150

3E1631

Roll No. : _____ Total Printed Pages : 7

3E1631

B. Tech. (Sem. III) (Main/Back) Examination, December - 2017
Aeronautical Engg.
3AN1 Mechanics of Solids (AE, ME, PI, AN)

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

*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 materials is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

UNIT - I

1 (a) Briefly explain :

(i) Poisson ratio

(ii) Lateral strain

(iii) Complementary shear stress

(iv) Thermal stress and strain

(v) Generalized Hook's law

(vi) Factor of safety. **8**

(b) A composite rod as shown in figure is loaded by various axial forces, determine largest value of P such that the stress in steel does not exceed 150 MPa and that in brass does not exceed 75 MPa. Hence determine elongation of the bar. Take

$E_{steel} = 200\ GPa$ & $E_{brass} = 75\ GPa.$

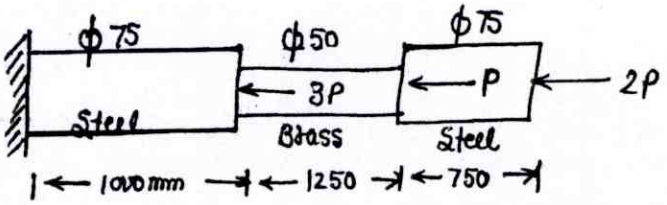

Fig. 1

8

OR

2 (a) A rectangular taper plate of length 'L'. The width of plate varies uniformly from 'a' at one end and 'b' at other end. Find extension of plate when it carries an axial pull P and having uniform thickness t.

8

(b) A steel tube of 45 mm in external diameter and 3 mm thickness encloses centrally a solid copper bar of 30 mm diameter. The bar and the tube are rigidly connected together at the ends at a temperature of 30°C. Find the stress in each metal when heated to 180°C. Also find increase in the length, if original length of assembly is 300 mm. Coefficient of expansion for steel and copper are 1.08×10^{-5} and 1.7×10^{-5} respectively per degree centigrade.

$E_{steel} = 2.1 \times 10^{-5}\ N/mm^2$, $E_{cu} = 1.1 \times 10^{-5}\ N/mm^2$ for copper.

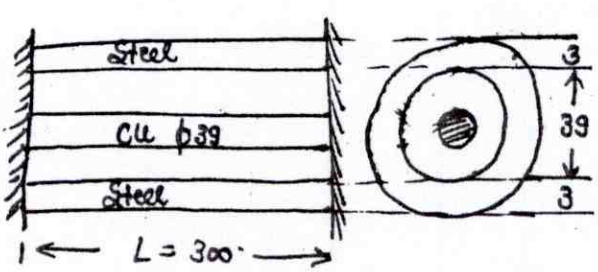

Fig. 2

8

(b) 3 (a)

(b)

(c)

4 (a)

UNIT - II

3 (a) Define and explain theory of failure :

(i) Maximum principal stress theory

(ii) Maximum strain energy theory. 6

(b) A short metallic column of 500 mm^2 cross sectional area carries an axial compressive load of 100 kN for a plane inclined at 60° with the direction of load. Calculate :

(i) Normal stress

(ii) Tangential stress

(iii) Resultant stress

(iv) Maximum shear stress

(v) Obliquity of resultant stress. 6

(c) Derive equation for equivalent Twisting and bending moment. 4

OR

4 (a) Find by Mohr's circle method Normal; and shear stress on section AB. Also find Max. shear stress.

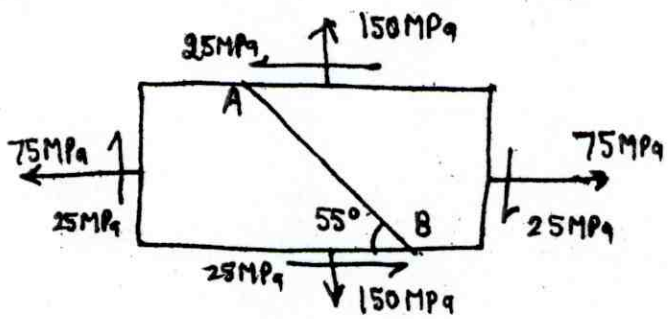

Fig. 3 8

(b)

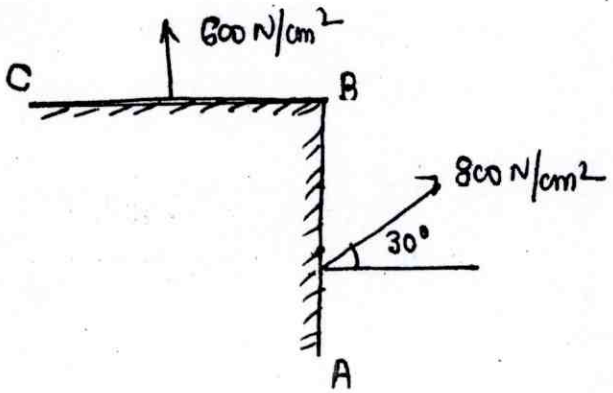

Fig. 4

Determine following :

(i) Resultant stress on plane BC

(ii) Principal stresses and their directions

(iii) Max. shear stresses and their planes.

8

UNIT - III

5 (a) Derive relation between load shear force and bending moment.

6

(b) Draw S.F. and B.M. diagram and find point of contraflexure if any.

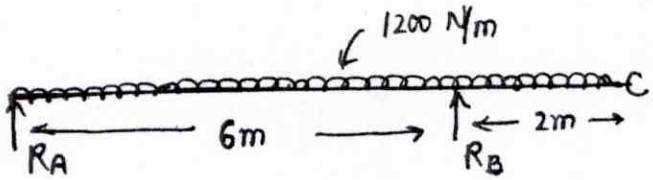

Fig. 5

10

OR

6 (a) Explain different types of beams, load and supports. 8

(b) Draw S.F. and B.M. diagram of simply supported beam of span 2.5 m subjected to U.D.L. and clockwise couple.

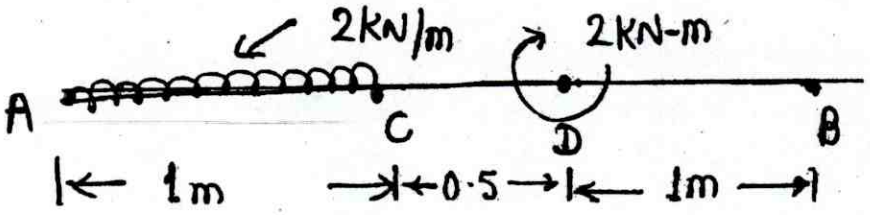

Fig. 6 8

UNIT - IV

7 (a) What is pure bending ? What are the assumptions in theory of bending ? 4

(b) A rectangular beam 60 mm wide and 150 mm deep is simply supported over a span of 4 m. If the beam is subjected to U.D.L. of 4.5 kN/m. Find maximum bending stress in the beam. 4

(c) Derive flexure formula for beam.

$$\frac{M}{I} = \frac{a}{y} = \frac{E}{R}$$

8

OR

8 (a) Show for Triangular section the distribution of shearing stress. 6

(b) Two 150 × 150 mm rectangular timber section glued together to form a T-section as shown in figure. If bending moment 4 kN-m applied on beam about horizontal axis then find :

(i) Stress at extreme fibres

(ii) Calculate total compressive force

(iii) Total force due to tensile bending stress.

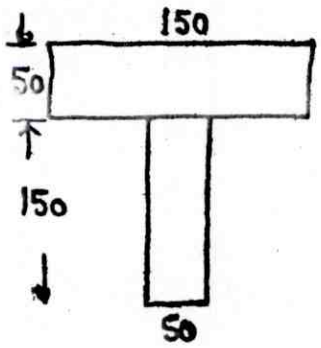

Fig. 7

10

UNIT - V

9 (a) Derive the torsion equation and state the assumptions made. 8

(b) A hollow shaft of diameter ratio 3/8 (inner to outer) is to transmit 375 kW at 100 rpm. The max. torque 20% more than mean torque. Shear stress not to exceed 60 N/mm^2 and twist in the 4 m length is not to exceed 2°. Calculate inside and outside diameter which satisfy both the conditions

$G = 0.85 \times 10^5 \ N/mm^2$.

8

OR

10 (a) Explain Euler's theory and assumptions made in theory. Also brief the limitation of Euler's formula. **4**

(b) Determine crippling load for a T-section of dimensions 12 cm × 12 cm × 2 cm and of length 6 m when it is used as column with one of its end fixed and other hinged $E = 2 \times 10^5 \ N/mm^2$. **6**

(c) Find Euler's crushing load for a hollow cylindrical cast from column 120 mm extreme diameter and 20 mm thick. If it is 4.2 m long and hinged at both ends. Take $E = 80 \ kN/mm^2$. Compare this load with crushing load given by Rankine formula using constant $f = 550 \ N/mm^2$ and $a = 1/1600$. **6**

10

8

5 kW
s not
culate

8

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3E1632

Roll No. : _____ Total Printed Pages : 3

3E1632

B. Tech. (Sem. III) (Mercy Back) Examination, December - 2017
Mechanical Engg.
3ME2A Material Science & Engg.

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

*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

1 (a) With neat sketches, explain crystal lattice of BCC and FCC. **8**

(b) Explain with neat sketches, the various types of crystal imperfections. **8**

OR

1 (a) Explain slip and twinning mechanisms with neat sketches. **8**

(b) What is recovery, recrystallization and grain growth ? Draw suitable graph to explain. **8**

UNIT - II

2 (a) Distinguish between homogeneous and heterogeneous nucleation for solidification of a pure metal.

6

(b) Draw an equilibrium diagram of binary isomorphous alloy system, also explain it.

10

OR

2 Draw iron carbon equilibrium diagram and label the various phase, fields and temperature. Discuss in brief different reactions that take place in the system.

16

UNIT - III

3 Describe all the transformation which appear in TTT curve for steel.

16

OR

3 Explain briefly the following heat treatment operations :

(i) Annealing

(ii) Normalising

(iii) Hardening

(iv) Tempering.

4×4=16

UNIT - IV

4 (a) What are properties and engineering applications of PMMA, ABS, PVC, PA and PTFE ?

10

(b) Write a short note on urea and phenol formaldehyde.

6

OR

4 (a) Explain the effects of addition of Si, Cr, Mo, V and W alloying elements on the properties of steel. **10**

(b) Write short notes on :

(i) Stainless steel

(ii) Tool steel. **6**

UNIT - V

5 (a) Explain Rockwell hardness testing method with sketch. **8**

(b) Discuss Izod and Charpy impact test for the materials with sketch. **8**

OR

5 (a) Discuss the properties and applications of Al_2O_3, Si_3N_4, SiC and PSZ. **8**

(b) Explain various properties and applications of Nano structured materials. **8**

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3E1633

Roll No. _____ Total No. of Pages : 4

3E1633

B. Tech. (Sem. III) (Main/Back) Examination, December - 2017
Mechanical Engg.
3ME3A Engg. Thermodynamics

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

*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

1 (a) (i) What is property ? Distinguish between different types of properties. **4**

(ii) What is thermodynamic equilibrium ? **4**

(b) A 0.5 m^3 vessel is fitted with air at atmospheric pressure. The air is churned by a paddle wheel attached to a shaft 0.1 m in dia., rotating at a speed of 1800 rpm. A force of 5N acts on the rim of the shaft. What would be the pressure in the vessel after 10 second of operation ? **8**

OR

1 (a) Apply first law to the following processes of a closed system using ideal gas as the working substance :

(i) Constant volume

(ii) Constant pressure

(iii) Constant temperature

(iv) Reversible adiabatic.

8

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

8

UNIT - II

2 (a) (i) Explain the working principle of a Carnot engine.

4

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

4

(b) A Carnot refrigerator operates between temperature limits of 7°C in the evaporator and 35°C in the condenser. It is now desired to keep a medicine which requires a steady temperature of –5°C, in the refrigerator. By what percent should the compressor capacity be increased keeping the same refrigerating effect and the same condenser temperature ?

8

OR

2 One kg of nitrogen expands from 200 kPa and 400°C to 100 kPa and 300°C. Calculate the entropy change along different paths and prove that entropy is a point function.

16

UNIT - III

3 (a) (i) What is triple point ? Explain with reference to P-T, P-V and T-V planes. **4**

(ii) What is pure substance ? Explain in detail. **4**

(b) Derive the relations for the entropy change of an ideal gas in terms of T-P, T-V, P-V. **8**

OR

3 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. **16**

UNIT - IV

4 (a) Explain with P-V and T-S diagram - Otto cycle, Diesel cycle, Dual cycle and Brayton cycle. **8**

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

OR

4 The velocity of sound C in a medium is given by $C = \sqrt{\left(\frac{\partial p}{\partial \rho}\right)_s}$. Find an expression for the velocity of sound in terms of such quantities as p, u, T, R and k for

(a) an ideal gas and

(b) an incompressible liquid. **16**

UNIT - V

5 (a) What factors render the Carnot cycle an impractical cycle ?

8

(b) What is cogeneration ? Explain the working principle of a practical cogeneration plant.

8

OR

5 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.

16

3E1634

Roll No. _____ Total No. of Pages : 3

3E1634

B. Tech. (Sem. III) (Mercy Back) Examination, December - 2017

Automobile Engg.

3AE4A Manufacturing Processes

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

Min. Passing Marks : 24

*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 materials is permitted during examination. (Mentioned in form No. 205)

1. Nil 2. Nil

UNIT - I

1 (a) Write the introduction and classification of manufacturing processes. **4**

(b) Explain the properties of moulding sand. **8**

(b) Discuss the Gating system. **4**

OR

165

1 (a) What is investment casting ? What are the main materials used for making the investment pattern ? What the advantages of investment casting ? **8**

(b) With the help of neat sketch explain Slush casting process. What are the advantages and applications of Slush casting ? **8**

UNIT - II

2 (a) What are the differences between hot working and cold working ? **8**

(b) Explain the drop forging and press forging methods. 8

OR

2 (a) Discuss the characteristics and applications of hot rolling and cold rolling. **8**

(b) How to estimate the forces and power for shearing and drawing operations ? **8**

UNIT - III

3 (a) Explain the explosive welding with its applications. **8**

(b) Explain the following welding techniques with the help of neat sketches :
(i) MIG Welding
(ii) Spot Welding **8**

OR

3 (a) Distinguish between gas welding, arc welding, and resistance welding with respect to temperature generated, quality of welding obtained, application, and cost. **8**

(b) Briefly explain welding defects. **8**

UNIT - IV

4 (a) Explain the properties of powder processed materials. **8**

(b) Explain the following :
(i) Mechanical pulverization
(ii) Electrolytic process **8**

OR

4 (a) Give four examples of the products manufactured by powder metallurgy process. List four components, which cannot be manufactured by powder metallurgy. **8**

(b) Write short notes on following :
(i) Subtractive processes
(ii) Additive processes **8**

UNIT - V

5 (a) What are plastics ? Name two broad classifications of plastics. Distinguish between them. **4×2=8**

(b) Describe with the help of neat sketches the following plastic processing methods stating their advantages and applications :
(i) Transfer moulding
(ii) Extrusion moulding **8**

OR

5 Write short notes on the following :
(i) Injection moulding
(ii) Properties of plastics
(iii) Thermoforming
(iv) Ingredients of moulding compounds. **4×4=16**

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3E1635

Roll No. _____ Total No. of Pages : 3

3E1635

B. Tech. (Sem. III) (Main/Back) Examination, December - 2017
Aeronautical Engg.
3AN5 Object Oriented Programming in C++
(AE, ME, AN)

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

*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

1 What is class ? Explain various other features of object orient programming in C++ in detail. **16**

OR

1 (a) Write a program in C++ to store the book information in a Central Library. Also write function to update the book information. **9**

(b) Write short note on Message Passing with an example. **7**

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UNIT - II

2 (a) What is a pointer ? How it is available to member function of a class ? Explain. **10**

(b) What are the uses of reference in functions ? **6**

OR

2 (a) Explain the purpose of a function parameter. Also explain the difference between parameter and an argument. **9**

(b) Explain '+' operator overloading with an example. **7**

UNIT - III

3 (a) Write brief note on friend function and show how modifying a class's private data with a friend function. **10**

(b) Compare constructor conversion and operator conversion. **6**

OR

3 Explain various forms of inheritance with appropriate examples. **16**

UNIT - IV

4 Explain standard tempelate library and standard library container class in detail. **16**

OR

4 (a) Write a program which clearly describes function and class tempelates. **8**

(b) Write short note on files and streams classes. **8**

UNIT - V

5 (a) Write a function to insert and delete the element in a sorted single linked list. **8**

(b) What is circular queue ? Explain the need of taking an array of size one more than the size of queue. **8**

OR

5 (a) Explain doubly linked list with an appropriate example. **8**

(b) Write short note on priority queues with example. **8**

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3E1636

Roll No. _____ Total No. of Pages : 4

3E1636

B. Tech. (Sem. III) (Main/Back) Examination, December - 2017
Automobile Engg.
3AE6A Advanced Engg. Mathematics (AE, ME, PI)

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

*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 materials is permitted during examination. (Mentioned in form No. 205)

1. Nil 2. Nil

UNIT - I

1 (a) Define the discrete Fourier transform. Find the discrete Fourier transform of the sequence $\{1, 0, -1\}$. **2+6**

(b) Find the Fourier transform of $f(x) = \begin{cases} 1-x^2 & , \text{ for } |x| \le 1 \\ 0 & , \text{ for } |x| > 1 \end{cases}$

Hence evaluate $\int_0^\infty \left(\frac{x\cos x - \sin x}{x^3} \right) \cos \frac{x}{2} dx$ **8**

OR

1 (a) Find $f(x)$ if its Fourier sine transform is $\frac{1}{s}e^{-as}$. Hence deduce $\overline{F}_s^{-1}\left(\frac{1}{s}\right)$.

6+2

(b) Solve : $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2}$, given that $u_x(0,t)=0$ and $u(x,0)=\begin{cases}x, & 0\le x\le 1\\ 0, & x>1\end{cases}$, $u(x,t)$ is bounded and $x>0,\ t>0$.

8

UNIT - II

2 (a) Find $L\{\sin\sqrt{t}\}$. Hence show that $L\left\{\frac{\cos\sqrt{t}}{\sqrt{t}}\right\}=\sqrt{\frac{\pi}{s}}\,e^{-\frac{1}{4}s}$.

6+2

(b) Use Laplace transform technique, to solve the differential equation : $\left(D^2+9\right)y=\cos 2t,\ y(0)=1.\ y=\left(\frac{\pi}{2}\right)=-1$.

8

OR

2 (a) (i) Find the inverse Laplace transform of $\frac{s}{s^4+s^2+1}$.

4

(ii) If $L\{f(t)\}=\overline{f}(s)$, then prove that $L\left\{\frac{1}{t}f(t)\right\}=\int_0^\infty \overline{f}(s)\,ds$, provided that the integral exists. Hence obtain $L\left\{\frac{1}{t}(\cos at-\cos bt)\right\}$.

4+2

(b) Find the bounded solution $y(x,t),\ 0<x<1,\ t>0$, of the boundary value problem $\frac{\partial y}{\partial x}-\frac{\partial y}{\partial t}=1-e^{-t},\ y(x,0)=x$.

6

UNIT - III

3 (a) State and prove the Baye's theorem. **8**

(b) Razor blades are supplied by a manufacturing company in packets of 10. There is a probability of 1 in 100 blades to be defective. Using Poisson distribution, calculate the number of packets containing one defective blade, no defective blade and all defective blades in a consignment of 10,000 packets. **8**

OR

3 (a) Define the Binomial distribution and find its mean and variance. **2+6**

(b) If the heights of 300 students are normally distributed with mean 64.5 inches and standard deviation 3.3 inches, how many students have heights.

(i) less than 5 feet, i.e. 60 inches

(ii) between 5 feet and 5 feet 9 inches. **8**

UNIT - IV

4 (a) Define the operators Δ, δ, E and μ, prove that

(i) $\mu\delta = \frac{1}{2}\Delta\left(1+E^{-1}\right)$

(ii) $E = 1+\frac{\delta^2}{2}+\delta\sqrt{1+\frac{\delta^2}{4}}$ **2+3+3**

(b) The ordinates of the normal curve are given by the following table :

x :	0.0	0.2	0.4	0.6	0.8
y :	0.3989	0.3910	0.3683	0.3332	0.2897

Evaluate :

(i) $y(0.25)$ (ii) $y(0.43)$ **4+4**

OR

4 (a) Using Stirling formula compute $u_{12.2}$ from the following table :

x :	10	11	12	13	14
$10^5 u_x$:	23967	28060	31788	35209	38368

8

(b) Use Lagrange's interpolation formula to find y when $x = 2$, given that

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

8

UNIT - V

5 (a) Evaluate $\int_0^{\pi/2} \sqrt{\cos x}\, dx$ by Simpson's $\frac{1}{3}$ and $\frac{3}{8}$ rule.

8

(b) If $\frac{dy}{dx} = x + y^2$.

Use Runge-Kutta method of fourth order to find an approximate value of y for $x = 0.2$; given that $y = 1$ when $x = 0$. (Take $h = 0.1$)

8

OR

5 (a) From the following table :

x :	1.0	1.2	1.4	1.6	1.8	2.0
$f(x)$:	0.0000	0.1280	0.5440	1.2960	2.4320	4.0000

Find $f''(1.2)$ and $f'(1.8)$.

8

(b) Given $\frac{dy}{dx} = x^2 + y$, $y(0) = 1$. Determine $y(0.02)$ and $y(0.04)$, using Euler's modified method.

8