III ME/CV

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10MAT31

Third Semester B.E. Degree Examination, June 2012
Engineering Mathematics – III

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions choosing atleast two from each part.***

PART – A

1 a. Obtain the Fourier series for the function

$$f(x)=\begin{cases}1+\frac{2x}{\pi}, & -\pi\le x\le 0\\ 1-\frac{2x}{\pi}, & 0\le x\le \pi\end{cases}$$ and deduce $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\ldots\ldots=\frac{\pi^2}{8}$. **(07 Marks)**

b. Find the half range cosine series for the function $f(x) = (x-1)^2$ in $0 < x < 1$ **(06 Marks)**

c. Obtain the constant term and the coefficient of the first sine and cosine terms in the Fourier expansion of y as given below. **(07 Marks)**

x	0	1	2	3	4	5
y	9	18	24	28	26	20

2 a. Express the function

$$f(x)=\begin{cases}1, & |x|\le 1\\ 0, & |x|>1\end{cases}$$ as a Fourier integral and hence evaluate $\int_0^\infty \frac{\sin x}{x}\,dx$. **(07 Marks)**

b. Find the sine and cosine transform of $f(x) = e^{-ax}$, $a > 0$ **(06 Marks)**

c. Find the inverse Fourier sine transform of $\frac{e^{-as}}{s}$. **(07 Marks)**

3 a. A tightly stretched string with fixed end points x = 0 and x = l is initially at rest in its equilibrium position. If it is vibrating giving to each of its points a velocity $\lambda x(l - x)$, find the displacement of the string at any distance x from one end and at any time t. **(07 Marks)**

b. Find the temperature in a thin metal bar of length 1 where both the ends ate insulated and the initial temperature in bar is $\sin \pi x$. **(07 Marks)**

c. Find the solution of Laplace equation, $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$, by the method of separation of variables. **(06 Marks)**

4 a. Fit a parabola $y = a + bx + cx^2$ to the following data: **(07 Marks)**

x	-3	-2	-1	0	1	2	3
y	4.63	2.11	0.67	0.09	0.63	2.15	4.58

b. A fertilizer company produces two products Naphtha and Urea. The company gets a profit of Rs.50 per unit product of naphtha and Rs.60 per unit product of urea. The time requirements for each product and total time available in each plant are as follows:

Plant	Hours required		Available hours
	Naphtha	Urea	
A	2	3	1500
B	3	2	1500

The demand for product is limited to 400 units. Formulate the LPP and solve it graphically. **(06 Marks)**

c. Solve the following using Simplex method:
Maximize $Z = x_1 + 4x_2$
Subject to constraints $-x_1 + 2x_2 \le 6$; $5x_1 + 4x_2 \le 40$; $x_j \ge 0$. **(07 Marks)**

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06CS/IS72

Seventh Semester B.E. Degree Examination, June/July 2011
Software Architecture

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from Part – A and Part - B.***

PART - A

1 a. With the help of a neat block diagram of ABC (Architecture Business Cycle), explain in detail the different activities which are involved in creating a software architecture. **(10 Marks)**

b. Enumerate and explain in detail the different groups software architecture structures are categorized into, with the help of appropriate pictorial descriptions. **(10 Marks)**

2 a. Discuss the importance and advantages of the following architectural styles with reference to an appropriate application area. **(08 Marks)**

b. List out the design considerations for mobile robotics case study. With the help of the design considerations, evaluate the pros and cons of the layered architecture and implicit invocation architecture for mobile robots. **(12 Marks)**

3 a. With the help of appropriate diagrams, explain the availability scenario and testability scenario in detail. **(12 Marks)**

b. Briefly discuss the various types of dependencies that one module can have on another which forms the basis for prevention of ripple effect. **(08 Marks)**

4 a. Discuss the 3 – part schema which underlies the layers Architectural patterns, with reference to networking protocols. **(14 Marks)**

b. Briefly explain the benefits offered by the pipes and filters pattern. **(06 Marks)**

PART - B

5 a. Give detailed explanation on the different steps involved in the implementation of the broken pattern. **(15 Marks)**

b. Propose the description of a scenario that depicts the dynamic behavoiur of MVC in detail. Support the description with appropriate pictorial representation. **(05 Marks)**

6 a. Discuss on the benefits and liabilities offered by Microkernel pattern. **(10 Marks)**

b. Give detailed explanation on the different known applications offered by the reflection pattern. **(10 Marks)**

7 a. Enumerate with explanation the different steps, which constitute the implementation of the whole part structure for a CAD system for 2D modeling. **(14 Marks)**

b. Briefly comment on the different steps carried out to realize the implementation of the proxy pattern. **(06 Marks)**

8 a. Briefly explain the different steps performed while designing an architecture using the ADD method. **(10 Marks)**

b. Write short notes on : i) Forming team structures ii) Documenting across views iii) Documenting interfaces. **(10 Marks)**

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PART – B

5 a. Use Regula-falsi method to find a root of the equation $2x - \log_{10}x = 7$ which lies between 3.5 and 4. **(06 Marks)**

b. Solve by relaxation method.

$10x - 2y - 2z = 6$; $-x + 10y - 2z = 7$; $-x - y + 10z = 8$ **(07 Marks)**

c. Use the power method to find the dominant eigenvalue and the corresponding eigenvector of the matrix $A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$ with the initial eigenvector as $[1\ 1\ 1]^T$. **(07 Marks)**

6 a. The following data is on melting point of an alloy of lead and zinc where t is the temperature in Celsius and P is the percentage of lead in the alloy, tabulated for P = 40(10)90 (i.e., P from 40 to 90 at intervals of 10). Find the melting point of the alloy containing 86% of lead.

P	40	50	60	70	80	90
t	180	204	226	250	276	304

(07 Marks)

b. Using Lagrange's formula, find the interpolation polynomial that approximates to the functions described by the following table:

x	0	1	2	5
f(x)	2	3	12	147

and hence find f(3). **(07 Marks)**

c. Evaluate $\int_0^5 \frac{dx}{4x+5}$, by using Simpson's $\frac{1}{3}^{rd}$ rule, taking 10 equal parts. Hence find log 5. **(06 Marks)**

7 a. Solve the partial differential equation

$$\frac{\partial^2 U}{\partial x^2} + \frac{\partial^2 U}{\partial y^2} = -10\left(x^2 + y^2 + 10\right)$$

over the square with side x = 0, y = 0, x = 3, y = 3 with u_0 on the boundary and mesh length h = 1. **(07 Marks)**

b. Solve the heat equation $\frac{\partial U}{\partial t} = \frac{\partial^2 U}{\partial x^2}$, subject to the conditions

$U(0, t) = u(1, t) = 0$ and $u(x,0) = \begin{cases} 2x & \text{for } 0 \le x \le 1/2 \\ 2(1-x) & \text{for } 1/2 \le x \le 1 \end{cases}$

Taking h = 1/4 and according to Bender Schmidt equation. **(06 Marks)**

c. Evaluate the pivotal values of the equation $u_{tt} = 16\, u_{xx}$ taking h = 1 upto t = 1.25. The boundary conditions are u(0, t) = u(5, t) = 0, $u_t(x, 0) = 0$ and $u(x, 0) = x^2(5 - x)$. **(07 Marks)**

8 a. If $U(z) = \frac{2z^2 + 5z + 14}{(z-1)^4}$, evaluate u_2 and u_3. **(06 Marks)**

b. Find the Z-transform of i) sin(3n + 5) ii) $\frac{1}{(n+1)!}$. **(07 Marks)**

c. Solve the $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$ with $y_0 = y_1 = 0$ using Z-transforms. **(07 Marks)**

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06CS/IS72

Seventh Semester B.E. Degree Examination, June/July 2011
Software Architecture

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from Part – A and Part - B.***

PART - A

1 a. With the help of a neat block diagram of ABC (Architecture Business Cycle), explain in detail the different activities which are involved in creating a software architecture. **(10 Marks)**

b. Enumerate and explain in detail the different groups software architecture structures are categorized into, with the help of appropriate pictorial descriptions. **(10 Marks)**

2 a. Discuss the importance and advantages of the following architectural styles with reference to an appropriate application area. **(08 Marks)**

b. List out the design considerations for mobile robotics case study. With the help of the design considerations, evaluate the pros and cons of the layered architecture and implicit invocation architecture for mobile robots. **(12 Marks)**

3 a. With the help of appropriate diagrams, explain the availability scenario and testability scenario in detail. **(12 Marks)**

b. Briefly discuss the various types of dependencies that one module can have on another which forms the basis for prevention of ripple effect. **(08 Marks)**

4 a. Discuss the 3 – part schema which underlies the layers Architectural patterns, with reference to networking protocols. **(14 Marks)**

b. Briefly explain the benefits offered by the pipes and filters pattern. **(06 Marks)**

PART - B

5 a. Give detailed explanation on the different steps involved in the implementation of the broken pattern. **(15 Marks)**

b. Propose the description of a scenario that depicts the dynamic behavoiur of MVC in detail. Support the description with appropriate pictorial representation. **(05 Marks)**

6 a. Discuss on the benefits and liabilities offered by Microkernel pattern. **(10 Marks)**

b. Give detailed explanation on the different known applications offered by the reflection pattern. **(10 Marks)**

7 a. Enumerate with explanation the different steps, which constitute the implementation of the whole part structure for a CAD system for 2D modeling. **(14 Marks)**

b. Briefly comment on the different steps carried out to realize the implementation of the proxy pattern. **(06 Marks)**

8 a. Briefly explain the different steps performed while designing an architecture using the ADD method. **(10 Marks)**

b. Write short notes on : i) Forming team structures ii) Documenting across views iii) Documenting interfaces. **(10 Marks)**

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10CV32

Third Semester B.E. Degree Examination, June 2012
Building Materials and Construction Technology

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. What are the different types of foundations? Under what circumstances they are adopted? **(06 Marks)**

b. List the different methods of site exploration and explain any one of them. **(06 Marks)**

c. Define safe bearing capacity of soil. Explain in detail, procedure for proportioning a rectangular footing for two columns carrying unequal loads. **(08 Marks)**

2 a. With reference to masonry construction, briefly explain the following terms:
i) Header and stretcher.
ii) Bond and course.
iii) King closer, queen closer. **(06 Marks)**

b. Write note on Flemish bond in brick masonry. **(07 Marks)**

c. State advantages and disadvantages of stone masonry construction over brick masonry construction. **(07 Marks)**

3 a. Explain with neat sketches functions of lintel, chezza and canopy in buildings. **(08 Marks)**

b. How are arches classified? How do you assess the stability of an arch? **(07 Marks)**

c. Mention the qualities of good bricks. **(05 Marks)**

4 a. Explain briefly different types of roof covering materials used in our country. **(06 Marks)**

b. What are the factors that govern the selection of flooring materials? List the different types of flooring. **(07 Marks)**

c. Draw the neat sketch of a steel roof truss (half portion) indicating bearing plate, purlins and roof coverings. Name all the parts. **(07 Marks)**

PART – B

5 a. Explain briefly the following with neat sketches:
i) Fully paneled door (Double leaf) ii) Rolling shutters. **(07 Marks)**

b. List all the fixtures and fastenings for doors and windows. **(05 Marks)**

c. List different types of windows used in buildings and explain any two of them. **(08 Marks)**

6 a. List the different types of staircase and explain under what circumstances they are used. **(05 Marks)**

b. Design an open newel staircase for an office building in a room of inner dimension $3.25m \times 3.25m$. Width of stair = 1.00 m. Floor to floor height = 3.60 m. Stair has to be provided along all walls and all four flights carry equal number of steps. Draw the plan and sectional elevation of any one flight. **(10 Marks)**

c. Briefly explain the constituents of paints. **(05 Marks)**

7 a. Mention the type of paints to be used and procedure of applying them on the following:
i) Inner walls of residential buildings. ii) Outer walls of buildings.
iii) Doors and windows. **(06 Marks)**

b. Explain different types of plaster finishes. **(07 Marks)**

c. Mention the ingredients of varnish and type of varnish depending upon solvent used. **(07 Marks)**

8 a. Define underpinning and mention some of the situation, which demand under pinning. **(06 Marks)**

b. What is damp proof course? Explain its necessity in building. **(07 Marks)**

c. Sketch the section across a beam, the formwork required for beam and slab floor giving details of its components. **(07 Marks)**

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

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10CV/EV34

Third Semester B.E. Degree Examination, June 2012
Surveying – I

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer FIVE full questions, selecting at least TWO questions from each part.***
2. Missing data may be suitably assumed.

PART – A

1 a. Explain the basic principles of surveying. **(06 Marks)**

b. What do you understand by ranging a line? Explain how you will range a line between two points which are not visible to each other due to a small hillock in between. **(08 Marks)**

c. The distance between two points measured along a slope is 800 m. Find the distance between the points if,
i) The difference in level between the points is 60 m.
ii) The angle of slope between the points is 10°. **(06 Marks)**

2 a. With a neat sketch, explain the construction and working of an optical square. **(06 Marks)**

b. A 30 m chain was found to be 12 cms too long after chaining a distance of 1750 m. It was found to be 23 cms too long at the end of day's work after chaining a total distance of 3600 m. Find the true distance if the chain was correct, before the commencement of the work. **(06 Marks)**

c. A tape 100 m long of standard length at 29°C was used to measure a line, the mean temperature during measurement being 14.4°C. The measured length was 636.94 m, the following being the slopes.

2° 20′ for 100 m	5° 0′ for 60 m
1° 0′ for 100 m	3° 40′ for 100 m
7° 20′ for 40 m	1° 40′ for 100 m
1° 20′ for 100 m	1° 40′ for 36.94 m

What was the true length of the line? Assume the coefficient of expansion of the tape was 0.00001116/1°C. The tape was used on the flat to measure the line. **(08 Marks)**

3 a. Define baseline, checkline, tieline and random line. **(06 Marks)**

b. What are the sources of error in chaining? How to avoid them? **(06 Marks)**

c. In passing an obstacle in the form of a pond, stations A and D on the main line, were taken on the opposite sides of a pond. On the left of AD, a line AB - 200 m long was laid down and a second line AC - 250 m long was ranged on the right at AD, the points B, D and C being in the same straight line. BD and DC were then chained and found to be 125 m and 150 m respectively. Find the length of AD. **(08 Marks)**

4 a. Distinguish between:
i) Magnetic bearing and true bearing
ii) Whole circle bearing and reduced bearing
iii) Dip and Declination. **(06 Marks)**

b. Compute the bearings for setting out regular pentagon, if the bearing of the line AB of pentagon ABCDE is N 30° E. **(06 Marks)**

c. The fore bearings of the sides of a closed traverse are as follows:

Side	AB	BC	CD	DE	EA
FB	60° 30′	122° 0′	46° 0′	205° 30′	300° 0′

Sketch the traverse, compute the interior angles and apply the check. **(08 Marks)**

PART – B

5 a. What is local attraction? How is it detected with the data of compass survey? **(04 Marks)**

b. The following bearings were observed while traversing with a compass.

Line	FB	BB
AB	150° 0′	329° 45′
BC	77° 30′	256° 0′
CD	41° 30′	222° 45′
DE	314° 15′	134° 45′
EA	220° 15′	40° 15′

* FB – Fore bearing
BB – Back bearing

At what stations do you suspect local attraction? Determine the correct bearings. Also determine the true bearings if declination is 2° 30′ E. **(08 Marks)**

c. In the following traverse ABCDEA, the length and bearing of EA is omitted. Calculate the length and bearing of line EA. **(08 Marks)**

Line	Length (m)	FB
AB	204.0	87° 30′
BC	226.0	20° 20′
CD	187.0	280° 0′
DE	192.0	210° 3′
EA	?	?

* FB – Fore bearing

6 a. Define the following terms:
i) Benchmark ii) Back sight iii) Foresight iv) Reduced level. **(06 Marks)**

b. Explain the temporary adjustments of a dumpy level. **(06 Marks)**

c. What is meant by sensitiveness of bubble tube? Describe how you would determine in the field the sensitiveness of a level tube attached to a dumpy level. **(08 Marks)**

7 a. List the methods of plane tabling. Explain the radiation method. **(06 Marks)**

b. What is orientation? Explain the orientation of plane table by back sighting. **(06 Marks)**

c. What is three point problem in plane table survey? Explain Bessel's graphical solution for the same. **(08 Marks)**

8 a. Explain rise and fall method of entering the levelling data, with an example. **(06 Marks)**

b. What is fly back levelling? Why is it performed? **(04 Marks)**

c. The following staff readings were observed successfully with a level, the instrument was shifted after 2nd, 5th and 8th reading.
0.675, 1.230, 0.750, 2.565, 2.225, 1.935, 1.835, 3.220 & 2.875.
The first reading was taken on a benchmark of elevation 100.00 m. Tabulate the readings in a level book format and find the elevation of all the points by height of instrument method and check the entry with suitable arithmetic check. **(10 Marks)**

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10CV35

Third Semester B.E. Degree Examination, June 2012
Fluid Mechanics

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Define the following fluid properties. Give their dimensions:
   i) Specific weight
   ii) Relative density
   iii) Specific volume
   iv) Dynamic viscosity
   v) Surface tension. **(10 Marks)**

b. A 400 mm diameter shaft is rotating at 200 rpm in a bearing of length 100 mm. If the thickness of the oil film is 1.4 mm and the dynamic viscosity of the oil is 0.7 N-S/m^2. Determine.
   i) Torque required to over come friction in bearing.
   ii) Power utilized in overcoming viscous resistance. Assume a linear velocity profile. **(10 Marks)**

2 a. With the help of a neat sketch define the terms: Absolute, gauge and vacuum pressure. Bring out the relationship between absolute and gauge pressure. **(08 Marks)**

b. List out the characteristics of Manometric liquids. Give any two examples for manometric liquids. **(04 Marks)**

c. An inverted U-tube manometer is connected to two horizontal pipes A and B through which water is flowing. The vertical distance between the axes of these pipes is 30 cms. When an oil (S = 0.8) is used as a gauge fluid, the vertical height of the water columns in the two limbs of the inverted manometer (when measured from the respective centre lines of the pipes) are found to be same and equal to 35 cms. Determine the difference of pressure between the pipes. Pipe B is lying below the pipe A. **(08 Marks)**

3 a. Derive an expression for total pressure on one side of an inclined plane and show that the centre of pressure lies lower than its centroid. **(10 Marks)**

b. A rectangular gate 5m×3m is placed under water such that the 3m edges are parallel to the free surface. The top and bottom edges are 4.0 m and 8.0 m below the water surface respectively. Determine the total pressure and the position of the centre of pressure on the gate. **(10 Marks)**

4 a. What do you mean by equipotential line and line of constant stream function? Show that the stream lines and equipotential lines meet orthogonally. **(08 Marks)**

b. Write the differences between Lagrangian and Eulerian concepts. **(04 Marks)**

c. The velocity components in a fluid flow are given by u = 2xy; V = $a^2 + x^2 - y^2$.
   i) Show that the flow is possible
   ii) Obtain an expression for the stream function. **(08 Marks)**

PART – B

5 a. State the Bernoulli's theorem. Starting from Euler's equation of motion along a stream line, derive the Bernoulli's equation. List the assumptions and limitations. **(08 Marks)**

b. 250 liters/sec of water is flowing in a pipe having a diameter of 300 mm. If the pipe is bent by 135°, find the magnitude and direction of the force on the bend. The pressure of water flowing is 400 kN/m^2. Take specific weight of water as 9.81 kN/m^3. **(12 Marks)**

6 a. Derive the Darcy-Weisbach equation for head loss due to friction in pipe. **(08 Marks)**

b. Water is to be supplied to the inhabitants of a college campus, through a supply main. The following data is given:
Distance of the reservoir from the campus = 3000 m
Number of inhabitants = 4000
Consumption of water per day of each inhabitants = 180 liters.
Loss of head due to friction = 18 m
Coefficient of friction for the pipe, f = 0.007.
If one half of the daily supply is pumped in 8 hours, determine the size the supply main. **(06 Marks)**

c. A hydraulic pipe line 3 km long, 500 mm diameter is used to convey water with a velocity of 1.5 m/sec. Determine the pressure growth if the valve provided at the out flow end is closed in (i) 20 seconds (ii) 3.5 seconds . Consider pipe to be rigid and take bulk modules of water $K_{water} = 20\times10^8$ N/m^2. **(06 Marks)**

7 a. Briefly explain the following:
i) Point and Hook gauges
ii) Float gauge. **(06 Marks)**

b. With a neat sketch explain the working of a current meter. **(06 Marks)**

c. A pitot static tube is inserted in a 30 cm diameter pipe. The static pressure in the pipe is 12.5 cm of mercury (vacuum). The stagnation pressure at the centre of the pipe is 1.15 N/cm^2 (Gauge). Calculate the rate of flow of water through the pipe. The mean velocity of flow is 0.875 times the central velocity. Take C = 0.985. **(08 Marks)**

8 a. Distinguish between:
i) Venturimeter and orificemeter
ii) Rectangular with inlet and cipolletti notch. **(08 Marks)**

b. A horizontal venturimeter with inlet diameter of 25 cm and throat diameter of 15 cm is used to measure the flow of water. The pressure at the throat is 30 cm of mercury (vacuum) and that at the inlet is 200 kN/m^2(Gauge). Find the discharge of water through the meter. Take $C_d = 0.98$. **(06 Marks)**

c. A jet of water issuing from an orifice 25 mm diameter under a constant head of 1.5 m falls 0.915 m vertically before it strikes the ground at a distance of 2.288 m measured horizontally from the vena contracta. The discharge was found to be 102 ℓpm. Calculate the hydraulic coefficients of the orifice. **(06 Marks)**

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10CV36

Third Semester B.E. Degree Examination, June 2012
Applied Engineering Geology

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer FIVE full questions, selecting atleast TWO questions from each part.***
2. Draw neat sketches wherever necessary.

PART - A

1 a. What is geology? Explain the importance of geology in the field of civil engineering. **(08 Marks)**

b. What is seismology? Explain how seismic waves are useful in determining the structure and composition of the Earth. **(12 Marks)**

2 What is a mineral? Explain how the physical properties of minerals are useful in their identification in the field. **(20 Marks)**

3 a. What is metamorphism? What are the agents of metamorphism? Explain regional metamorphism, with rock examples. **(10 Marks)**

b. What are sedimentary rocks? Explain with sketches, plane of stratification, graded bedding and cross bedding structures. **(10 Marks)**

4 Explain the following :
a. Epigene and Hypogene geological agents.
b. Preventive measures of land slides.
c. 'Soil Profile', with a neat sketch.
d. Importance of weathering of rocks. **(20 Marks)**

PART - B

5 Explain the following, with neat sketches :
a. Anticlinorium and Synclinorium.
b. Horst and Graben structure.
c. Recognisation of Uncomformities in the field.
d. Compass clinometer and its uses. **(20 Marks)**

6 What is a dam? With what purposes it will be constructed? Explain in detail the geological investigations of a good dam site. **(20 Marks)**

7 Explain the following :
a. Vertical distribution of ground water. **(10 Marks)**
b. Porosity and permeability of different rocks. **(05 Marks)**
c. Unconfined and confined aquifers. **(05 Marks)**

8 Discuss the following :
a. What is remote sensing? Write its applications in the field of civil engineering. **(05 Marks)**
b. What is GPS? Write its different uses. **(05 Marks)**
c. Discuss the impact of mining on geoenvironment. **(10 Marks)**

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MATDIP301

Third Semester B.E. Degree Examination, June 2012

Advanced Mathematics – I

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Express $z = \frac{2-\sqrt{3}i}{1+i}$ in the form a + ib. **(06 Marks)**

b. Find modulus and amplitude of $z = \frac{3+i}{2+i}$. **(07 Marks)**

c. Find all the values of $z = \left(\frac{1}{2} + i\frac{\sqrt{3}}{2}\right)^{3/4}$. **(07 Marks)**

2 a. Find the n^{th} derivative of $y = e^{ax}\cos(bx + c)$. **(06 Marks)**

b. If $y = \sin(m\sin^{-1}x)$ prove that $(1-x^2)y_{n+2} - (2n+1)x\,y_{n+1} + (m^2 - n^2)y_n = 0$. **(07 Marks)**

c. Expand $y = \log(1+x)$ in Maclaurins series upto 5th term. **(07 Marks)**

3 a. If $u = \frac{x^2y^2}{x+y}$, find the value of $x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2}$. **(06 Marks)**

b. If $u = 3x^2 + y^2$ and $x^2 - y^2 = 1$, find $\frac{du}{dx}$. **(07 Marks)**

c. If $x = r\cos\phi$, $y = r\sin\phi$, $z = z$, find $\frac{\partial(x, y, z)}{\partial(r, \phi, z)}$. **(07 Marks)**

4 a. Obtain the reduction formula for $\int_0^{\pi/2} \sin^n x\,dx$ and hence obtain $\int_0^{\pi/2} \sin^4 x\,dx$. **(06 Marks)**

b. Evaluate $\int_0^1 x^2(1-x^2)^{7/2}dx$. **(07 Marks)**

c. Evaluate $\int_0^1\int_0^3 x^3y^3\,dx\,dy$. **(07 Marks)**

5 a. Evaluate $\int_0^1\int_0^2\int_0^3 (x+y+z)dz\,dy\,dx$. **(06 Marks)**

b. Evaluate $\int_0^\infty x^2e^{-4x}\,dx$ using gamma function. **(07 Marks)**

c. Find $\beta\left(\frac{5}{2}, \frac{3}{2}\right)$ in terms of gamma function.. **(07 Marks)**

6 a. Solve the equation $\sqrt{1-y^2}\,dx + \sqrt{1-x^2}\,dy = 0$. **(06 Marks)**

b. Solve $\frac{dy}{dx} = \frac{x-y}{x+y}$. **(07 Marks)**

c. Solve $\frac{dy}{dx} = (x+y)^2$. **(07 Marks)**

7 a. Solve $\frac{dy}{dx} = \frac{\sin 2x - \tan y}{x \sec^2 y}$. **(06 Marks)**

b. Solve $\frac{d^2y}{dx^2} + x^2 y = x^2$. **(07 Marks)**

c. Solve $\frac{dy}{dx} + \sin xy = \sin x \cos x$. **(07 Marks)**

8 a. Solve $(D^2 + a^2)y = x^2$. **(06 Marks)**

b. Solve $(D^3 + D^2 - D - 1)y = e^{2x}$. **(07 Marks)**

c. Solve $(D^4 - 1)y = \sin x + 2$. **(07 Marks)**

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