F 6270 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Third Semester

Branch : Civil Engineering

CE 010 304—MECHANICS OF SOLIDS–I (CE)

(New Scheme—Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Write the relation between elastic constants. Briefly explain.
2. List the various types of supports.
3. What do you mean by modulus of section ?
4. Define shear centre.
5. Differentiate between short and long columns.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Discuss the concept of "bars of uniform strength.
7. Derive the relation between load, shear force and bending moment.
8. Write a note on : Shear stresses in beams.
9. What are the stresses due to torsion ?
10. Define and explain Lame's equation.

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each question carries 12 *marks.*

11. A rigid beam is suspended from three rods having 300 mm spacing between the adjacent rods. The outer rods are 1 m. long but the middle rod is made 0.5 mm. shorter than the outer two rods and assembled with initial stress. Determine the stresses in the rods. The cross-sectional area of each rod is 2 cm^2 and E = 200 GPa.

Or

Turn over

12. The principal strains at a point are in the ratio of 4 : 3 : 2. Find the ratio of Principal stresses at that point. Take $\upsilon = 0.3$.

13. A vertical plate 1 m wide and 2 m high retains water on one side. The plate is supported centrally by a vertical beam which is fixed at 2.5 m depth from the top of the plate. Find the maximum bending moment and shear force in the vertical supporting beam if the water rises to the top of the plate. Assume the mass density of water as 1000 kg/cm^3.

Or

14. A simply supported beam, with equal overhangs on the two ends, carries a U.D.L. of 500 N/m over whole of its length. If the supported length is 10 m, find the overhangs such that (a) the bending moment is zero at the centre ; and (b) the maximum negative and maximum positive bending moments are equal. Draw bending moment and shear force diagrams for cases (a) and (b).

15. A water pipe is 120 cm. internal diameter and 122.4 cm external diameter. Neglecting the water pressure stresses, find the maximum span on which pipe can be supported freely if the maximum bending stress is to be 56 MPa, Force densities of water and steel respectively are 10 kN/m^3 and 76.8 kN/m^3.

Or

16. A thin channel section has outside flange and web dimensions of 10.2 cm and 20.4 cm respectively. The thickness of flanges and web is uniform and equal to 4 mm. Draw the shear stress and shear flow distribution for the section and find the position of shear centre. The shear force = 50 kN.

(12 marks)

17. Compare the allowable torque for two shafts of same length and weight. One of the shafts is 5 cm in diameter while the other is hollow having inner diameter half the outside diameter. Take the materials of the two shafts to be same and assume that each of the two shafts are subjected to the same maximum shear stress.

Or

18. Find the internal and external diameters required for a hollow shaft which is to transmit 40 kW of power at 240 rev/min. if the shear stress is to be limited to 100 MN/m^2. Take the outside diameter to be twice the inside diameter.

19. A long column 6 m. long is fixed at either end. The Euler's critical load for it is 100 kN. The column is now supported at its mid-section all around by hingers. What is the new Euler's critical load ?

Or

20. A steel strut of circular cross-section 1.25 m. long is hinged at both ends. Find the necessary diameter in order that if a thrust of 50 kN deviates at the end by Y10th of diameter from the axis of strut, the greatest compressive stress shall not exceed 35 MPa. If yield stress of steel is 300 MPa, find the crippling load. E = 200 GPa.

[5 × 12 = 60 marks]

F 6259 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Third Semester

Branch : Common for all Branches

EN 010 302—ECONOMICS AND COMMUNICATION SKILLS

(AI, AN, AU, CE, CS, EC, EE, EI, IC, IT, ME, MT, PE and PO)

(New Scheme—Regular/Improvement/Supplementary/)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

Each question carries 3 *marks.*

1. Mention any *six* Nationalised Banks.
2. What do you mean by an MNC ?
3. Explain the merits of direct tax.
4. Discuss the reasons for inflation.
5. What is TRIPS and TRIMS ?

(5 × 3 = 15 marks)

Part B

Each question carries 5 *marks.*

6. Discuss the importance of mutual funds.
7. Distinguish between Direct and Indirect taxes.
8. Explain the steps involved in tax evasion.
9. What is meant by demand pulls and cost push effects of inflation ?
10. Comment on the international trade systems.

(5 × 5 = 25 marks)

Part C

Each question carries 12 *marks.*

11. Explain the major roles of small scale industries (SSI).

Or

12. What are the problems facing by Indian stock markets (BSE and NSE) ?

Turn over

13. Discuss the effects of MNC's in the Indian economy.

Or

14. Explain the Government of Indian's policy on LPG. (Liberalisation Privatisation and Globelisation).

15. Explain the problems associated with deficit financing.

Or

16. What are the functions of tax system in India ? Discuss different types of indirect taxes.

17. Write notes on the following :

    (a) GNP.

    (b) NNP and

    (c) NI.

Or

18. Explain the methods of estimating National Income.

19. Explain the imparts of WTO decisions on Indian industry.

Or

20. Explain the different aspects of BOP (Balance of payments).

(5 × 12 = 60 marks)

F 6289 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Third Semester

Branch : Civil Engineering

CE 010 306—ENGINEERING GEOLOGY (CE)

(New Scheme—Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions briefly.*
Each question carries 3 *marks.*

1. What is the need for coastal protection ?
2. What are the effects of faults on rocks ?
3. List the properties and uses of Fluorite.
4. Define stratification and outcrop.
5. What are the causes of landslides ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Describe the soil profile explaining the various types of layers.
7. Explain Elastic Rebound Theory of earthquakes.
8. Describe the textures and structure of foliated and nonfoliated rock.
9. Discuss the effects of faulting and erosion on outcrops.
10. What are the factors in designing reservoirs ? Explain.

(5 × 5 = 25 marks)

Part C

Answer any **one** *full question from each module.*
Each full question carries 12 *marks.*

Module I

11. What is Engineering Geology ? How Geology relates to Civil Engineering ? Discuss the scope and application of geological knowledge in the planning and execution of Civil Engineering works.

Or

12. Rivers are the essential agency for soil formation. How ? Explain.

Module II

13. (a) Describe the different types of seismic waves.

(b) How the epicentre and hypocentre are located ? Explain.

Or

14. Describe the different layers, their composition and important features of lithosphere and asthenosphere.

Module III

15. Explain the different characteristic properties required for a good building stone. Discuss the mineral composition, texture, petrogenesis and uses of charnockite, peridotite and Mylonite.

Or

16. Define a Rock. Describe the distinguishing features of Igneous, sedimentary and metamorphic rocks. Explain common rock forming minerals.

Module IV

17. Describe the effects of overlaps, folds and joints in dams.

Or

18. (a) Define folds. How they are classified ? What are their effects in a reservoir ?

(b) What are unconformities ? How they affect a dam ?

Module V

19. Define a tunnel. What are the uses of tunnels ? Discuss the various aspects of geological investigations to be carried out to select a site for a tunnel.

Or

20. What are the different types of water tables and resources ? Describe their important features.

(5 × 12 = 60 marks)

F 6257 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Third Semester

Branch : Common to all Branches except C.S. and I.T.

EN 010 301 A—ENGINEERING MATHEMATICS–II (CE, ME, EE, AU, AN, EC, AI, EI, IC, PE, PO and MT)

(New Scheme—Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Find the directional derivative of $\phi(x, y, z) = x y^2 + y z^3$ at the point $(2, -1, +1)$ in the direction of the vector $\bar{i} + 2\bar{j} + 2\bar{k}$.

2. Find the work done in moving a particle once around the circle $x^2 + y^2 = 4$ in the xy–plane and if the force field is given by $\bar{F} = (2x - y + 2z)\bar{i} + (x + y - z)\bar{j} + (3x - 2y + 5z)\bar{k}$.

3. Prove that $\Delta = \mu\delta + \frac{1}{2}\delta^2$.

4. Derive Simpson's $\frac{1}{3}^{rd}$ rule from Newton Cote's quadrature formula.

5. Prove that $z\{n^p\} = -z\frac{d}{dz}\{z(n^{p-1})\}$, p being a +ve integer.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Find the angle between the surfaces $y = x^2 + z^2 - 5$ and $x^2 + y^2 + z^2 = 7$ at $(2, -1, 2)$.

7. Evaluate $\int_S \bar{F} \cdot \bar{n}\, dS$ where $\bar{F} = yz\,\bar{i} + zx\,\bar{j} + xy\,\bar{k}$ and S is the part of the sphere $x^2 + y^2 + z^2 = 1$ which lies in the first octant.

8. Given that $u_0 = 3$, $u_1 = 12$, $u_2 = 81$, $u_3 = 200$, $u_4 = 100$ and $u_5 = 8$. Find $\Delta^5 u_0$.

Turn over

9. Solve $y_{n+2} - 4\,y_{n+1} + 3\,y_n = 2^n + 3^n + 7$.

10. If $z\{u_n\} = \dfrac{z}{z-1} + \dfrac{z}{z^2+1}$ find the z transform of u_{n+2}.

(5 × 5 = 25 marks)

Part C

Each full question carries 12 marks.

Module I

11. (a) If $r = |\bar{r}|$ where $\bar{r} = x\,\bar{i} + y\,\bar{j} + z\,\bar{k}$ then evaluate :

(i) ∇r^n ; and (ii) $\nabla \log r$.

(6 marks)

(b) Show that $r^n\,\bar{r}$ is an irrotational vector for any value of 'n' but is solenoidal only if $n = -3$.

(6 marks)

Or

12. (a) Find div $\bar{f}$ and curl $\bar{f}$ where curl $\bar{f}$ = grad $(x^3 + y^3 + z^3 - 3\,xyz)$. (6 marks)

(b) Prove that $\nabla \times (\phi\,\bar{f}) = (\nabla\phi) \times \bar{f} + \phi(\nabla \times \bar{f})$. (6 marks)

Module II

13. Verify Green's theorem in the plane for $\oint_C \left[(xy + y^2)\,dx + x^2 dy\right]$ where C is the closed curve of the region bounded by $y = x$ and $y = x^2$.

(12 marks)

Or

14. Verify Stoke's theorem for the function $\bar{F} = x^2\,\bar{i} + xy\,\bar{j}$ integrated round the square in $z = 0$ plane whose sides are along the lines $x = 0, y = 0, x = a, y = a$.

(12 marks)

Module III

15. The following table gives the population in loss of a town during the last six censuses. Estimate the population during 1947 and 1987.

x :	1941	1951	1961	1971	1981	1991
y :	12	15	20	27	39	52

(12 marks)

Or

16. Evaluate u_{28}, given $u_{20} = 49225$, $u_{25} = 48316$, $u_{30} = 47236$, $u_{35} = 45926$ and $u_{40} = 44306$.

(12 marks)

Module IV

17. From the following data find the first and second order derivatives at the point $x = 1.1$.

x :	1.0	1.2	1.4	1.6	1.8	2
$f(x)$:	0	0.128	0.544	1.296	2.432	4

(12 marks)

Or

18. Evaluate $\int_0^{\pi} \sin^4 x\,dx$ correct to four places of decimals using Trapezoidal rule by dividing $(0, \pi)$ into 10 equal parts.

(12 marks)

Module V

19. Using convolution theorem find the inverse z transform of $\left(\dfrac{z}{z-1}\right)^3$. (12 marks)

Or

20. Using z transform solve :

$u_{n+2} + 4\,u_{n+1} + 3\,u_n = 3^n$ with $u_0 = 0$ and $u_1 = 1$.

(12 marks)

[5 × 12 = 60 marks]

F 6263 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Third Semester

Branch : Civil Engineering

CE 010 303—FLUID MECHANICS (CE)

(New Scheme—Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Answer should be supported by sketches wherever necessary.
Assume missing data suitably.

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Define surface tension.
2. Give the condition for stability of submerged and floating bodies.
3. Explain the use of Pitot tube, on what principle it works.
4. Differentiate between Laminar and Turbulent flow.
5. What is the physical significance of Reynold's number ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Derive an expression for the depth of center of pressure from free surface of liquid of an inclined plane surface submerged in the liquid.
7. The stream function of a two-dimensional flow is given by $\Psi = 2xy$. Calculate the velocity at the point P (2, 3).
8. Brief the application of Bernoulli's equation.
9. Write short note on minorlosses in pipes.
10. What is meant by geometric, kinematic and dynamic similarities ? Are this similarities truly attainable ?

(5 × 5 = 25 marks)

Turn over

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. (a) Two large plane surfaces are 2.4 cm. apart. The space between the surface is filled with glycerine. What force is required to drag a very thin plate of surface area 0.5 m^2. between the two large plane surface at a speed of 0.6 m/s. If (i) the thin plate is middle of the two plane surface ; and (ii) the thin plate is at a distance of 8 mm. from bottom plane surface. Take the dynamic viscosity of glycerine as 0.810 Ns/m^2.

(12 marks)

Or

(b) (i) The surface tension of water in contact with air at 20° C. is 0.0725 N/m. The pressure inside a droplet of water is to be 200 N/m^2. greater than the outside pressure. Calculate the diameter of the droplet of water.

(6 marks)

(ii) The capillary rise in the glass tube is not to exceed 0.2 mm. of water. Determine its minimum size, given that surface tension for water in contact with air = 0.0725 N/m.

(6 marks)

12. (a) (i) A cylinder has a diameter 0.3 m. and a specific gravity 0.75. What is the maximum permissible length in order that it may float in water with its axis vertical ?

(7 marks)

(ii) Explain the term metacentre and metacentric height. (5 marks)

Or

(b) The velocity potential function is given by

$$\phi = -\left(\frac{xy^3}{3-x^2}\right)+\left(\frac{x^3y}{3+y^2}\right).$$

(i) Find the velocity component in x and y.

(ii) Show that ϕ represents a possible case of flow.

(12 marks)

13. (a) A venturimeter having a diameter of 75 mm. at the throat and 150 mm. diameter at the enlarge end is installed in a horizontal pipe line 150 mm. in diameter carrying an oil of specific gravity 0.9. The difference of pressure head between enlarged end and the throat recorded by a U-tube is 175 mm. of mercury. Determine the discharge through the pipe. Assume the coefficient of discharge of the venturimeter as 0.97.

(12 marks)

Or

(b) (i) Define the various coefficients of an orifice. (3 marks)

(ii) What is a mouth piece ? What is the advantage of providing a mouth piece ? (4 marks)

(iii) Find the discharge through a triangular notch under a constant head of 0.25 m. if the angle of the notch is 120°. Take C_d= 0.62.

(5 marks)

14. (a) (i) Explain the terms hydraulic gradient and total energy lines. (6 marks)

(ii) Calculate the discharge through a pipe of diameter 200 mm. when the difference. If pressure head between the two ends of a pipe 500 m. apart is 4 m. of water. Take the value of f as 0.009.

(6 marks)

Or

(b) The difference in water surface levels in two tanks, which are connected by three pipes in series of lengths 300 m., 170 m., and 210 m. and of diameters 300 mm., 200 mm., and 400 mm. respectively is 12 m. Determine the rate of flow of water if coefficient of friction are 0.005, 0.0052 and 0.0048 respectively considering (i) minor losses also ; (ii) neglecting minor losses.

(12 marks)

15. (a) The pressure difference ΔP in a pipe of diameter D, and length l due to viscous flow depends on the velocity V, viscosity μ, and density ρ. Using Buckingham's π-theorem. Obtain an expression for ΔP.

(12 marks)

Or

(b) (i) In 1 in 40 model of spillway, the velocity and discharge are 2 m./s and 2.5 $m.^3/s$. Find the corresponding velocity and discharge in prototype.

(7 marks)

(ii) Explain the terms distorted model and undistorted model. What is the use of distorted model ?

(5 marks)

[5 × 12 = 60 marks]

F 6280 **(Pages : 3)** **Reg. No.....**

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Third Semester

Branch : Civil Engineering

CE 010 305—SURVEYING—I (CE)

(New Scheme—Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions in* **one** *or* **two** *sentences.*
Each question carries 3 *marks.*

1. What is meant by local attraction ?
2. What do you mean by resection ?
3. Explain different benchmarks.
4. What is meant by tacheometry ? How is it classified ?
5. What is meant by shift ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. The true bearing of a line is N 63° 48′ W. What is the magnetic bearing of the line if the magnetic declination is : (a) 3° 50′ W ; and (b) 2° 20′ E ?
7. Find the distance of the visible horizon from the top of a light house 40 m. high. What is the dip of the horizon, assuming the radius of the earth to be 6371 km. ?
8. The constant for an instrument is 1200 and the value of additive constant is 0.4 metres. Calculate the distance from the instrument to the staff when the micrometer readings are 6.262 and 6.258, the staff intercept is 2.5 m. and the line of sight is inclined at + 6° 30′, the staff being held vertically.
9. Deduce the fundamental formula for horizontal distance between tacheometer and staff station by fixed hair tacheometry.
10. How will you set out a curve by successive bisection of arcs ?

(5 × 5 = 25 marks)

Turn over

Part C

Answer **all** *questions.*
Each question carries 12 *marks.*

11. In an old survey made the magnetic declination was 3° 38′ E, the magnetic bearing of a line AB was N 68° 12′ E. If the present magnetic declination in the same locality is 2° 26′ W. Find the true bearing and present magnetic bearing of AB.

Or

12. What is meant by three point problem and show how it is solved by Tracing paper method and trial and error method ?

13. What are the different methods of locating contours ? Discuss in detail.

Or

14. In levelling between two points A and B on opposite banks of a river, the level was set up near A, the staff readings on A and B were 1.564 and 2.934 respectively. The level was then moved and setup near B and the respective readings on A and B were 1.895 and 3.271. Find true difference of level between A and B.

15. Describe how a theodolite is set up at a station and a round angle is measured at it. What errors are minimized in this procedure.

Or

16. A tacheometer was setup at station A and the following readings were obtained on a vertically held staff :

Station	*Staff Station*	*Vertical Angle*	*Hair Reading*	*Remark*
	BM	− 2° 18′	3,225, 3.550, 3.875	RL of BM =
A	B	+ 8° 36′	1.650, 2.515, 3.380	437.655 m.

Calculate the horizontal distance from A to B and the RL of B, if the constants of the instrument were 100 and 0.4.

17. The following give the values in M of the offsets taken from a chain line to an irregular boundary :—

Distance :	0	50	100	150	200	250	300	350	400
Offset :	10.6	15.4	20.2	18.7	16.4	20.8	22.4	19.3	17.6

Calculate the area in sq.m. included between chain line, the irregular boundary and the first and last offsets by (i) Trapezoidal rule ; and (ii) Simpson's rule.

Or

18. (a) What is a prismoid ? Derive the prismoidal formula.

(b) Explain the concept of zero circle in planimeter.

19. Two straights T_1V and VT_2 are intersected by a third line AB. The angles VAB and VBA are measured to be 26° 24′ and 34° 36′ and the distance AB = 358 m. Calculate the radius of the simple circular curve which will be tangential to the three lines T_1A, AB and BT_2 and the chainage of PC of PT. Chainage of V = 6860 m.

Or

20. (a) What are the problems encountered in setting out reverse curve ?

(b) What is meant by vertical curve ? Where is it adopted ?

(5 × 12 = 60 marks)

F 6293

(Pages : 3)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2013

Third Semester

Branch : Common to all branches except R and T

ENGINEERING MATHEMATICS—II (CMEPLANSUF)

(Old Scheme—Supplementary/Mercy Chance)

Time : Three Hours

Maximum : 100 Marks

Answer any **one** *full question from each module.*
Each full question carries 20 *marks.*

Module 1

1. (a) Prove that $\frac{d}{dt}\left[\vec{a}\cdot\frac{d\vec{b}}{dt}-\frac{d\vec{a}}{dt}\cdot\vec{b}\right]=\vec{a}\cdot\frac{d^2\vec{b}}{dt^2}-\frac{d^2\vec{a}}{dt^2}\cdot\vec{b}$.

(b) Find the angle between the tangents to the curve $x=t, y=t^2, z=t^3$, at $t=\pm 1$.

(c) Show that $\vec{E}=\frac{\vec{r}}{r^2}$ is irrotational.

Or

2. (a) If $\vec{r}=x\hat{i}+y\hat{j}+z\hat{k}$, prove that $\nabla\cdot\left\{r\nabla\left(\frac{1}{r^3}\right)\right\}=\frac{3}{r^4}$.

(b) In what direction from $(3,1,-2)$ is the directional derivative of $\phi=x^2y^2z^4$ maximum and what is its magnitude ?

Module 2

3. (a) Find the value of $\vec{r}$ satisfying the equation $\frac{d^2\vec{r}}{dt^2}=6t\hat{i}-24t^2\hat{j}+4\sin t\,\hat{k}$, given that $\vec{r}=2\hat{i}+\hat{j}$ and $\frac{d\vec{r}}{dt}=-\hat{i}-3\hat{k}$ at $t=0$.

(b) Evaluate by stoke's theorem, $\oint_C(\sin z\,dx-\cos x\,dy+\sin y\,dz)$ where C is the boundary of the rectangle $0\le x\le\pi,\ 0\le y\le 1, z=3$.

Or

Turn over

4. (a) Apply Green's theorem to evaluate $\oint_C [(y - \sin x)\,dx + \cos x\,dy]$ where C is the plane triangle enclosed by the lines $y = 0, x = \pi/2$ and $y = \frac{2}{\pi}x$.

(b) If $\vec{F} = (2x^2 - 3z)\hat{i} - 2xy\hat{j} - 4x\hat{k}$, then evaluate $\iiint_V \nabla \times \vec{F}\,dV$ where V is the closed region bounded by the planes $x = 0, y = 0, z = 0$ and $2x + 2y + z = 4$.

Module 3

5. (a) Find the bilinear transformation which maps $1, i, -1$ to $2, i, -2$ respectively. Find the critical and fixed points of the transformation.

(b) Find the analytic function whose real part is $e^{-x}(x \sin y - y \cos y)$.

(c) Show that under the transformation $W = \frac{Z - i}{Z + i}$, real axis in the Z-plane is mapped into the circle $|W| = 1$. Which portion of the Z-plane corresponds to the interior of the circle ?

Or

6. (a) If $f(z)$ is an analytic function, prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|Rf(z)|^2 = 2|f'(z)|^2$.

(b) If the potential function is $\log(x^2 + y^2)$, find the flux function and the complex potential function.

(c) Find the image of the circle $|z| = 3$ under the transformation $w = z + 4 + 3i$.

Module 4

7. (a) Evaluate $\Delta(\sin 2x \cos 4x)$. Assume the interval of differencing as h.

(b) Express $f(u) = u^4 - 3u^2 + 2u + 6$ in terms of factorial polynomials. Hence show that $\Delta^4 f(u) = 24$.

(c) If $u_0 = 1, u_1 = 0, u_2 = 5, u_3 = 22, u_4 = 57$, find the $u_{0.5}$ by Newton's formula.

Or

8. (a) Use Lagrange's interpolation formula and find the value at $x = 4.5$ with the following data :

x	:	1	3	5
y	:	1.5706	1.5712	1.5728

(b) Use Newton's divided difference formula to find $f(x)$ from the following data :

x	:	0	1	2	4	5	6
y	:	1	14	15	5	6	18

Module 5

9. (a) From the following table, calculate $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1.25$.

x	:	1.1	1.2	1.3	1.4	1.5	1.6
y	:	–1.6263	0.1558	2.4526	5.3917	9.1250	13.8307

(b) Estimate the length of the arc of the curve $3y = x^3$ from (0, 0) to (1, 3) using Simpson's $\frac{1}{3}$ rule taking 8 sub-intervals.

Or

10. (a) Apply (i) trapezoidal rule ; (ii) Simpson's $\frac{1}{3}$ rule, to find an approximate value of $\int_{-3}^{3} x^4\,dx$ by taking six equal sub-intervals. Compare them with the exact values.

(b) From the table below, for what values of x, y is minimum ? Also find this value of y.

x	:	3	4	5	6	7	8
y	:	0.205	0.240	0.266	0.260	0.251	0.222

(5 × 20 = 100 marks)