3E1631

Roll No. ____

Total No of Pages: 7

3E1631

B. Tech III Sem. (Main/Back) Exam. Jan. 2016
Mechanical
3ME1A Mechanics of Solids - I
Common to 3AN1, 3PI1A and 3AE1A

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.

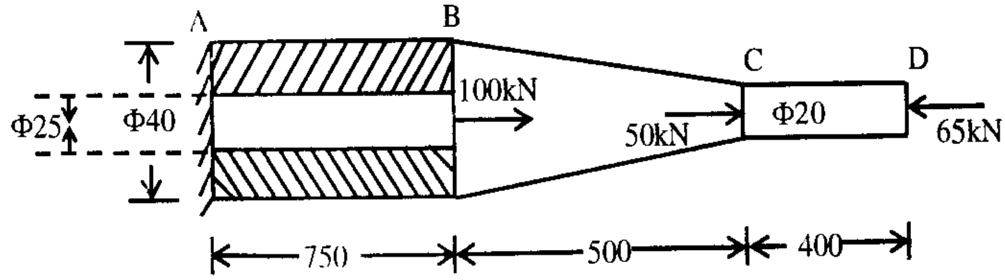
Use of following supporting material is permitted during examination.

1. NIL 2. NIL

UNIT-I

Q.1 (a) The width of a rectangular taper plate of length 'L' varies uniformly from 'a' at one end and 'b' at other end. Find the extension of the plate when it carries an axial pull P and having uniform thickness t. Take modules of elasticity as E. [8]

(b) Determine the net deformation in the diagram. Take E=105Gpa. [8]



OR

Q.1 (a) A flat bar of aluminum alloy 24mm wide and 6mm thick is placed between two steel bars each 24mm wide and 9mm thick to form a composite bar 24mm×24mm. The three bars are fastened together to their ends when the temperature is 10°C. Find the stresses in each of the material when the temperature of whole assembly is raised to 50°C. If at the new temperature, a compressive load of 20kN is applied to the assembly, what are the final stresses in steel & Al. [8]

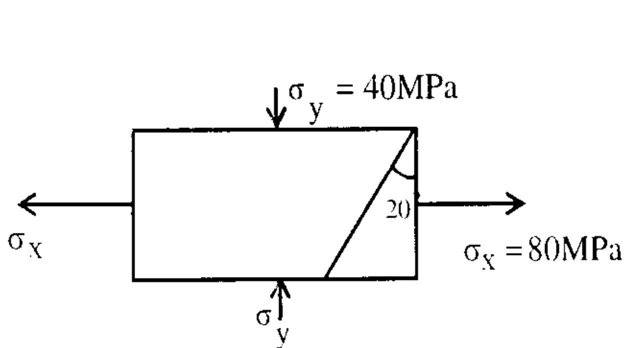
$E_S = 2\times10^5\ N/mm^2$ $\alpha_S = 1.2\times10^{-5}/°C$

$E_A = 2/3\times10^5 N/mm^2$ $\alpha_A = 2.3\times10^{-5}/°C$

(b) Derive the relationship between Modules of Elasticity, Modules of Rigidity & Poisson's Ratio of an elastic body. [8]

UNIT-II

Q.2 (a) The principal stresses at a point across two perpendicular planes are 80MPa (T) & 40MPa (comp.). Find the normal, tangential & resultant stresses on a plane inclined at 20° to the axis of major principal plane. [8]



(b) Explain & derive concept of Equivalent Bending & Equivalent Twisting Moment. [8]

OR

Q.2 (a) In a material subjected to strain, the resultant stress across a plane is 60Mpa tensile, inclined at 30° to its normal including clockwise shear on the plane. The normal stress across the plane at right angle to this one is 40N/mm2 tensile. Find the principal stresses and locate their plane. [8]

(b) Write short note on theories of failure. [8]

UNIT-III

Q.3 (a) A simply supported beam of span L is carrying uniformly distributed load W over its entire span. Calculate S.F & B.M. Also Draw S.F.D & B.M.D. [6]

(b) Derive relation between Load, Shear Force & Bending Moment at a section of Beam. [6]

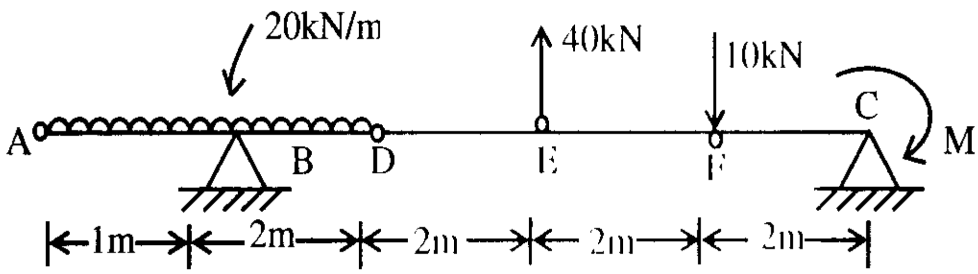
(c) Explain following -

(i) Hogging & Sagging Bending Moment

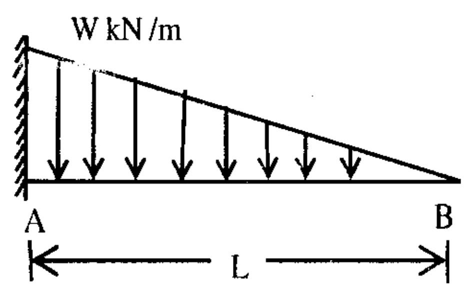
(ii) Contra-flexure point [4]

OR

Q.3 (a) A Beam ABC is loaded & supported as shown below. Find the magnitude of the clockwise moment (M) to be applied at (C) so that the reaction at (B) will be 30kN upward & then draw the Shear Force & Bending Moment diagram for the beam. [10]



(b) For a cantilever carrying load whose intensity varies from zero at the free end to (W) per unit run at the fixed end. Find out bending moment and shear force value at ends. Also draw S.F. & B.M diagram. [6]



OR

Q.4 (a) Prove the relation $\frac{M}{I} = \frac{\sigma}{Y} = \frac{E}{R}$ [6]

M= Bending stress

Y= Distance from N.A

E= Young's modulus

R= Radius of curvature

I= Moment of Inertia

(b) Draw & explain the shear stress distribution over the rectangular cross section. [6]

(c) A thin cylindrical pressure vessel of 500mm diameter is subjected to an internal pr. of 2N/mm2, If the thickness of vessel is 20mm, find the hoop stress, longitudinal stress & maximum shear stress. [4]

UNIT-V

Q.5 (a) A solid steel shaft is subjected to Torque of 45kN.m. If the angle of twist is 0.5° per meter length of shaft & shear stress should not exceed 90N/mm^2, Find:

(i) Suitable diameter of shaft

(ii) Final maximum shear stress and angle of twist for diameter of shaft selected.

(iii) Maximum shear strain in shaft.

Take modules of rigidity= 80Gpa [8]

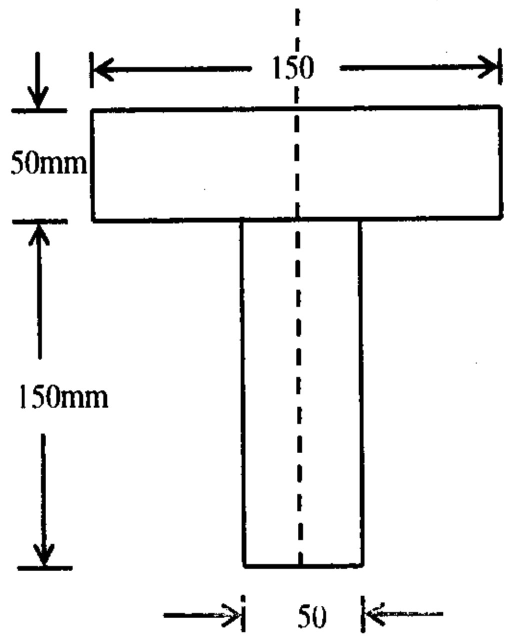
UNIT-IV

Q.4 (a) Two 150×150 rectangular timber section are glued together to form a T- section as shown in figure. If bending moment of 4kN-m is applied to this about the horizontal axis.

(i) Find the stresses at the extreme fibers.

(ii) Calculate total compressive force developed by normal stress above neutral axis.

(iii) Find the total force due to tensile bending stress. [10]



(b) What is hoop & longitudinal stress? Also derive formula for wall of cylinder. [6]

(b) A bar of length 4m is used as a simply supported beam, subjected to uniformly distributed load of 30kN/m over the whole span, deflects 15mm at centre. Determine crippling load when it is used as a column with following end condition - [8]

(i) Both ends are pin jointed

(ii) One end fix and other end hinged

(iii) Both end fixed

OR

Q.5 (a) Explain following :

(i) Long & short column [2]

(ii) Crippling load [2]

(iii) Slenderness ratio [2]

(iv) Rankine formula [2]

(b) Find the Euler's crushing load for a Hollow Cylinder Cost Iron Column 120mm extreme diameter and 20mm thick, if it is 4.2m long & hinged at both end. $E=80kN/mm^2$

Compare this load with crushing load given by Rankine's formula, using f=550N/mm2, & $\alpha=1/1600$(Rankine const.) [8]

3E1632

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3E1632

B. Tech III Sem. (Main/Back) Exam. Jan. 2016
Automobile Engineering
3AE2A Material Science and Engineering
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) Explain with neat sketches the various types of crystal imperfections. [8]

(b) With neat sketches explain Crystal lattice of BCC, and HCP. [8]

OR

Q.1 (a) What is recovery and recrystallization? Draw suitable graph. [8]

(b) Explain critically resolved shear stress for slip. [8]

UNIT-II

Q.2 Draw iron carbon equilibrium diagram and level the various phase, fields and temperature. Discuss in brief different reactions that take place in the system. [16]

OR

Q.2 Describe binary system when two metals are completely soluble in the liquid state but only partly soluble in the solid state with suitable. [16]

UNIT-III

Q.3 Explain the working of TTT diagram and what information is supplied by them? [16]

OR

Q.3 Explain briefly:- [4×4=16]

(a) Nitriding

(b) Carburizing

(c) Cyaniding

(d) Flame Hardening

UNIT-IV

Q.4 (a) What are the effects of alloying elements? Discuss the effects of alloying Si, Cr, Ni, Al in steel. [10]

(b) Write short note on:- [3×2=6]

(i) Bearing Materials

(ii) Tool Steel

OR

Q.4 (a) Give the classification of the polymers. [8]

(b) Write a short note on Urea and Phenol formaldehyde. [8]

UNIT-V

Q.5 (a) Explain Rockwell hardness testing method. Write its advantages and limitations. [10]

(b) What are the different types of fracture in metals? [6]

OR

Q.5 (a) Describe Indian Standard Designations of plain and alloy steels. [8]

(b) What is a fiber-reinforced composite? What fiber-reinforced materials are commonly used? [8]

3E1633

Roll No. ____________ Total No of Pages: 4

3E1633

B. Tech III Sem. (Main/Back) Exam. Jan. 2016
Mechanical
3ME3A Engineering Thermodynamics
Common to 3AN3, 3PI3A and 3AE3A

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.

1. Steam Table 2. Molier chart

UNIT-I

Q.1 (a) (i) What is the perpetual motion m/c of the first kind? [2]

(ii) What is Joule – Thomson coefficient? Explain its significance. [2]

(iii) Sketch the following process on p – v, p – T, v – T, u – T and h – T coordinates – isochoric, isothermal, isentropic & isobaric. [4]

(b) A tank $1m^3$ in volume is filled with air at an absolute pressure of 700kPa and a temperature of 120°C. The air is discharged to the atmosphere through a valve. Consider air to be a perfect gas.

Take R = 0.287kJ/kgK, C_P = 1.169 kJ/kgK and C_V = 0.717kJ/kgK.

What would be the work that is lost in the kinetic energy of air? [8]

OR

Q.1 (a) A hydrocarbon gaseous fuel enters an engine at 143 kPa and 187°C with a velocity of 44 m/s. The inlet and exit pipes have the same cross–sectional area of $0.022m^2$. The work done by the engine is 53 kN. Calculate the heat transferred in kJ/kg for exit conditions of 105kPa and 400K. [8]

(b) In an adiabatic flow through a stream nozzle the following parameters are measured:- [8]

(i) Mass flow rate 300 kg/h

(ii) Initial pressure 1280 kPa

(iii) Final pressure 13.5 kPa

(iv) Entrance velocity 135 m/s

(v) Exit velocity 1080 m/s

Determine the enthalpy change.

UNIT-II

Q.2 (a) (i) Prove that no refrigerator can have a higher cop than a reversible refrigerator operating between the same temperature limit. [4]

(ii) What is the perpetual motion machine of the second kind? [2]

(iii) What is the importance of the second law? [2]

(b) Carnot refrigerator removes 20,000 kJ/min from a cold storage at – 20°C. Heat is rejected to the atmosphere at 25°C. Determine the power required. [8]

OR

Q.2 (a) In a reversible, steady flow process nitrogen is heated at constant pressure from 125 kPa and 40°C to 80°C. Evaluate the change in entropy per unit mass of nitrogen. [8]

(b) (i) Sketch T-S, p - v, p - h, h - s & h - v diagrams of a Carnot cycle using ideal gas as a working fluid. [4]

(ii) Prove that for a steady flow isothermal process, the difference in Gibbs function represents the maximum work. [4]

UNIT-III

Q.3 (a) Determine the isothermal compressibility of an ideal gas and a vander waals gas. [8]

(b) What are characteristic functions? Prove that the internal energy of an ideal gas is function of temperature only. [8]

OR

Q.3 (a) Derive an expression for the change in enthalpy of a gas follows the equation of state $p(v-b) = RT$. [8]

(b) A vessel with a volume of 0.1 m^3 contains an ideal gas at 100°C, 600 kPa. It expands isentropically to a final pressure of 150 kPa. Evaluate the work done. Assume $C_v = 0.7202$ kJ/kgK and $C_p = 1.0044$ kJ/kgK. [8]

UNIT-IV

Q.4 (a) Derive an expression for the air standard efficiency of a Otto cycles. [8]

(b) Explain with p – v & T-S diagram-

Atkinson cycle, Ericssion cycle, stirling cycle & Dual cycle. [8]

OR

Q.4 (a) Derive an expression for the air standard efficiency of a diesel cycle. [8]

(b) Explain- [8]

(i) Intercooler

(ii) Mean effective pressure

UNIT-V

Q.5 (a) Determine the efficiency of a Rankine cycle employing steam as the working fluid in which boiler pressure is 2.0 MPa and the exhaust pressure is 100 kPa. Consider the steam leaving the boiler saturated, repeat and with the exception that the exhaust pressure is lowered to 15 kPa by means of a condenser. [8]

(b) Explain ideal regenerative feed heating cycle. Why such a cycle is not possible in practice? [8]

OR

Q.5 (a) Explain the significance of Mollier diagram for thermodynamic calculation of the properties of steam, work done heat transfer during - [8]

(i) Throttling process

(ii) Constant pressure process

(iii) Reversible adiabatic process

(iv) Constant sp. vol. process.

(b) 5 kg of steam at a pressure of 14 bar and 280°C expands following law $pv^{1.25} = C$ down to 1.4 bar.

Determine, final temperature, work done, heat transferred & the change in entropy. [8]

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3E1634

3E1634

B. Tech III Sem. (Main/Back) Exam. Jan. 2016
Automobile Engineering
3AE4A Manufacturing Processes
Common for 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) Define the following terms as related to castings: - Sprue, Gate, Runner, Riser, Draft allowance, Permeability, Cope, Skeleton pattern. [8]

(b) Compare the solidification time of two optimum risers of same volume, when one has a cylindrical shape (h = d) and other is of the form of a square paralleleopiped (L = 4a). [8]

Where L = Length of paralleleopipe

A = side of square.

OR

Q.1 Write notes:

(a) Die casting [4]

(b) Centrifugal casting [4]

(c) Casting defects & remedies. [8]

UNIT-II

Q.2 (a) Describe press forging. How does it differ from drop forging? Why heat treatment is necessary for forging? [8]

(b) An aluminum wire having yield strength 300 MPa and diameter 10 mm is to be drawn using a HSS die having draw angle 12° and ultimate tensile strength 1.6GPa. The coefficient of friction before conditioning was 0.25 and after acid pickling, sulling, liming and lubricating using soap solution became 0.05. Calculate the drawing force needed for achieving a 20% reduction in area. [8]

OR

Q.2 (a) With the aid of a sketch, briefly describe the process of spinning. Why is it called a flow turning process? [8]

(b) Estimate the clearance and the maximum shearing force needed to punch a rectangular hole of length 1cm & breadth 5mm in an aluminum sheet of thickness 4mm. Given shear strength of aluminum sheet is 0.2 GPa. [8]

UNIT-III

Q.3 (a) Explain TIG & MIG welding processes. Also differentiate between these two processes. [8]

(b) Discuss types of welding defects. Also explain causes, effects and remedies for these defects. [8]

OR

Q.3 (a) Classify various welding processes. Compare welding with brazing & soldering techniques. [8]

(b) Discuss laser beam welding with the help of sketch. [8]

UNIT-IV

Q.4 (a) What do you understand by powder metallurgy? Explain how powder is formed by electrolytic, carbonyl and mechanical pulverization processes. [8]

(b) Discuss virtual prototyping process and its applications. [8]

OR

Q.4 Describe the process of blending, compacting and sintering in details. [16]

UNIT-V

Q.5 (a) Define plastics. Differentiate between thermoplastics and thermo-setting plastics. [8]

(b) Writes notes on laminating process. [8]

OR

Q.5 Write notes: - [4×4=16]

(a) Compression moulding

(b) Extrusion moulding

(c) Blow moulding

(d) Calendaring

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3E1635

3E1635

B. Tech III Sem. (Main/Back) Exam. Jan. 2016
Mechanical
3ME5A Object Oriented Programming In C++
Common with 3AN5, 3AE5A

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.

1. NIL 2. NIL

UNIT-I

Q.1 What is Object - Oriented programming language? Explain all the features of object - oriented programming. How it is different from procedural programming language? [16]

OR

Q.1 (a) What is class & object? Explain with example. [8]

(b) Differentiate top-down & bottom-up approach. [8]

UNIT-II

Q.2 What is operator? Explain binary operator overloading with example. [16]

OR

Q.2 (a) Explain inline function with example. [8]

(b) Explain access specifier. [8]

UNIT-III

Q.3 What is constructor? Explain different types of constructor. [16]

OR

Q.3 What is inheritance? Explain different types of inheritance. [16]

UNIT-IV

Q.4 What is file handling in C++? What are the different modes in file? [16]

OR

Q.4 What is template? Write syntax for template class. [16]

UNIT-V

Q.5 Write algorithm for singly linked list for the following operations: - [4+6+6=16]

(a) Traversing

(b) Insertion in between the nodes

(c) Deletion operation.

OR

Q.5 (a) What is the different between stack & queue? Explain push & pop operation in stack. [8]

(b) Explain polish & reverse-polish notations. [8]

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3E1636

3E1636

B. Tech III Sem. (Main/Back) Exam. Jan. 2016
Mechanical
3ME6A Advanced Engineering Mathematics
Common to 3PI6A and 3AE6A

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.

1. NIL 2. NIL

UNIT-I

Q.1 (a) Show that the Fourier transform of [8]

$$f(x) = \begin{cases} a - |x|, & |x| < a \\ 0, & |x| > a > 0 \end{cases}$$

is $\sqrt{\frac{2}{\pi}}\left(\frac{1-\cos as}{s^2}\right)$

(b) Using Fourier transform, solve [8]

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}, \quad x > 0, t > 0$$

subject to the conditions -

(i) $u = 0$ when $x = 0, t > 0$

(ii) $u = \begin{cases} 1, & 0 < x < 1 \\ 0, & x > 1 \end{cases}$ at $t = 0$

(iii) $u(x, t)$ is bounded.

OR

Q.1 (a) Find f(x), if its Fourier sine transform is $\frac{1}{s}e^{-as}$. [8]

(b) Use Fourier transform to solve - [8]

$$\frac{\partial u}{\partial t} = C^a \frac{\partial^a u}{\partial x^2}, \quad 0 \le x < \infty$$

under the conditions

(i) $u = 0$ at $t = 0$, $x > 0$

(ii) $\frac{\partial u}{\partial x} = -u, \quad x = 0$

(iii) $\frac{\partial u}{\partial x} \to 0$ as $x \to \infty$

UNIT-II

Q.2 (a) Find -

(i) $L(t^2 \sin^2 t)$ [4]

(ii) $L^{-1}\left\{\frac{s+2}{s^2-4s+13}\right\}$ [4]

(b) Use Laplace transform to solve the differential equation. [8]

$$\frac{d^2y}{dt^2} + 9y = \cos 2t, \; y(0)=1, \; y(\pi/2) = -1$$

OR

Q.2 (a) Find inverse Laplace transform of $\frac{s}{s^4+4a^4}$ [8]

(b) Solve $\frac{\partial u}{\partial t} = 5\frac{\partial^a u}{\partial x^2}$ [8]

Given u(x, 0) = cas5x, $\frac{\partial u}{\partial x}(0,t) = 0$, $u(\frac{\pi}{2}, t) = 0$.

OR

Q.4 (a) Use Stirling's formula to compute y(12.2) from the following data - [8]

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

(b) Use Regula Falsi method to find a real root of the equation $x \log_{10}x - 1.2 = 0$, correct to four places of decimal. [8]

UNIT-V

Q.5 (a) Solve the system of equations. [8]

$$27x + 6y - z = 85$$

$$6x + 15y + 2z = 72$$

$$x + y - 54z = 110$$

(b) From the following table, calculate $\frac{dy}{dx}$ at x = 1.35. [8]

x	1.1	1.2	1.3	1.4	1.5	1.6
y	-1.6263	0.1558	2.4526	5.3917	9.1250	13.8308

OR

Q.5 (a) Evaluate $\int_{-1.6}^{-1} e^x \, dx$ by Simpson's one third rule. [8]

(b) Use Milne's method to obtain the solution of the equation $\frac{dy}{dx} = x - y^2$ at x = 0.8, given y(0) = 0, y(0.2) = 0.02, y(0.4) = 0.0795 and y(0.6) = 0.1762. [8]

UNIT-III

Q.3 (a) Assume that the probability of an individual coal miner being killed in an accident during a year is $\frac{1}{2400}$. Calculate the probability that in a mine employing 200 miners, there will be at least one fatal accident in a year. [8]

(b) Fit a second degree parabola to the following data. [8]

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

OR

Q.3 (a) In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution. [8]

(b) Find the correlation coefficient from the following data - [8]

x	10	14	18	22	26	30
y	18	12	24	6	30	36

UNIT-IV

Q.4 (a) (i) Prove $\Delta \equiv \frac{s^2}{2} + s\sqrt{1+\frac{s^2}{4}}$ [4]

(ii) Find $\Delta^1(\cos 2x)$ [4]

(b) Apply Lagrange's formula to find (x) from the following data - [8]

x	0	1	4	5
f(x)	4	3	24	39