F 9287 (Pages : 3) Reg. No.....7 cables.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Third Semester

Branch : Civil/Mechanical/Electrical and Electronics/Automobile/Aeronautical/Electronics and Communication/Applied Electronics and Instrumentation/Electronics and Instrumentation/Instrumentation and Control Engineering/Production Engineering/Polymer Engineering

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

(Regular)

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Find a unit vector normal to the surface $xy^3z^2 = 4$ at the point $(-1, -1, 2)$.
2. If S is any closed surface, prove that $\int_S \text{curl } \bar{F} \cdot d\bar{S} = 0$.
3. Evaluate $\Delta^2 \cos 2x$.
4. What is Simpson's one-third rule ? How it is related to Newton-Cote's formula ?
5. Find the inverse transform of $\frac{2z^2 + 3z}{(z+2)(z-4)}$.

(5 × 3 = 15 marks)

Part B

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

6. Find div $\bar{F}$ and curl $\bar{F}$, where $\bar{F} = \text{grad}\left(x^3 + y^3 + z^3 - 3xyz\right)$.
7. Find the work done in moving a particle in the force field $\bar{F} = 3x^2\hat{i} + (2xz - y)\,\hat{j} + z\hat{k}$ along the curve defined by $x^2 = 4y$, $3x^3 = 8z$ from $x = 0$ to $x = 2$.
8. Prove that $e^x = \left(\frac{\Delta^2}{E}\right) e^x \cdot \frac{Ee^x}{\Delta^2 e^x}$, the interval of differencing is h.

Turn over

9. A solid of revolution is formed by rotating about the x-axis, the area between the x-axis, the lines $x = 0$ and $x = 1$ and a curve through the points with the following co-ordinates :

x :	0.00	0.25	0.50	0.75	1.00
y :	1.0000	0.9898	0.9589	0.9089	0.8415

Estimate the volume of the solid formed using Simpson's rule.

10. Solve $y_{n+2} - 4y_{n+1} + 3y_n = 5^n$.

(5 × 5 = 25 marks)

Part C

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

Module 1

11. (a) If $r = \sqrt{x^2 + y^2 + z^2}$, show that $\nabla^2\left(r^n\right) = n(n+1)r^{n-2}$ and hence deduce that $\nabla^2\left(\frac{1}{r}\right) = 0$, except at $r = 0$.

(6 marks)

(b) Show that curl $\left(\phi\overline{A}\right) = \text{grad } \phi \times \overline{A} + \phi \text{ curl } \overline{A}$. (6 marks)

Or

12. (a) Find the directional derivative of $\nabla \cdot (\nabla\phi)$ at the point $(1, -2, 1)$ in the direction of the normal to the surface $xy^2z = 3x + z^2$; where $\phi = 2x^3y^2z^4$.

(6 marks)

(b) Show that curl $\left(\overline{u} \times \overline{v}\right) = \left(\overline{v} \cdot \nabla\right)\overline{u} - \left(\overline{u} \cdot \nabla\right)\overline{v} + \overline{u} \text{ div } \overline{v} - \overline{v} \text{ div } \overline{u}$. (6 marks)

Module 2

13. Verify divergence theorem for $\overline{F} = (2xy + z)\,\hat{i} + y^2\hat{j} - (x + 3y)\,\hat{k}$ when the surface S is that of the region bounded by the plane $2x + 2y + z = 6$ in the first octant.

Or

14. Use Stoke's theorem to calculate $\oint_C (ydx + zdy + xdz)$, where C is the curve of intersection of $x + y = 2$ and $x^2 + y^2 + z^2 - 2x - 2y = 0$.

Module 3

15. Using Newton's forward interpolation formula, estimate the number of students who scored marks between 40 and 45 :

Marks	:	30—40	40—50	50—60	60—70	70—80
No. of students	:	31	42	51	35	31

Or

16. Use Lagrange's formula to find the form of $f(x)$, given :

x	:	0	2	3	6
$f(x)$	:	648	704	729	792

Module 4

17. Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using (i) trapezoidal rule ; (ii) Simpson's 1/3rd rule ; and (iii) Simpson's 3/8th rule. Compare their accuracies.

Or

18. Find the first and second derivatives of the function from the following table at point $x = 1.1$:

x	:	1.0	1.2	1.4	1.6	1.8	2.0
$f(x)$	:	0.0	0.128	0.544	1.296	2.423	4.01

Module 5

19. (a) If $\bar{u}(z) = \frac{2z^2+5z+14}{(z-1)^4}$, evaluate u_2 and u_3. (6 marks)

(b) Using the z-transform, solve $u_{n+2} + 4u_{n+1} + 3u_n = 2^n$ with $u_0 = 0$, $u_1 = 1$. (6 marks)

Or

20. (a) Show that $z\left(\frac{1}{n+1}\right) = z\log\left(\frac{z}{z+1}\right)$. (6 marks)

(b) Using Convolution theorem, evaluate $z^{-1}\left[\frac{z^2}{(z-1)(z-3)}\right]$. (6 marks)

[5 × 12 = 60 marks]

F 9289 (Pages : 2) Reg. No.....12 copies

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Third Semester

EN 010 302—ECONOMICS AND COMMUNICATION SKILLS (AI, AN, AU, CE, CS, EC, EE, EI, IC, IT, ME, PE and PO)

(Regular)

[Common to all Branches]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Name three Commercial banks. Describe their main functions.
2. Explain the meaning of Globalisation.
3. What is incidence of tax ? Explain.
4. What are the causes of inflation ?
5. List any *six* arguments in support of protectionism.

(5 × 3 = 15 marks)

Part B

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

6. Explain how Commercial banks aid Economic Development of a country.
7. Discuss the various effects and defects of privatisation.
8. What is meant by direct and indirect taxes ? Give *four* examples each with your reasons.
9. Define National Income and per capita income and account for the low level of per capita income in under-developed countries.
10. Why is international trade distinguished from domestic or inter-regional trade ?

(5 × 5 = 25 marks)

Part C

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

Module I

11. State and explain the major financial institutions in India providing financial assistance to industries.

Or

Turn over

12. Explain the various credit control methods ? What are the methods used by the RBI to control the creation of credit by Commercial banks.

Module II

13. Discuss the impact of multinational companies in Indian economy.

Or

14. Describe the growth and development of Information Technology industries in India.

Module III

15. Explain clearly the characteristics of good tax system.

Or

16. Define tax and explain its features. Distinguish between incidence and shifting of a tax. What are the factors influencing the shifting of a tax ?

Module IV

17. How is National Income estimated ? Bring out the difficulties involved in National Income estimation in under-developed countries.

Or

18. Define inflation and explain the types of inflation. What are the effects of inflation ? How is inflation controlled ?

Module V

19. What is free trade ? What are its advantages ? What is the case against free trade ?

Or

20. Distinguish between Balance of Trade and Balance of Payments. Why must the balance of payments balance in the long run ?

(5 × 12 = 60 marks)

F 9319 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Third Semester

Branch : Civil Engineering

CE 010 306—ENGINEERING GEOLOGY (CE)

(Regular)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

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

1. Write products of weathering.
2. What is Mohorovicic discontinuity ?
3. Write physical properties of Quarz.
4. Explain parts of a fold.
5. Define ground water table.

(5 × 3 = 15 marks)

Part B

Each question carries 5 *marks.*

6. Explain different alluvial deposites.
7. Define and explain continental drift.
8. Write textures of Igneous rocks.
9. Describe Geometric classification of joints.
10. Write classification of landslides.

(5 × 5 = 25 marks)

Part C

Each carries 12 *marks.*

11. Write the importance of Geology in Engineering. Add a note on Geology timescale.

Or

12. Explain the geological work of seas and briefly describe erosional and depositional land forms. Add a note on Marie erosion control measures.

(12 marks)

Turn over

13. Define Earthquakes. Discuss the cause and effects of earthquakes. Describe classification and distribution of earthquakes.

Or

14. What is plate tectonics ? Describe the various types of plate boundaries.

(12 marks)

15. Explain different physical properties of minerals with examples.

Or

16. Write definition mineralogical composition, texture and uses of the following rocks :

(a) Syenite. (b) Basatt.

(c) Sand-stone. (d) Gneiss.

(3 + 3 + 3 + 3 = 12 marks)

17. Describe the classification of faults with neat sketches. Discuss the role of fault in the selection of sites for Civil Engineering projects.

Or

18. What is meant by Dip and strike ? How are they measured in the field ? Briefly explain the effects of geological structures in engineering projects.

(12 marks)

19. Define Aquifer. Describe the different types of aquifers. Write the difference between aquifer, aquiclude, aquitard and aquifuge. Highlight the importance of ground water investigation in engineering projects.

Or

20. Give a brief account about the geological problems encountered in the construction of the tunnels. List down the precautions to be taken in highly disturbed area before tunelling.

(12 marks)

[5 × 12 = 60 marks]

F 9293

(Pages : 2)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Third Semester

Branch : Civil Engineering

CE 010 303—FLUID MECHANICS (CE)

(Regular)

Time : Three Hours

Maximum : 100 Marks

Part A

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

1. Distinguish between Ideal fluids and Real fluids.
2. Define metacentric height.
3. List the various types of notches and weirs.
4. What do you mean by toal energy line ?
5. What are the advantages of dimensional analysis ?

(5 × 3 = 15 marks)

Part B

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

6. Obtain an expression for the pressure intensity at a point in a fluid.
7. Differentiate Lagrangian and Eulerian method.
8. Discuss the various energies of fluids.
9. Write a note on transmission of power through pipes.
10. Define and explain (i) Reynold's number ; and (ii) Froude number.

(5 × 5 = 25 marks)

Part C

Answer (a) **or** *(b).*
Each full question carries 12 *marks.*

11. (a) (i) Determine the dynamic viscosity of a liquid having kinematic viscosity 6 Stokes and specific gravity 1.9. (6 marks)

(ii) State the Newton's law of viscosity and give examples of its application. (6 marks)

Or

(b) Distinguish between manometers and mechanical gauges. What are the different types of mechanical pressure gauges ?

Turn over

12. (a) Define the terms "buoyancy" and "centre of buoyancy". A wooden block of width 2 m., depth 1.5 m., and length 4 m. floats horizontally in water. Find the volume of water displaced and position of centre of buoyancy. The specific gravity of the wooden block is 0.7.

Or

(b) (i) Describe the use and limitations of the flow nets. (6 marks)

(ii) Under what conditions can one draw flow net ? (6 marks)

13. (a) Discuss with neat sketches :

(i) Venturimeter. (4 marks)

(ii) Orifice meter. (4 marks)

(iii) Pitot tube. (4 marks)

Or

(b) A Cipoletti weir of crest length 60 cm. discharges water. The head of water over the weir is 360 mm. Find the discharge over the weir if the channel is 80 cm. wide and 50 cm. deep. Take $C_d = 0.60$.

14. (a) Discuss :

(i) Hydrodynamically smooth and rough boundary. (6 marks)

(ii) Drag and lift for immersed bodies. (6 marks)

Or

(b) Explain Reynold's experiment with neat sketches.

15. (a) State Buckingham's π-theorem. The efficiency 'η' of a fan depends on density 'ρ', dynamic viscosity 'μ' of the fluid, angular velocity 'ω', diameter 'D' of the rotor and the discharge 'Q'. Express 'η' in terms of dimensionless parameters.

Or

(b) (i) What is meant by geometric, kinematic and dynamic similarities ? Are these similarities truly attainable ? If not why ?

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

[5 × 12 = 60 marks]

F 9310 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Third Semester

Branch : Civil Engineering

CE 010 305—SURVEYING—I (CE)

(Regular)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions in* 1 **or** 2 *sentences.*
Each question carries 3 *marks.*

1. What is meant by whole circle bearing ?
2. What is a temporary benchmark ?
3. Enlist the methods for measuring horizontal angles with a theodolite.
4. Write the prismoidal rule for measuring volume.
5. Explain degree of a curve.

(5 × 3 = 15 marks)

Part B

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

6. Explain any *one* method of resection.
7. What is reciprocal levelling ?
8. Define fundamental lines of a theodolite.
9. Explain mass haul curve.
10. Explain Rankine's method of setting out a simple curve.

(5 × 5 = 25 marks)

Part C

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

11. ABCD is a traverse. The lengths and bearings of the traverse lines AB, BC, CD and DA are 501 m. 30° 15′ ; 620.8 m. 145° 30′ ; 380.4 m. 222° 15′ ; and 501.18 m. 315° 58′ 59″ ; respectively. Calculate the co-ordinates of the station points :

    (i) with B as origin.

    (ii) with D as origin.

Or

12. The following bearings were observed while traversing with a compass :

Line	*F.B.*	*B.B.*
PQ ...	150° 0′	329° 45′
QR ...	77° 30′	256° 0′
RS ...	41° 30′	222° 45′
ST ...	314° 15′	134° 45′
TP ...	220° 15′	40° 15′

Determine the local attraction and corrected bearings.

13. (a) Explain the characteristics of contour with suitable examples. (5 marks)

(b) The following notes refer to a reciprocal level taken with one level :

Instrument neat	*Staff readings on*		*Remarks*
	A	B	
A ...	1.824	2.748	Distance
B ...	0.928	1.606	AB = 1010 m.

RL of A = 145.325 m.

Determine :

(i) RL of B.

(ii) Combined correction for curvature and refraction.

(iii) Angular error in the collimation adjustment of instrument. (7 marks)

Or

14. (a) Explain any *one* method for preparing a contour. (5 marks)

(b) A line of levels was run from point P to Q. The levelling was then continued to a bench mark of 83.500. The readigns obtained are shown below. Obtain the RL of P and Q.

BS	IS	FS	RL	Remarks
1.620				P
1.875		0.355		
2.030		1.780		
	2.360			Q
0.985		1.120		
1.905		2.825		
		2.035	83.500	BM

15. What is traversing ? Explain loose needle and fast needle methods. (7 marks)

Or

16. A tacheometer was set up at a station A and the readings on a vertically held staff at B were 2.255, 2.605 and 2.955, the line of sight being at an inclination of + 8° 40′. Another observation on the vertically held staff at BM gave the readings 1.640, 1.920, 2.200, the line of sight is inclined at angle + 1° 6′. Calculate the horizontal distance between A and B, and the elevation if B if the RL of benchmark is 418.685 m. The constants of instruments were 100 and 0.30.

17. (a) Derive Simpson's rule for computing the area. (4 marks)

(b) In a tape and offset survey the following offsets were taken to a fence from a survey line :

Chainage (m) :	0	20	40	60	80	100	120	140	160	180
Offset (m) :	0	5.49	9.14	8.53	10.67	12.50	9.75	4.57	1.83	0

Find the area between the fence and the survey line.

Or

18. Calculate the volume of embankment of which cross-sectional area at 20 m. interval are as follows :

Chainage (m) :	0	20	40	60	80	100	120
Area ($m.^2$) :	11	42	52	70	125	185	210

Using :

(i) Trapezoidal rule.

(ii) Prismoidal formula.

19. What is a compound curve ? Explain with a neat sketch elements of a compound curve.

Or

20. Explain the various methods for determining the length of a transition curve.

(5 × 12 = 60 marks)

F 9300 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Third Semester

Branch : Civil Engineering

CE 010 304—MECHANICS OF SOLIDS–I (CE)

(Regular)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions in one* **or** *two sentences.*

1. Differentiate between (i) Elastic Limit and Proportionality limit (ii) Linear strain and Lateral strain.
2. What do you mean by temperature stresses and strain ?
3. How do you find the maximum bending moment in a beam ?
4. What is meant by pure bending ? What are the assumptions made in the theory of simple bending ?
5. Discuss on Lame's equation for analysing cylinders.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*

6. Derive the relation between bending moment, shearforce and applied distributed load for a beam.
7. Derive expression for finding out shear stress at any point on the cross-section of a circular shaft under pure torsion.
8. Explain the assumptions and limitations of Euler's theory of buckling.
9. Show that in thin cylindrical shells subjected to internal fluid pressure, the circumferential stress is twice the longitudinal stress.
10. Explain about principal planes, plane of minimum shear and principal stresses.

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*

11. In a tension test on a 25 mm. diameter rod it is observed that an extension of 0.25 mm. occurs over a gauge length of 300 mm and correspondingly the diameter decreases by 0.00595 mm when a load of 100 kN is applied. Determine, the three modulii of elasticity and the Poisson's ratio.

Or

Turn over

12. A point in a strained material is subjected to a tensile stress of 100 N/mm^2 and a compressive stress of 80 N/mm^2 acting on two mutually perpendicular planes and shear stress of 20 N/mm^2 along the planes. Determine (i) principal stresses ; (ii) principal planes ; (iii) plane of maximum shear and (iv) maximum shear stress by Mohr's circle method.

13. Draw the SF and BM diagrams for the beam shown in Fig.1 below. Mark on it all salient values.

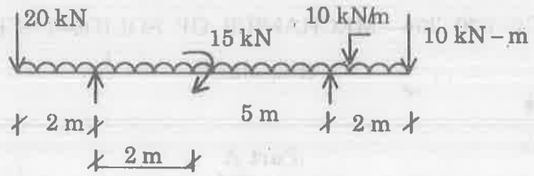

Fig.1

Or

14. A simply supported beam is subjected to a u.d.l. of 4 kN/m over the right half, a concentrated load 6 kN at the left hand quarter point on t he span of 8 m. Draw SFD and BMD. Find the location and magnitude of maximum bending moment.

15. A timber beam of 4 m span has to carry a u.d.l. of 25 kN/m. Calculate the dimensions of the beam if the maximum permissible stress is limited to 8 N/mm^2. The ratio of depth to width is to be 1.5. Calculate the maximum shear stress in the beam.

Or

16. A timber beam of depth 160 mm. and width 80 mm. is strengthened by two steel plates 160 mm. wide and 20 mm. thick at top and bottom of the timber section. Find the moment of resistance of the section. Allowable stress in timber = 7 N/mm^2. Take $E_s = 20\ E_{timber}$.

17. Determine the diameter of a solid steel shaft which will transmit 80 kN at 150 r.p.m. Also determine the length of the shaft if the twist must not exceed 1° over the entire length. The maximum shear stress is limited to 60 N/mm^2. Take the value of modulus of rigidity = 8×10^4 N/mm^2.

Or

18. Determine the maximum and minimum hoop stress across the section of a pipe 400 mm. internal diameter and 100 mm. thick, when the pipe contains a fluid at the pressure of 9 N/mm^2. Also sketch the radial pressure distribution and hoopstress distribution across the section.

19. Compare the crippling loads given by Rankine's formula and Euler's formula for tubular strut 2.25 m long having outer and inner diameters of 40 mm and 35 mm and loaded through pin joint at both ends. Take yield stress as 315 MN/m^2 and $\alpha = \frac{1}{7500}$. E = 200 GPa.

Or

20. A masonry pier 3m × 4m supports a vertical load P of 80 kN as shown in Fig.2. Find the stresses developed at each corner.

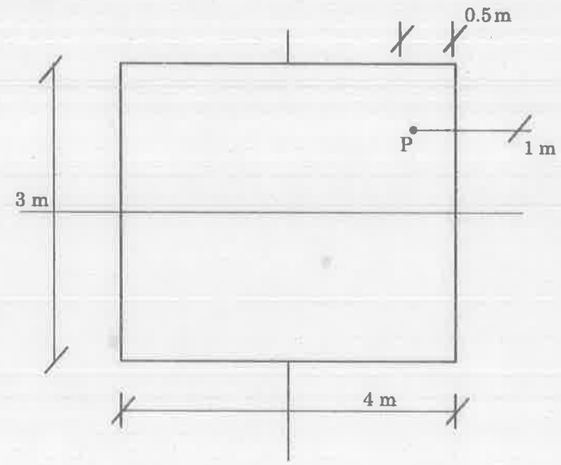

Fig.2

(5 × 12 = 60 marks)

(c) A curve is given by the table :

x :	0	1	2	3	4	5	6
y :	0	2	2.5	2.3	2	1.7	1.5

The x-co-ordinate of the centre of gravity of the area bounded by the curve, the end ordinates and the x-axis is given by $A\bar{x} = \int_0^6 xy\,dx$, where A is the area. Find $\bar{x}$ by using Simpson's rule.

(12 marks)

(d) Find the missing value using backward difference formula :

x :	0	1	2	3	4
y :	1	3	9	—	81

Explain why the result differs from $3^3 = 27$.

(8 marks)

[5 × 20 = 100 marks]

F 9243 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Third Semester

Branches : Civil, Mechanical, Electrical and Electronics, Electronics and Communication, Polymer, Applied Electronics and Instrumentation, Instrumentation and Control, Electronics and Instrumentation, Automobile Engineering, Aeronautical Engineering

ENGINEERING MATHEMATICS—II (CMEPLANSUF)

(2009 admissions—Improvement ; 2004—2009 admissions—Supplementary)

Time : Three Hours Maximum : 100 Marks

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

Module 1

1. (a) Find the directional derivation of $4xz^3 - 3x^2y^2$ at (2, – 1, 1) in the direction of $2\vec{i} - 3\vec{j} + 6\vec{k}$.

(5 marks)

(b) Expand $\nabla \cdot (\vec{A} \times \vec{B})$. Deduce that if ϕ and ψ are differentiable scalar functions then $\nabla\phi \times \nabla\psi$ is solenoidal.

(9 marks)

(c) If $\vec{A} = (4xy - 3x^2z^2)\vec{i} + 2x^2\vec{j} - 2x^3z\vec{k}$ show that $\int_C \vec{A} \cdot d\vec{r}$ is independent of the path C and find the scalar potential for $\vec{A}$.

(6 marks)

Or

(d) Find div $\vec{F}$ and curl $\vec{F}$ if $\vec{F}$ = grad $(x^3 + y^3 + z^3 - 3xyz)$. (7 marks)

(e) Find the directional derivation of $f(x, y, z) = x^2y^2z^2$ at the point (1, 1, – 1) in the direction of the tangent to the curve $x = e^t$, $y = 1 + 2 \sin t$ and $z = t - \cos t$, where $-1 \le t \le 1$. (8 marks)

(f) If $\vec{f} = (x + y + 1)\vec{i} + \vec{j} - (x + y)\vec{k}$ show that $\vec{f} \cdot \text{curl } \vec{f} = 0$. (5 marks)

Module 2

2. (a) Using Green's theorem show that the area enclosed by any closed curve C is given by $\frac{1}{2}\oint (x\,dy - y\,dx)$.

(5 marks)

(b) Verify Stoke's theorem for the function $\vec{F} = x^2\hat{i} + xy\hat{j}$ integrated round the square in the plane $z = 0$ whose sides are $x = 0$, $y = 0$, $x = a$, $y = a$.

(8 marks)

(c) Evaluate $\int_C \vec{F} \cdot d\vec{r}$ if $\vec{F} = xy\hat{i} + \left(x^2 + y^2\right)\hat{j}$ and C is the arc of $y = x^2 - 4$ from (2, 0) to (4, 12).

(7 marks)

Or

(d) Verify Green's theorem for $\int_C \left[\left[xy + y^2\right]dx + x^2 dy\right]$, where C is bounded by $y = x$ and $y = x^2$.

(10 marks)

(e) Evaluate $\int_C \vec{F} \cdot d\vec{r}$ where $\vec{F} = xy\hat{i} + \left(x^2 + y^2\right)\hat{j}$ along the path of the straight line from (0, 0) to (1, 0) and then to (1, 1).

(5 marks)

(f) Find the total work done in moving a particle in a force field $\vec{f} = 3xy\,\vec{i} - y\vec{j} + 2zx\vec{k}$ once round the circle in xy plane whose centre is at origin and radius equal to 2 units.

(5 marks)

Module 3

3. (a) Define an analytic function. Derive the Cauchy Riemann equations for an analytic function $f(z)$.

(7 marks)

(b) If an analytic function $f(z) = u(x, y) + iv(x, y)$ is expressed in terms of the polar co-ordinates r and θ, show that $f'(z) = (\cos\theta - i\sin\theta)\dfrac{\partial f}{\partial r} = -\dfrac{\sin\theta + i\cos\theta}{r}\dfrac{\partial f}{\partial \theta}$.

(8 marks)

(c) State and prove CR equation in polar form. (5 marks)

Or

(d) Define Bilinear transformation and show that the cross ratio of four points is unaltered by bilinear transformation.

(8 marks)

(e) Discuss the transformation $w = z + \dfrac{1}{z}$. (7 marks)

(f) Show that the real and imaginary parts of an analytic function are harmonic (in the Cartesian form.)

(5 marks)

Module 4

4. (a) Construct the table of differences for the data below :

x	:	0	1	2	3	4
$f(x)$	:	1.0	1.5	2.2	3.1	4.6

Evaluate $\Delta^3 f(2)$.

(10 marks)

(b) The following table gives the values of x and y :

x	:	1.2	2.1	2.8	4.1	4.9	6.2
y	:	4.2	6.8	9.8	13.4	15.5	19.6

Find the value of corresponding to $x = 3.5$, using Lagrange's technique.

(10 marks)

Or

(c) Certain corresponding values of x and $\log_{10}^x$ are given below :

x	:	300	304	305	307
$f(x)$	:	2.4771	2.4829	2.4843	2.4871

Find $\log_{10} 310$ by Newton's divided difference formula.

(10 marks)

(d) Given the table :

x	:	310	320	330	340	350	360
$\log x$	:	2.4914	2.5052	2.5185	2.5315	2.5441	2.5563

Find the value of log 337.5 by Stirling's formula.

(10 marks)

Module 5

5. (a) Evaluate $\int_0^6 \dfrac{dx}{1+x^2}$ by using (i) Trapezoidal rule ; (ii) Simpson's $\dfrac{1}{3}$ rule ; and (iii) Simpson's 3/8 rule and compare the results with actual value.

(12 marks)

(b) From the following table estimate the number of students who obtained marks more than 55 :—

Marks	:	31—40	41—50	51—60	61—70	71—80
Number of students	:	31	41	51	35	31

(8 marks)

Or