	4
y :	5	6	50	105

b) Use stirling's formula to compute $y_{12.2}$ from the following table **(8)**

x	10	11	12	13	14
y	23967	28060	31788	35209	38368

(OR)

4. a) Find the missing value in the following data. **(4)**

x	2	4	6	8	10
y	5.6	8.6	13.9	-	35.6

b) Prove $\delta[f(x)g(x)] = \mu[f(x)]\delta[g(x)] + \mu[g(x)]\delta[f(x)]$. **(4)**

c) Find f(1.28) by using suitable interpolation formula for the table. **(8)**

x	1.15	1.20	1.25	1.30
f(x)	1.0723	1.0954	1.1180	1.1401

Unit - V

5. a) Find $y'(0)$ and $y''(0)$ from the data **(8)**

x :	0	1	2	3	4	5
y :	4	8	15	7	6	2

b) Apply Picard's method to obtain solution of the following differential equation correct to far places of decimals.

$\frac{dy}{dx} = x^2 + y^2$; with y = 0 when x = 0 for x = 0.4. **(8)**

(OR)

5. a) Compute $\int_0^{\pi/2} \sin x\,dx$ by simpson's 3/8 rule. **(5)**

b) Use R-K fourth order method to solve $\frac{dy}{dx} = x + y$, given that y = 1 when x = 0 for x = 0.2 taking one step of h = 0.2. **(5)**

c) Use Milne's method to find y(0.8) from $\frac{dy}{dx} = 1 + y^2$, y(0) = 0; given that y(0.2)= 0.2027; y(0.4) = 0.4228 and y(0.6) = 0.6844. **(6)**
