3E1116

Roll No. _____ Total No of Pages: 3

3E1116

B. Tech. III - Sem. (Main / Back) Exam., Dec. 2019

ESC Mechanical Engineering

3ME3-04 Engineering Mechanics

Common For AE, ME

Time: 2 Hours **Maximum Marks: 80**

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 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)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[5×2=10]**

All questions are compulsory

Q.1 What is Engineering Mechanics?

Q.2 Explain the principle of virtual work.

Q.3 What is area moment of inertia for disk?

Q.4 Explain the Newton's second law.

Q.5 How couple works?

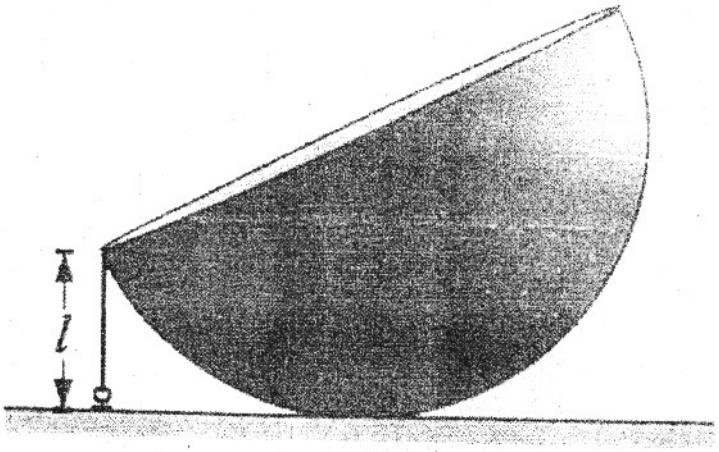
PART – B

(Analytical/Problem solving questions) **[4×10=40]**

Attempt any four questions

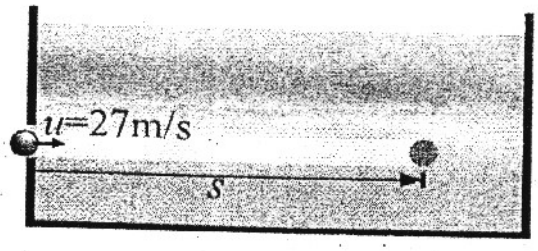
Q.1 State and explain the Varignon's theorem.

Q.2 A hemisphere of radius r and weight W is placed with its curved surface on a smooth table and a string of length l (< r) is attached to a point on its rim and to a point on the table as shown in Figure. Find the tension of the string.



Q.3 Derive an expression for the length of the cross belt.

Q.4 A sphere is fired horizontally into a viscous liquid with an initial velocity of 27 m/s, as shown in Figure. If it experiences a deceleration a = - 6t m/s^2, where t is in seconds, determine the distance travelled before it stops.

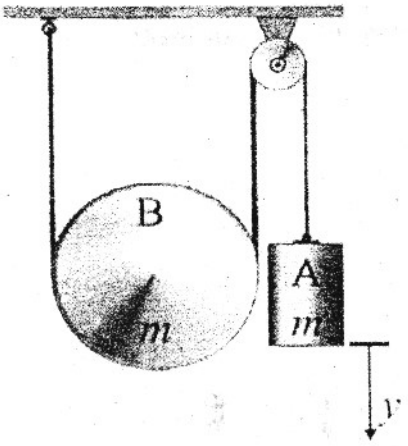


Q.5 Define the angle of friction and angle of repose.

Q.6 If the system shown in figure is released from rest, find:

(a) velocity v of the falling block A as a function of v.

(b) tensions of the string.



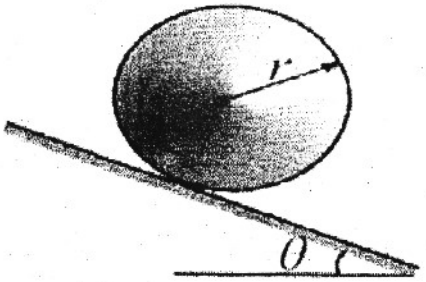
PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[2×15=30]**

Attempt any two questions

Q.1 Determine the moment of inertia of a thin elliptical disk of mass m, having axial radius of a and b.

Q.2 Find the minimum value of the coefficient of friction between a body and a plane, so that the body may roll without slipping. As shown in Figure, the radius of gyration and radius of body are k and r, respectively.



Q.3 Write short note on –

(a) Principle of work and energy

(b) Conservation of Energy

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3E1117

B. Tech. III - Sem. (Main / Back) Exam., Dec. 2019

PCC Automobile Engineering

3AE4-05 Engineering Thermodynamics

AE, ME

Time: 3 Hours **Maximum Marks: 120**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel 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)

1. Steam Tables and Mollier Chart 2. NIL

PART – A

(Answer should be given up to 25 words only) **[10×2=20]**

All questions are compulsory

Q.1 Differentiate between closed and open systems.

Q.2 What is the significance of First law of thermodynamics?

Q.3 Explain the difference between refrigerator and heat-pump.

Q.4 Why second law is called the law of degradation of energy?

Q.5 What do you understand by Entropy principle?

Q.6 What are saturation states? What is the critical state?

Q.7 What is Joule Thomson coefficient? Why is it zero for an ideal gas?

Q.8 State Gibbs Dalton law.

Q.9 Mention the demerits of Ericsson cycle?

Q.10 What are the basic components of steam power plant? What do you mean by average temperature of heat addition?

PART – B

(Analytical/Problem solving questions) **[5×8=40]**

Attempt any five questions

Q.1 A house requires 2×10^5 kJ/hr for heating in winter. Heat pump is used to absorb heat from cold air outside in winter and send heat to the house. Work required to operate the heat pump is 3×10^4 kJ/hr. Determine-

(i) Heat absorbed from outside

(ii) Coefficient of performances

Q.2 Prove that for a polytropic process, the change of entropy is given by

$$s_2 - s_1 = \frac{\gamma - n}{\gamma - 1} R. \ln\left(\frac{v_2}{v_1}\right)$$

Where, the symbols have their usual meanings.

Q.3 Derive the general expression for the maximum work of an open system which exchanges heat only with the surroundings.

Q.4 With the help of Maxwell's relations prove that enthalpy of an ideal gas is function of temperature only.

Q.5 A rigid vessel of volume 1 m^3 contains steam at 19 bar and 300°C. The vessel is cooled until the steam is just dry and saturated. Calculate the mass of steam in the vessel, the final pressure of the steam and the heat removed during the process.

Q.6 Draw P-v and T-s diagram of the Brayton cycle and derive an expression for its thermal efficiency. Also, derive an expression to determine the optimum pressure ratio for the maximum specific output of Brayton cycle.

Q.7 Derive an expression for the air standard efficiency and mean effective pressure of ideal Diesel cycle. Show the cycle on P-v and T-s diagram, describing the processes, briefly.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[4×15=60]**

Attempt any four questions

Q.1 A quantity of air initially occupies a volume of 0.028 m^3 at a pressure of 7 bar, and temperature of 260°C. The gas is expanded at constant pressure to 0.084 m^3. A polytropic process with n=1.50 is then carried out, followed by isothermal process which completes the cycle. All processes are reversible. Sketch the cycle in P-v and T-s planes and determine for each process-

(i) The heat transfer

(ii) The work done or required

(iii) The change of entropy.

Q.2 A steam generated at a pressure of 50 bar, 400°C is supplied to a throttle valve where its pressure drops to 40 bar. It then enters a turbine and expanded isentropically up to a pressure of 4 bar. On leaving the turbine, the steam is taken at a velocity of 60 m/s to a nozzle where it expands until the steam at the exit of nozzle is at pressure of 1.5 bar and dryness fraction 0.9. The changes in K.E. and the P.E. in the throttle valve and turbine are neglected. Determine the following:

(i) Power output by the turbine assuming steam flow rate of 2 kg/s.

(ii) The velocity of steam at the exit of nozzle assuming no heat loss.

Q.3 0.5 kg of air as an ideal gas executes a Carnot cycle having a thermal efficiency of 50%. The heat transferred 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 the following:

(i) The maximum and minimum temperature of the cycle

(ii) The volume at the end of isothermal expansion

(iii) The work and heat transfer for each kg of four processes

(iv) Sketch the cycle on P-v diagram.

Q.4 (a) With the help of TdS equations, show that the slope of an isentropic is greater than that of an isotherm on P-v plot. How is it meaningful for estimating the work of compression?

(b) In an air standard Otto cycle, the pressure and temperature of the air at the start of the compression are 1 bar and 330 K respectively. The compression ratio is 8 and the energy added at constant volume is 1250 kJ/kg. Determine the following-

(i) Maximum pressure and temperature of cycle

(ii) Air standard efficiency

(iii) Specific volume at the start of compression

(iv) Specific volume at the end of compression

(v) Mean effective pressure.

Q.5 Consider a regenerative cycle using steam as the working fluid. Steam leaves the boiler and enters the turbine at 4 MPa, 400 °C. After expansion to 400 kPa, some of the steam is extracted from the turbine for the purpose of heating the feed water in an open feed water heater. The pressure in feed water heater is 400 kPa, and the water leaving it is saturated liquid at 400 kPa. The steam not extracted expands to 10 kPa. Determine the cycle efficiency.

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Roll No. _____ Total No of Pages: 3

3E1118

B. Tech. III - Sem. (Main / Back) Exam., Dec. 2019

PCC Automobile Engineering

3AE4-06 Material Science and Engineering

AE, ME

Time: 3 Hours **Maximum Marks: 120**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel 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)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[10×2=20]**

All questions are compulsory

Q.1 What is recrystallization temperature? [2]

Q.2 Which deformation process requires more shear stress slip or twinning? [2]

Q.3 What are examples of isomorphous phase transformations? [2]

Q.4 State the equation of eutectoid reaction. [2]

Q.5 What are values of length and diameter in Jominy and quench test? [2]

Q.6 What is the product of Martempering process? [2]

Q.7 What is the effect of alloying Cr in steel? [2]

Q.8 State the microconstituents of Bronze. [2]

Q.9 What is toughness? [2]

Q.10 Which indenter is used in Brinell test? [2]

PART – B

(Analytical/Problem solving questions) **[5×8=40]**

Attempt any five questions

Q.1 Determine the Miller indices of a plane that makes intercepts of 2A, 3A and 4A on the Coordinate axes of an orthorhombic crystal with a: b: c = 4:3:2. [8]

Q.2 Draw and explain phase diagram for materials when constituents are soluble in liquid state and insoluble in solid state. [8]

Q.3 Draw T.T.T curve and label it neatly. [8]

Q.4 What is hardenability? Explain Jominy and quench test. [8]

Q.5 Discuss properties and applications of PP, PS and PVC polymers. [8]

Q.6 Discuss properties and applications of Al_2O_3 and SiC ceramics. [8]

Q.7 Explain strain hardening process and its different stages. [8]

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[4×15=60]**

Attempt any four questions

Q.1 Explain recovery, recrystallization and grain growth with suitable diagram. [15]

Q.2 Draw iron carbon diagram, explain its micro-constituents and all reaction points. [15]

Q.3 Discuss full annealing, austempering and nitriding heat treatment process. [15]

Q.4 Discuss different mechanical properties of materials and explain Izod impact testing method with suitable diagram. [15]

Q.5 Describe fiber, particulate reinforce composite materials and nano crystals. [15]

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3E1119

Roll No. _____ Total No of Pages: 4

3E1119

B. Tech. III - Sem. (Main /Back) Exam., Dec. 2019

PCC Automobile Engineering

3AE4-07 Mechanics of Solids

AE, ME

Time: 3 Hours **Maximum Marks: 160**

Min. Passing Marks: 56

Instructions to Candidates:

Attempt all ten questions from Part A, fiver questions out of seven questions from Part B and four questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel 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)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[10×3=30]**

All questions are compulsory

Q.1 Explain Hooke's Law.

Q.2 Define Poission's Ratio and give its value for steel and rubber.

Q.3 What are temperature stress and strain? Explain.

Q.4 Define Yield and Ultimate Strength of Material.

Q.5 Explain maximum shear stress theory of failure.

Q.6 Explain Principal stress and Principal plane.

Q.7 Define Section Modulus and Radius of gyration.

Q.8 What assumptions are taken in Euler's theory for Column?

Q.9 Explain point of contraflexure in beam.

Q.10 Define flexural and torsional rigidity.

PART – B

(Analytical/Problem solving questions) **[5×10=50]**

Attempt any four questions

Q.1 Derive torsional equation for shaft – [10]

$$\frac{T}{j} = \frac{\tau}{R} = \frac{G\theta}{l}$$

Where T = Torque

J = Polar Moment of Inertia

τ = shear stress

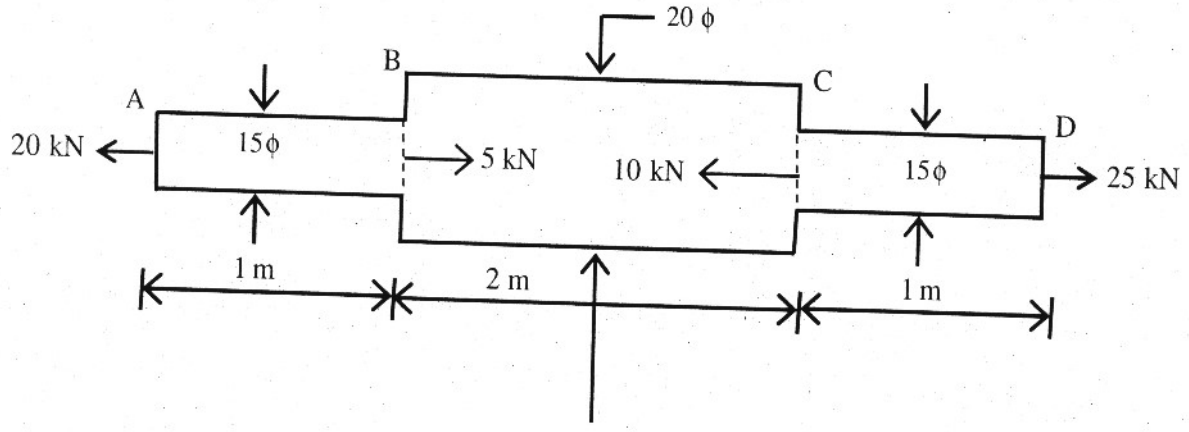
G = Modulus of Rigidity

θ = Angle of Twist

l = length of shaft

R = Radius of shaft

Q.2 A steel bar ABCD 4m long is subjected to forces as shown in Fig. 1 [10]



Diameter of portion AB, BC and CD are 15, 20 and 15 mm respectively. Find the elongation of bar. Take E = 200 GPa.

Q.3 A gas cylinder of internal diameter 40 mm is 5 mm thick. If the tensile stress in the material is not to exceed 30 MPa. Find the maximum pressure which can be allowed in the cylinder. [10]

Q.4 Compare the ratio of the strength of a solid steel column to that of a hollow of the same cross – section area. The internal diameter of the hollow column is ¾ of the external diameter. Both the columns have the same length and are pinned at both ends. [10]

Q.5 At a particular section of a shaft, the maximum torque is 10 kN-m and the maximum bending moment is 7.5 kN – m. According to maximum shear stress theory, find the diameter of shaft if the allowable equivalent stress in simple tension is 160 MN/m^2. [10]

Q.6 Find the Euler's crippling load for a hollow cylindrical steel column of 38 mm external diameter and 2.5 mm thick. Take length of the column as 2.3 mm and hinged at its both ends. Take E = 205 GPa.

Also determine crippling load by Rankine's formula using constants as 335 MPa and $1/7500$. [10]

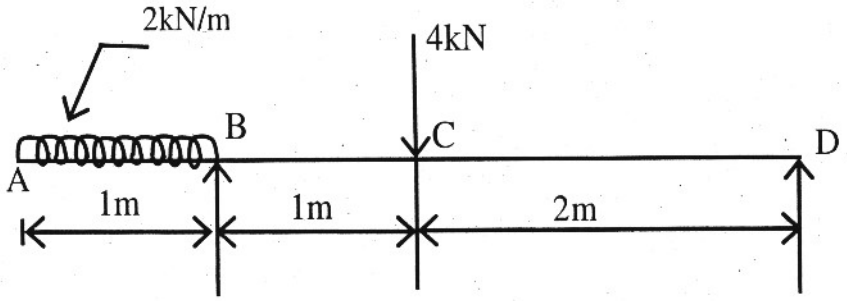
Q.7 An I – section beam 350 mm × 200 mm has a web thickens of 12.5 mm and a flange thickness of 25 mm. It carries a shearing force of 200 kN at a section. Sketch the shear stress distribution across the section and determine the values of shear stresses. [10]

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[4×20=80]**

Attempt any two questions

Q.1 A beam ABCD, 4m long is overhanging by 1m and carries load as shown in Fig. 2. Draw the shear force and bending moment diagrams for the beam and locate the point of contra flexure. [20]



Q.2 A plane element in a boiler is subjected to tensile Stresses of 400 MPa on one plane and 150 MPa on the other at right angles to the former. Each of the above stresses is accompanied by a shear stress of 100 MPa. such that when associated with the minor tensile stress tends to rotate the element in anticlockwise direction. Find [20]

(a) Principal Stresses and their direction.

(b) Maximum shearing stresses and the directions of the plane on which they act.

Q.3 A solid cylindrical shaft is to transmit 300 kW power at 100 rpm. [20]

(a) Find the diameter of shaft if shear stress is not to exceed 80 N/mm^2.

(b) What percentage of saving in weight would be obtained if this solid shaft is replaced by hollow shaft whose internal diameter is 0.6 times it external diameter. The length, material and maximum shear stress remain same.

Q.4 A member is subjected to a direct stress in one plane. Derive relation for normal and tangential stress across the oblique section, which is making an angle (θ) with the normal cross section. [20]

Also determine the value of angle (θ) for which normal and tangential stresses are maximum.

Q.5 A cantilever beam of length '2a' is carrying a load of 'W' at the free end, and on another load 'W' at its center. Determine. [2×10=20]

(a) Deflection of cantilever beam by moment area method.

(b) Draw shear force and bending moment diagram for the cantilever beam with given loading arrangement.

3E1631

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3E1631

B. Tech. III Sem. (Back) Exam., Dec. 2019
Mechanical Engineering
3ME1A Mechanics of Solids-I

Time: 3 Hours **Maximum Marks: 80**
Min. Passing Marks: 26

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)

1. NIL 2. NIL

UNIT- I

Q.1 (a) 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. Length of bar is taken as 'L'. [6]

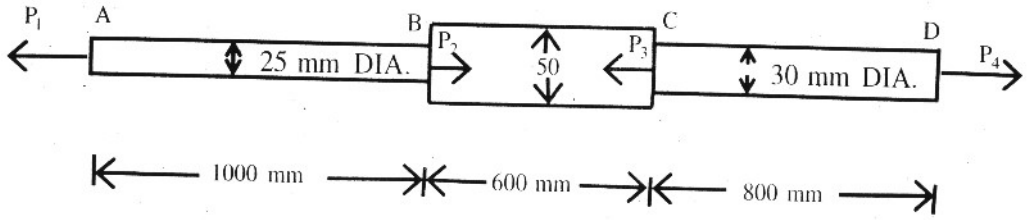
(b) The following results were obtained in a tensile test on a mild steel specimen of original diameter 2 cm and gauge length 4 cm. At the limit of proportionality the load was 80 kN and extension 0.048 mm. The specimen yielded at a load of 85 kN and the maximum load with strain was 150 kN. When the two parts were fitted together after being broken, the length between gauge points was found to be 5.56 cm and diameter at the neck was 1.58 cm. Calculate – [10]

(i) Young's modulus
(ii) Yield stress
(iii) Ultimate stress
(iv) Percentage elongation
(v) Safe stress by taking factor of safety 2

OR

Q.1 (a) Show that relation between E, K, C is given as $E = \frac{9KC}{3K+C}$, where, E = Young's Modulus, K = Bulk Modulus, C = Modulus of rigidity [8]

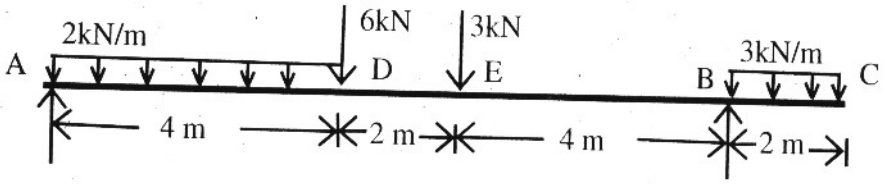
(b) A member ABCD is subjected to point loads P_1, P_2, P_3 and P_4 as shown in fig. Calculate the force P_2 necessary for equilibrium if P_1 = 10 kN, P_3 = 40 kN and P_4 = 16 kN. Taking modulus of elasticity as 2.05×10^5 N/ mm^2, determine the total elongation of the member. [8]



UNIT- II

Q.2 (a) Explain different types of Loads, Beam and support. [6]

(b) Draw the S. F. and B. M. diagrams for the beam as shown in fig. Also find out the point of contra flexure. [10]



OR

Q.2 (a) Prove the relation $\frac{M}{I} = \frac{\sigma}{Y} = \frac{E}{R}$ [8]

M = Bending Stress

Y = Distance from N.A

E = Young's Modulus

R = Radius of Curvature

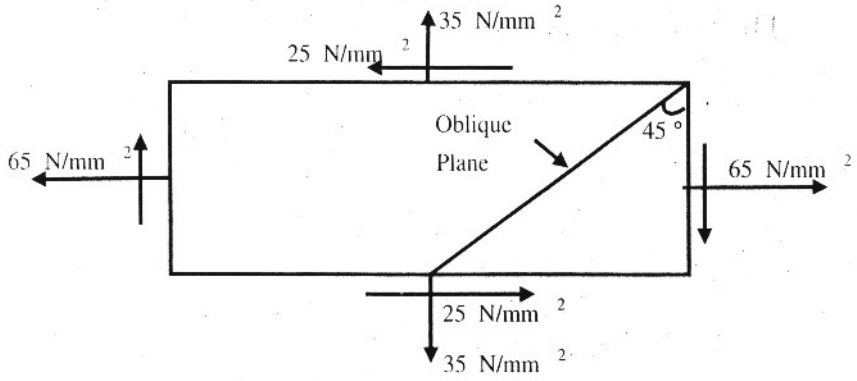
I = Moment of Inertia

(b) 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 to 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? [8]

UNIT- III

Q.3 (a) Derive an expression for equivalent bending and torsional moment of a circular rod. [6]

(b) A point in a strained material is subjected to stresses as shown in fig. Using Mohr's circle method, determine the normal and tangential stresses across oblique plane. Check answer analytically. [10]



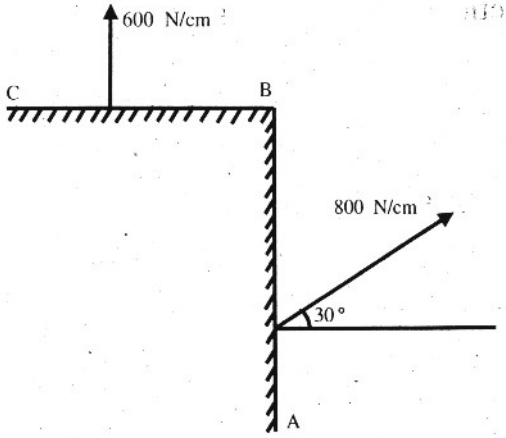
OR

Q.3 (a) Explain - [8]

(i) Maximum shear stress theory

(ii) Maximum principal strain theory

(b) The Intensity of a resultant stress on a plane AB, given below at a point in material under stress is 800N/cm^2 and it is inclined at 300 to the normal to that plane. The normal component of stress on another plane BC, at right angles to plane AB is 600 N/cm^2. [8]



Determine –

(i) Resultant stress on plane BC

(ii) Principal stress and their directions

(iii) Max, shear stress and their planes

UNIT- IV

Q.4 (a) Derive the expression for the torque transmitted by a circular solid shaft. [6]

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

OR

Q.4 (a) Explain the following – [8]

(i) Long & Short Column

(ii) Crippling Load

(iii) Slenderness Ratio

(iv) Rankine Formula

(b) A hollow shaft, having an internal diameter 40% of its external diameter, transmits 562.5 kW power at 100 r. p. m. Determine the external diameter of the shaft if the shear stress is not to exceed 60 N/mm^2 and the twist in a length of 2.5 m should not exceed 1.3 degrees. Assume maximum torque = 1.25 mean torque and modulus of rigidity = 9×10^4 N/mm^2. [8]

UNIT- V

Q.5 (a) Explain Moment Area Method. [6]

(b) A beam of length 5 m and of uniform rectangular section is simply supported at its ends. It carries uniformly distributed load of 9 kN/m run over the entire length. Calculate the width and depth of the beam if permissible bending stress is 7 N/mm^2 and central deflection is not to exceed 1 cm. Take E for beam material $=1 \times 10^4$ N/mm^2. [10]

OR

Q.5 (a) Derive relationship between slope, deflection & radius of curvature. [8]

(b) 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 [8]

(i) Change in diameter

(ii) Change in length and

(iii) Change in volume

3E1632

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3E1632

B. Tech. III Sem. (Back) Exam., Dec. 2019

Mechanical Engineering

3ME2A Material Science and Engineering

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 26

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)

1. NIL 2. NIL

UNIT- I

Q.1 (a) What is meant by Crystal Imperfections? State the effect of their presence in materials. [8]

(b) What is Space Lattice? Draw the following plane and direction in the FCC structure (101), (112). [8]

OR

Q.1 What is Slip? On what crystallographic planes and in what directions it is Likely to occur in BCC, FCC, and HCP metals? [16]

UNIT- II

Q.2 Draw the phase diagram for a binary system showing complete solubility in liquid and solid state. [16]

OR

Q.2 Draw neat labelled Iron – Carbide equilibrium diagram. Explain invariant reactions occurs in this diagram. [16]

UNIT- III

Q.3 Describe the process of austenite decomposition of alloyed steels with TTT diagrams. [16]

OR

Q.3 (a) Write short note on Heat treatment furnace. [8]

(b) Explain tempering of steel and its effects. [8]

UNIT- IV

Q.4 What are constituents, properties and engineering application of PPO, PMMS, PEEK, PAI, PI, PET, PPS? [16]

OR

Q.4 Why is alloying done? What are the effect of Si, Mn, Cr, Mo, V, Ti as alloying element on properties of steel. [16]

UNIT- V

Q.5 (a) Explain Rockwell hardness testing method. Write its advantages and limitations. [8]

(b) Write short notes on mechanism of creep. [8]

OR

Q.5 (a) Discuss various kind approaches for synthesis of nano – materials. [5]

(b) Write short note on Fiber reinforced plastic composites. [5]

(c) Discuss the properties and applications of Al_2O_3, SiC, Si_3N_4. [6]

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3E1633

Roll No. _____ Total No of Pages: 3

3E1633

B. Tech. III - Sem. (Back) Exam., Dec. 2019

Automobile Engineering

3CE3A Engineering Thermodynamics

AE, ME, PI

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 26

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)

1. Steam Table 2. Mollier Chart

UNIT- I

Q.1 (a) What is a thermodynamic system? What is the difference between closed system and open system? [8]

(b) (i) What is property? Distinguish between different types of properties? [4]

(ii) What is thermodynamic equilibrium? [4]

OR

Q.1 (a) Apply first law to the following processes of a closed system using ideal gas as the working substance- [8]

(i) Constant volume

(ii) Constant pressure

(iii) Constant temperature

(iv) Reversible adiabatic

(b) Five kilogram of air initially at 25°C and atmospheric pressure (101.325 kPa) is heated in a rigid container by adding 10kJ of heat. Calculate the change in internal energy of the system and the final temperature attained. [8]

UNIT- II

Q.2 (a) Give Kelvin Plank statement of second law of thermodynamics and discuss the process involved in a Carnot cycie. [8]

(b) Discuss why the second law of thermodynamics is called as a "Directional law of Nature". [8]

OR

Q.2 (a) Show that the COP of a Heat Pump is greater than the COP of Refrigerator by unity. [8]

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

UNIT- III

Q.3 Derive the following Reactions. [16]

(a) $\left[\frac{\partial h}{\partial P}\right]_T = V - T\left[\frac{\partial V}{\partial T}\right]_P = -C_P\left[\frac{\partial T}{\partial P}\right]_h$ ... (i)

(b) $\left(\frac{\partial u}{\partial V}\right)_T = T\left(\frac{\partial p}{\partial T}\right) - P$ ... (ii)

With the aid of equation (ii) show that

$$\left(\frac{\partial u}{\partial P}\right)_T - T\left(\frac{\partial u}{\partial T}\right)_P - P\left(\frac{\partial V}{\partial p}\right)_T$$

The Quantity $C_p\left(\frac{\partial T}{\partial P}\right)_h$ is known a Joule-Thomson cooling effect show that this cooling effect for a gas obeying, the equation of state $(v - b) = \frac{RT}{P} - \frac{C}{T^2}$ is equal to

$$\left(\frac{3C}{T^2}\right) - b$$

OR

Q.3 (a) Derive the Maxwell's equation. [10]

(b) Prove that $Tds = C_V dt + T \left(\frac{\partial p}{\partial T}\right)_V dV$ [6]

UNIT- IV

Q.4 An air standard duel cycle has a compression ratio of 16, and compression begins at 1 bar, 50°C. The maximum pressure is 70 bar. The heat transferred to air at constant pressure is equal to that at constant volume. Estimate (a) the pressures and temperatures at the cardinal point of the cycle, (b) the cycle efficiency, and (c) the mean effective pressure of the cycle, C_V = 0.718 kJ/kg K, C_P = 1.005kJ/kg K. [16]

OR

Q.4 (a) Compare petrol and diesel engine. [8]

(b) Compare the relative advantages and disadvantages of four stroke and 2 stroke cycle engines. [8]

UNIT- V

Q.5 Sketch the layout of various components comprising the vapour compression refrigeration cycle, and explain its working. [16]

OR

Q.5 (a) Draw the ideal Rankine cycle on P – v, T – s and h – s diagram. [6]

(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. [10]

3E1634

Roll No. _____ Total No of Pages: 3

3E1634

B. Tech. III - Sem. (Back) Exam., Dec. 2019

Automobile Engineering

3CE4A Manufacturing Processes

AE, ME

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 26

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)

1. NIL 2. NIL

UNIT- I

Q.1 (a) How do you classify Manufacturing Process? Explain in detail. [6]

(b) What are the primary requirements of the moulding sand how each in provided by sand and additive aggregates? [10]

OR

Q.1 Explain designing of casting. Explain casting defects with the help of diagram. [16]

UNIT- II

Q.2 Explain resistance welding in detail, also give its advantages and disadvantages. [16]

OR

Q.2 (a) Differentiate between cold working and hot working process in detail. [8]

(b) What are various metal working defects, their causes and remedies? [8]

UNIT- III

Q.3 Write short notes on following (Any four) - [4×4=16]

(a) Friction welding

(b) Induction welding

(c) Forge welding

(d) Ultra sonic welding

(e) Thermit welding

OR

Q.3 Explain briefly the following metal forming process with the help of neat sketches -

(a) Rolling [8]

(b) Forging [8]

UNIT- IV

Q.4 Write short notes on -

(a) Sintering [4]

(b) Infiltration [4]

(c) Mechanical Pulverization [4]

(d) Rapid Tooling [4]

OR

Q.4 (a) How metal powders used in powder metallurgy are characterized? What are the steps involved in making products by powder metallurgy technique? [8]

(b) Describe the significance of Rapid Prototyping. What is the concept of virtual prototyping and write its applications? [8]

UNIT- V

Q.5 (a) Compare thermo-setting materials with thermoplastic materials. [10]

(b) Explain calendaring process. [6]

OR

Q.5 (a) What the ingredients of moulding compounds? Explain laminating and slush moulding Methods with neat sketch. [8]

(b) What are the general properties of plastics for engineering components? Differentiate thermo – setting plastics and thermo – plastics. [8]

3E1635

Roll No. _____ Total No of Pages: 3

3E1635

B. Tech. III Sem. (Back) Exam., Dec. 2019

Automobile Engineering

3AE5A Object Oriented Programming in C++

AE, ME, AN

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 26

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)

1. NIL 2. NIL

UNIT- I

Q.1 What do you understand by polymorphism. Write a program to overload scan f () & print f () function. [16]

OR

Q.1 (a) Discuss reference variables and their utility in passing them as an argument to a function. [12]

(b) Discuss scope of a variable in a program. [4]

UNIT- II

Q.2 (a) Write prototype of at least 4 predefined functions in string.h [8]

(b) Discuss dynamic memory allocation using new operator. [8]

OR

Q.2 Write a program to Input a sentence as string and find the length of its longest word. Use pointers to handle the string. [16]

UNIT- III

Q.3 (a) What is friend function? Explain its Advantages using suitable example. [8]

(b) State the utility of creating static member variables in a class with suitable example. [8]

OR

Q.3 (a) Discuss following class Inheritance – [9]

(i) Public

(ii) Protected

(iii) Private

(b) Discuss Run time Polymorphism using Virtual functions. [7]

UNIT- IV

Q.4 (a) Discuss Generic Programming Implemented in C++. [4]

(b) State the difference between Macro and Template. [4]

(c) Distinguish between overloaded functions and function Templates. [4]

(d) Write Names of 10 header files that can be included in a C++ program. [4]

OR

Q.4 Explain about following string function with suitable example – [8×2=16]

(a) max_lsize ( )

(b) capacity( )

(c) find ( )

(d) r find ( )

(e) begin ( )

(f) r begin ( )

(g) insert ( )

(h) erase ( )

UNIT- V

Q.5 (a) Discuss stack and queues with their Applications. [8]

(b) Write a program to create a Node of a singly link list. [8]

OR

Q.5 Write a program to implement a Priority Queue. Also write routines for insertion and deletion in this queue. [16]

3E1636

Roll No. _____ Total No of Pages: 4

3E1636

B. Tech. III Sem. (Back) Exam., Dec. 2019

Automobile Engineering

3AE6A Advanced Engineering Mathematics

AE, ME, PI

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 26

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)

1. NIL 2. NIL

UNIT- I

Q.1 (a) Obtain the Discrete Fourier transform of the sequence $\{g_K\} = \{1, 0, -1\}$ [8]

(b) Show that $\int_0^\infty \frac{\cos x\lambda}{1+\lambda^2}\, d\lambda = \frac{\pi}{2}e^{-x}, x \geq 0$ [8]

OR

Q.1 (a) Find f(x) , if its sine transform is $\frac{s}{1+s^2}$. [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

Q.2 (a) (i) Compute L $[te^{at} \sin at]$ [4]

(ii) Evaluate L $[t^2 u(t-3)]$ [4]

(b) Solve $y'' + 2y' + 5y = e^{-t}\sin t$, $y(0) = 0$, $y'(0) = 1$ [8]

OR

Q.2 (a) (i) Evaluate $L^{-1}\left\{\frac{5s+3}{(s+1)(s^2+2s+5)}\right\}$ [4]

(ii) Use the convolution theorem to find $L^{-1}\left\{\frac{1}{s^3(s^2+1)}\right\}$ [4]

(b) $(D^2 + a)\, y = \cos 2t$, $y(0) = 1$, $y(\pi/2) = -1$ [8]

UNIT- III

Q.3 (a) Two unbiased dice are thrown. Find the expected value of the sum of number of points on them. [8]

(b) In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the parameters of the distribution. [8]

OR

Q.3 (a) The probability that a bolt manufactured by a company will be defective is $\frac{1}{10}$. If 12 such bolts are manufactured, find the probability that: [8]

(i) Exactly two will be defective.

(ii) Atleast two will be defective.

(iii) None will be defective.

(b) A can – hire form has two cars which it hires out day by day. The demand for a car on each day is distributed as a Poisson distribution with mean 1.5. Calculate the proportion of days on which some demand is refused. [8]

UNIT- IV

Q.4 (a) Evaluate:

(i) $\Delta = \frac{\delta^2}{2} + \delta\sqrt{1+\frac{\delta^2}{4}}$ [4]

(ii) $\Delta^2(\cos 2x)$ [4]

(b) Find the polynomial f(x) and the value of f(x) at x = 3 by Lagrange's interpolation formula for the data: [8]

x :	0	1	2	4	5
f (x):	0	16	48	88	0

OR

Q.4 (a) $\delta [f(x) . g(x)] = \mu [f(x)] \delta [g(x)] + \mu [g(x)] \delta [f(x)]$ Define δ and μ operators. [8]

(b) Use stirling's formula to compute $y_{12.2}$ from the following data: [8]

x :	10	11	12	13	14
$10^5 y_5$:	23967	28060	31788	35200	38368

UNIT- V

Q.5 (a) Find first and second derivative at x = 1.1 from the following data: [8]

x :	1	1.2	1.4	1.6	1.8	2.0
f (x):	0	0.1280	0.5440	1.2960	2.4320	4.0

(b) Solve numerically $\frac{dy}{dx} = 2e^x - y$ at 0.4 and 0.5, by Milne's predictor corrector method, given their values at the four points. [8]

x:	0	0.1	0.2	0.3
y:	2.0	2.010	2.040	2.090

OR

Q.5 (a) Use Trapezoidal rule, Simpson's 1/3 and Simpson's 3/8 rule of Numerical Integration to evaluate.

$$\int_4^{5.2} \log_e x dx$$ [8]

(b) Given $\frac{dy}{dx} = x^2 + y$, $y(0) = 1$ determine $y(0.02)$, $y(0.04)$, $y(0.06)$ using the modified method of Euler's [8]
