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10MAT31

Third Semester B.E. Degree Examination, June/July 2017
Engineering Mathematics - III

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Obtain Fourier series for the function f(x) given by

$$f(x) = \begin{cases} 1+\frac{2x}{\pi}, & -\pi \le x \le 0 \\ 1-\frac{2x}{\pi}, & 0 \le x \le \pi \end{cases}.$$

Hence deduce that $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\ldots\ldots=\frac{\pi^2}{8}$. **(06 Marks)**

b. Obtain Fourier half range Cosine series for the function $f(x) = x \sin x$ in $(0, \pi)$. Hence show that $\frac{1}{1.3}-\frac{1}{3.5}+\frac{1}{5.7}-\ldots\ldots\infty=\frac{\pi-2}{4}$. **(07 Marks)**

c. Obtain the constant term and the co-efficient of the first sine and cosine terms in the Fourier series of f(x) as given in the following table. **(07 Marks)**

x	0	1	2	3	4	5
f(x)	9	18	24	28	26	20

2 a. Find the Fourier transform of $e^{-a^2x^2}$, $a < 0$. Hence deduce that $e^{-x^2/2}$ is self reciprocal in respect of Fourier transform. **(06 Marks)**

b. Find the Fourier sine transform of $e^{-|x|}$. Hence show that

$$\int_0^\infty \frac{x \sin mx}{1+x^2}dx = \frac{\pi e^{-m}}{2},\ m > 0.$$ **(07 Marks)**

c. Find the Fourier Cosine transform of $f(x) = \frac{1}{1+x^2}$. **(07 Marks)**

3 a. Obtain various possible solutions of the one dimensional Heat equation $\frac{\partial u}{\partial t} = c^2\frac{\partial^2 u}{\partial x^2}$ by the method of separation of variables. **(06 Marks)**

b. Obtain the D'Alembert's solution of the wave equation $\frac{\partial^2 u}{\partial t^2} = c^2\frac{\partial^2 u}{\partial x^2}$. Subject to the conditions $u(x, 0) = f(x)$ and $\frac{\partial u}{\partial t}(x,0) = 0$. **(07 Marks)**

c. Obtain various possible solutions of the two dimensional Laplace equation $u_{xx} + u_{yy} = 0$ by the method of separation of variables. **(07 Marks)**

4 a. Fit a parabola $y = ax^2 + bx + c$ to the following data : **(06 Marks)**

x	0	1	2	3	4	5
y	1	3	7	13	21	31

b. A dealer wishes to purchase a number of fans and sewing machines. He has only Rs 5,760 to invest and has space for at most 20 items. A fan and sewing machine cost Rs 360 and Rs 240 respectively. He can sell a fan at a profit of Rs 22 and sewing machine at a profit of Rs 18. Assuming that he can sell whatever he buys, how should he invest his money in order to maximize his profit? Translate the problem into LPP and solve it graphically. **(07 Marks)**

c. Use Simplex method to solve the following LPP

Minimize $Z = x_1 - 3x_2 + 3x_3$

Subject to $3x_1 - x_2 + 2x_3 \leq 7$

$2x_1 + 4x_2 \geq -12$

$-4x_1 + 3x_2 + 8x_3 \leq 10$

$x_1, x_2, x_3 \geq 0.$ **(07 Marks)**

PART – B

5 a. Using Newton – Raphson method, find the value of $\sqrt[3]{18}$ correct to 2 decimals, assuming 2.5 as the initial approximation. **(06 Marks)**

b. Apply Gauss – Seidal iteration method to solve the following equations :

$3x + 20y - z = -18$; $2x - 3y + 20z = 25$; $20x + y - 2z = 17$. **(07 Marks)**

c. Find the largest Eigen - value and the corresponding Eigen - vector for the matrix $\begin{bmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{bmatrix}$ with initial approximation $[1\ 1\ 0]^T$. **(07 Marks)**

6 a. Determine f(x) as a polynomial in x for the following data by using Newton's divided difference formula. **(06 Marks)**

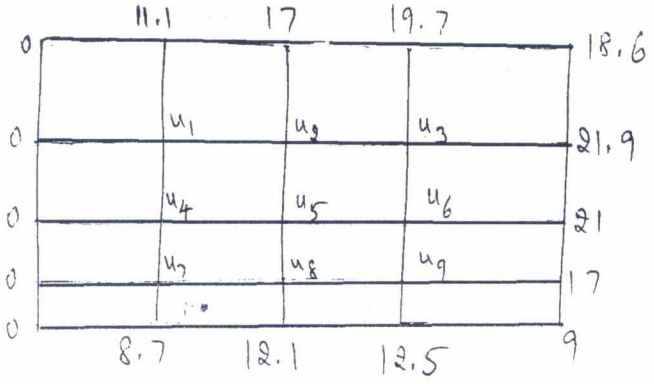
x	-4	-1	0	2	5
f(x)	1245	33	5	9	1335

b. From the data given in the following table, find the number of students who obtained i) less than 45 marks and ii) between 40 and 45 marks. **(07 Marks)**

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

c. Evaluate $\int_4^{5.2} \log_e x \, dx$ by Weddle's rule. **(07 Marks)**

7 a. Solve the Laplace equation $u_{xx} + u_{yy} = 0$, given that the boundary values for the following square mash. **(06 Marks)**



b. Evaluate the pivotal values of the equation $u_{tt} = 16u_{xx}$, 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)**

c. Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ in $0 < x < 5$, $t \geq 0$, given that $u(x, 0) = 20$, $u(0, t) = 0$, $u(5, t) = 100$. Compute u for the time – step with h = 1 by Crank – Nicholson method. **(07 Marks)**

8 a. Find the Z – transform of the following :
i) $(n + 1)^2$ ii) $\sin(3n + 5)$ iii) n_{c_p} $(0 \leq p \leq n)$. **(06 Marks)**

b. If $u(z) = \frac{2z^2 + 3z + 12}{(z-1)^4}$. Find u_0, u_1, u_2, u_3. **(07 Marks)**

c. Solve $y_{n+2} + 4y_{n+1} + 3y_n = 3^n$ with $y_0 = 0$, $y_1 = 1$, using Z - transforms. **(07 Marks)**

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10CV32

Third Semester B.E. Degree Examination, June/July 2017

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 is soil exploration? Why it is necessary? **(04 Marks)**

b. Name various types of foundations used in practice. Discuss construction of spread footing foundation. **(10 Marks)**

c. Explain pile foundations with neat sketches. **(06 Marks)**

2 a. What is significance of bonding in brickwork? Differentiate between English bond and double Flemish bond with sketches. **(10 Marks)**

b. Explain briefly with sketches types of stone masonry. **(10 Marks)**

3 a. Explain the functions of lintel and chezza and list different types of lintels. **(06 Marks)**

b. Differentiate between lintel and an arch. **(04 Marks)**

c. List different types of arches and with a neat sketch of a typical arch, explain its components. **(10 Marks)**

4 a. Sketch a king post truss naming its parts, explain the nature of force in each member. **(10 Marks)**

b. Write short notes on following types of flooring explaining their advantages:
i) Cement concrete flooring ii) Marble flooring
iii) Granite flooring iv) Wood flooring **(10 Marks)**

PART – B

5 a. List the factors in fixing the size and location of doors and windows. **(06 Marks)**

b. Draw a sketch of a paneled door and name its parts with standard dimensions. **(06 Marks)**

c. Explain with sketches: i) Bay window, ii) Cleary storey window. **(08 Marks)**

6 a. Briefly explain with neat sketches different types of staircases used in practice. **(10 Marks)**

b. Design a dog legged stair case for a residential building for staircase room size 2.5m × 4.8m, considering the height of the slab from finished floor level as 3.15 m. Draw neat sketches. **(10 Marks)**

7 a. Discuss various types of painting with sketches. **(08 Marks)**

b. Draw neat sketches of different types of plaster finishes. **(06 Marks)**

c. Describe the method of removing oil paint from wood work and repainting it. **(06 Marks)**

8 Write short notes on:
a. Form work and scaffolding
b. Damp proofing of buildings
c. Types of glasses
d. Plastics in buildings **(20 Marks)**

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10CV/EV/CT33

Third Semester B.E. Degree Examination, June/July 2017
Strength of Materials

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Draw the stress-strain diagram for ductile specimen under axial tensile force. Mark the salient points on the diagram and name them. **(06 Marks)**

b. Find the maximum and minimum stresses produced in the stepped bar shown in Fig.Q1(b) due to an axially applied compressive load of 12 kN.

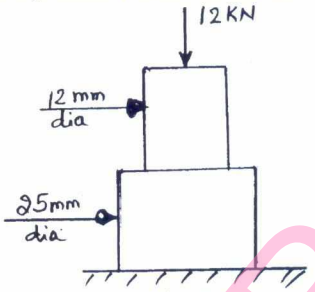

Fig.Q1(b) **(04 Marks)**

c. A 2 mt long steel bar has a uniform diameter of 40 mm for a length of 1 mt from one end. For the next 0.5 mt length the diameter decreases uniformly to "d". For the remaining 0.5 mt length it has a uniform diameter of "d" mm. When a load of 150 kN is applied, the observed extension is 2.40 mm. Determine the diameter "d". Take modulus of elasticity for steel as 200 GPa. [Refer Fig.Q1(c)]

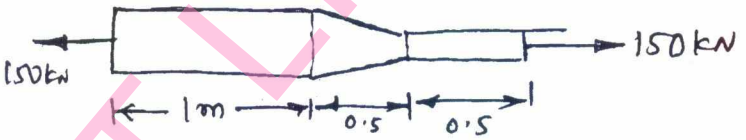

Fig.Q1(c) **(10 Marks)**

2 a. A steel bar is placed between two copper bars each having the same area and length as the steel bar at 15°C. At this stage they are rigidly connected together at both the ends. When the temperature is raised to 315°C, the length of the bars increases by 1.50 mm. Determine the original length and the final stresses in the bars. Take $E_{st} = 2.1 \times 10^5$ N/mm^2, $E_{cu} = 1 \times 10^5$ N/mm^2, $\alpha_{st} = 12 \times 10^{-6}$/°C and $\alpha_{cu} = 17 \times 10^{-6}$/°C. **(10 Marks)**

b. A concrete column 300 mm × 300 mm in cross section has 8 bars of 20 mm diameter. The column is subjected to an axial compressive load of 500 kN. Determine the stresses in each material. Also calculate the load shared by the two materials. Take the modular ratio between steel and concrete as 20. **(10 Marks)**

3 a. At a certain point in a strained material the intensities of normal stresses on two planes at right angles to each other are 20 N/mm^2 and 10 N/mm^2 both tensile. They are accompanied by shear stress of 10 N/mm^2. Find the principal planes and principal stresses. Also find the maximum shear stress. **(10 Marks)**

b. The principal stresses at a point in a bar are 200 N/mm^2 (tensile) and 100 N/mm^2 (compressive). Determine the resultant stress in magnitude and direction on a plane inclined at 60° to the axis of the major principal stress. Also determine the maximum intensity of shear stress in the material at the point. **(10 Marks)**

4 a. Establish a relationship between bending moment, shear force and loading for a laterally loaded member. **(06 Marks)**

b. Draw shear force and bending moment diagram for the beam loaded as shown in Fig.Q4(b). Also locate the points of contra flexures.

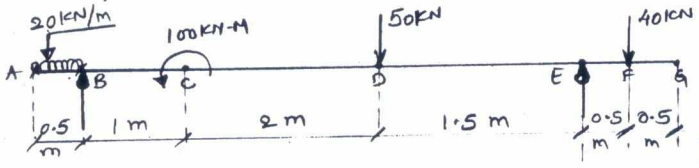

Fig.Q4(b) **(14 Marks)**

PART – B

5 a. For the section shown in Fig.Q5(a), find the (i) Position of the neutral axis, (ii) Section modulus.

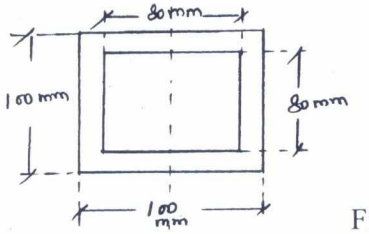

Fig.Q5(a) **(06 Marks)**

b. A steel beam of hollow section of outer side 100 mm and inner side 80 mm is used on a span of 4 mt. Find the uniformly distributed load the beam can carry if the bending stress is not to exceed 120 N/mm^2. The beam is taken as simply supported. [Refer Fig.Q5(a)] **(06 Marks)**

c. The moment of inertia of a beam section 500 mm deep is 69.49×10^7 mm^4. Find the longest span over which a beam of this section, when simply supported, could carry a uniformly distributed load of 50 kN per meter run. The flange stress in the material is not to exceed 110 N/mm^2. **(08 Marks)**

6 a. Establish the relationship between slope, deflection and radius of curvature for a beam. **(06 Marks)**

b. A horizontal girder of steel having uniform section is 14 metres long and is simply supported at its ends. It carries concentrated loads of 120 kN and 80 kN at two points 3m and 4.5m from the two ends respectively. I for the section of the girder is 16×10^8 mm^4 and E = 210×10^3 N/mm^2. Calculate the deflections of the girder at points under the two loads. Find also the maximum deflection. **(14 Marks)**

7 a. State the assumptions in the theory of pure torsion. **(05 Marks)**

b. Define: i) Polar section modulus, ii) Torsional rigidity. **(05 Marks)**

c. The external and internal diameters of a hollow shaft are 160 mm and 120 mm respectively. If the shaft is subjected to a torque of 20 kN-m, find:
   i) Shear stress at the outer surface of the shaft
   ii) Shear stress at the inner surface of the shaft
   iii) Angle of hoist per metre length of the shaft.
   Take C = 7.5×10^4 N/mm^2. **(10 Marks)**

8 a. Derive an expression for the Euler's crippling load for slender column having both ends of the column hinged. **(06 Marks)**

b. Find Euler's critical load for a hollow cylindrical cast iron column 200 mm external diameter and 25 mm thick, if it is 6 meters long and hinged at both ends. Take E = 8×10^4 N/mm^2. Compare Euler's critical load with the Rankine's critical load taking f_c = 550 N/mm^2 and a = 1/1600. For what length of the column would the critical loads by Euler's and Rankine's formula will be equal? **(14 Marks)**

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10CV/CT/EV34

Third Semester B.E. Degree Examination, June/July 2017
Surveying – I

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. How do you classify survey? Explain in detail. **(08 Marks)**

b. Differentiate between :
(i) Precision and Accuracy
(ii) Plan and map **(06 Marks)**

c. The distance between two points measured along a slope is 265 m. Find the horizontal distance between them if,
(i) the angle of slope is 4° 42′
(ii) the difference in level is 27m **(06 Marks)**

2 a. Explain different types of chains and tapes. **(08 Marks)**

b. A 30 m chain was found to be 15 cm too long after chaining 1524 m. The same chain was found to 30.5 cm too long after chaining a total distance of 3048 m. Find the true distance chained assuming the chain was correct at the commencement of chaining. **(12 Marks)**

3 a. What is meant by chain surveying? List the chain surveying equipments. **(05 Marks)**

b. What are offsets? Explain the types of offsets. **(05 Marks)**

c. In chaining past a pond, stations A and D on the main line were taken on the opposite sides of the pond. Two lines DB and DC measuring 250 m and 300 m were laid down to the left and right of the line AD. The points A, B and C are on the same line. AB and AC are measured and are found to be equal to 120 m and 130 m. Find the length of line AD. **(10 Marks)**

4 a. Differentiate between the following :
(i) Open traverse and closed traverse (ii) W.C.B and Q.B
(iii) Magnetic Dip and Declination (iv) Isogonic line and agonic line
(v) Magnetic bearing and true bearing **(15 Marks)**

b. During a closed traverse survey ABCDA, the following interior angles were measured with a compass:
$\angle A = 75°$, $\angle B = 120°$, $\angle C = 80°$ and $\angle D = 85°$. If the bearing of the line AB is 99°, what are the bearings of the remaining lines of the traverse? **(05 Marks)**

PART – B

5 a. List the errors in compass surveying and explain. **(08 Marks)**

b. With the help of neat sketches explain Bowditch graphical method of adjustment of closing error in a closed traverse. **(08 Marks)**

c. The magnetic bearing of a line is 105° 30′. At that time of observation if magnetic declination is 6° 15′ E, find the true bearing of the line. Also draw the relevant sketch. **(04 Marks)**

6 a. Explain the following :
(i) Balancing of sights (ii) Profile leveling **(06 Marks)**

b. During fly leveling, the following readings were taken:
B.S : 0.620, 2.050, 1.420, 2.630, and 2.420
F.S : 2.440, 1.350, 0.530, 2.410
The first B.S was taken on a B.M of R.L 100.000 metres. From the last B.S it is required to set 4 pegs each at distance of 30 metres on a rising gradient 1 in 200. Enter these readings in a level book form and calculate the R.L of the top of each peg by "Rise and Fall" method. Also calculate the staff reading on each peg and apply the usual checks. **(14 Marks)**

7 a. Define the following :
(i) Contour (ii) Contour interval (ii) Horizontal equivalent. **(06 Marks)**

b. List the various important factors to be considered at the time of selecting the contour interval and explain. **(06 Marks)**

c. List the characteristics of contour with the help of neat sketches. **(08 Marks)**

8 a. What do you mean by plane tabling? List the plane table and its accessories. **(05 Marks)**

b. What do you mean by orientation of plane table? Explain orientation by back sighting method. **(06 Marks)**

c. Explain method of plane table traversing with the help of neat sketch. **(09 Marks)**

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10CV35

Third Semester B.E. Degree Examination, June/July 2017
Fluid Mechanics

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Even though the needle is heavier than water, it can float on it, if it is placed lengthwise on the water surface. Why? **(04 Marks)**

b. If the velocity distribution for laminar flow in a pipe is given by $\frac{U}{U_{max}} = \left[1 - \frac{r^2}{R^2}\right]$.

Determine the expression for shear stress τ. V = velocity at a distance r from the centre line U_{max} = Centre line velocity ; R = Radius of pipe. **(06 Marks)**

c. If the relative density of fluid is 1.59, calculate its Mass density, Specific weight and Specific volume. **(06 Marks)**

d. Determine the diameter of a droplet of water in mm. If the pressure inside is to be greater than outside pressure by 130N/mm^2. **(04 Marks)**

2 a. State Pascal's law. **(04 Marks)**

b. Determine the pressure at the bottom of sea 1.0km deep if density of sea water is 1030kg/m^3. **(06 Marks)**

c. What considerations govern the diameter of glass tube to be used in a manometer? **(04 Marks)**

d. What are the common liquids used in manometer? What conditions should it satisfy before you choose a manometric liquid? **(06 Marks)**

3 a. When will the centre of gravity and centre of pressure coincide in case of plane immersed surfaces? **(02 Marks)**

b. A circular plane surface 4m in diameter is immersed in water such that the top and bottom edges are 1.5 and 4m below the water surface. Find the total pressure and the position of centre of pressure with respect to the water surface. **(12 Marks)**

c. Derive the expression for the depth of centre of pressure for an inclined submerged plane lamina. **(06 Marks)**

4 a. Define the terms : Stream line, Streak line , Flow net and Stagnation point. **(04 Marks)**

b. Check whether the velocity components U = 3x ,V = 2z + 3x^2 and W = -3z + 2t, satisfy the continuity equation. **(04 Marks)**

c. Complete the following table : **(12 Marks)**

ψ	x	y	u	v
x + y	1.0	1.0	?	?
$2x^2 - y^2$	?	-2.0	?	4

PART – B

5 a. State the differential form of Energy equation. Integrate it. Name the resulting equation. **(06 Marks)**

b. List the assumptions made in the derivation of energy equation. **(02 Marks)**

c. A 50mm tube gradually expands to 100mm diameter tube in a length of 10 mts. If the tube makes an angle of 20^0 in upward direction with the horizontal, determine the pressure P_2 at the exit end, if the tube carries a discharge of 3.925 lts/sec and the inlet pressure P_1 is $60kN/m^2$. Assuming i) No energy loss and ii) A loss of 0.20m. **(12 Marks)**

6 a. Define the term 'Equivalent diameter' of pipe. Obtain the 'Equivalent diameter' for the system of pipes in series. **(06 Marks)**

b. A 300mm diameter pipe gradually tapers to 150mm diameter in a length of 10mts. If the discharge through pipe is $0.15m^3/sec$. Determine the loss of head due to friction, if $f = 0.01$. **(06 Marks)**

c. A discharge of 60.70 lits/sec of water flows through a bend in 100mm diameter pipe and gives 300mm of differential mercury head across the bend. Determine the discharge coefficient of the bend. **(08 Marks)**

7 a. Write short notes on : Weight gauge, Float gauge, Pitot tube and Current meter. **(08 Marks)**

b. A Pitot – Static tube placed in the centre of a 200mm pipe line has one orifice pointing upstream and the other perpendicular to it. If the pressure difference between the two orifices is 40mm of water when the discharge through the pipe is 1365 litres per minute. Calculate the coefficient of the pitot tube. Take the mean velocity in the pipe to be 0.83 of the central velocity. **(12 Marks)**

8 a. Derive the expression for discharge through a 'Venturimeter'. **(10 Marks)**

b. Find the discharge of water flowing over rectangular notch of 3m length when the constant head of water over a notch is 40cm. Take $C_d = 0.6$. **(10 Marks)**

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10CV/CT36

Third Semester B.E. Degree Examination, June/July 2017

Applied Engineering Geology

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain the role of geology in the field of civil engineering. **(06 Marks)**
b. Describe the internal structure and composition of the earth. **(06 Marks)**
c. Describe the hardness and cleavage with suitable mineral examples. **(08 Marks)**

2 a. What are igneous rocks? Explain, how are they classified based on the texture. **(10 Marks)**
b. Write a note on the agents of metamorphism. **(06 Marks)**
c. Write a note on mechanically formed group of sedimentary rocks. **(04 Marks)**

3 a. What is weathering of rocks? Describe the different types of weathering. **(12 Marks)**
b. Write a note on river meandering. **(04 Marks)**
c. Write a note on sand-dunes. **(04 Marks)**

4 a. Describe the tectonic and non-tectonic earthquakes and their causes. **(10 Marks)**
b. Discuss the various causes and remedial measures of landslides. **(10 Marks)**

PART – B

5 Write notes on the following:
a. Dip, strike and escarpment **(06 Marks)**
b. Joints and their types **(06 Marks)**
c. Ridge fault and trough fault **(04 Marks)**
d. Domes and basins **(04 Marks)**

6 a. Discuss the various geological investigations required for selecting a suitable site for the safety and stability of a Dam. **(14 Marks)**
b. Discuss the problems of tunneling through folded strata. **(06 Marks)**

7 Discuss the following:
a. Vertical distribution of groundwater in the earth crust **(06 Marks)**
b. Spacing of wells **(04 Marks)**
c. Porosity and permeability **(06 Marks)**
d. Groundwater recharge **(04 Marks)**

8 Write short notes on the following:
a. Impact of quarrying and mining on the environment **(04 Marks)**
b. GIS and its key component **(06 Marks)**
c. Fluoride and its impact on human health **(04 Marks)**
d. Remote sensing and its different stages in capturing surfacial data. **(06 Marks)**

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MATDIP301

Third Semester B.E Degree Examination, June/July 2017
Advanced Mathematics – I

Time: 3 hrs. Max. Marks:100

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

1 a. Express : $\frac{1}{(2+i)^2}-\frac{1}{(2-i)^2}$ in the form of a + i b. **(07 Marks)**

b. Find the modulus and amplitude of the complex number $1-\cos\alpha+i\sin\alpha$. **(06 Marks)**

c. Express the complex number $\sqrt{3}+i$ in the polar form. **(07 Marks)**

2 a. Find the n^{th} derivative of log (ax + b). **(07 Marks)**

b. Find the n^{th} derivative of $\frac{x}{(x-1)(2x+3)}$. **(06 Marks)**

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

3 a. Using Taylor's theorem, expand sin x in power of $(x - \pi/2)$. **(07 Marks)**

b. Obtain the Maclaurin's series expansion of the function $\sqrt{1+\sin 2x}$ up to the term containing x^4. **(06 Marks)**

c. State and prove Euler's theorem. **(07 Marks)**

4 a. Find the total derivative of $z = xy^2 + x^2y$ where x = at, y = 2at, and also verify the result by direct substitution. **(07 Marks)**

b. If $u = f(y-z, z-x, x-y)$ prove that : $\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}+\frac{\partial u}{\partial z}=0$. **(06 Marks)**

c. if $x = u(1 - v)$ and $y = uv$, find $J=\frac{\partial(x,y)}{\partial(u,v)}$ and $J'=\frac{\partial(u,v)}{\partial(x,y)}$ and also verify $J\cdot J' = 1$. **(07 Marks)**

5 a. Obtain the reduction formula for $\int \cos^n x\cdot dx$. **(07 Marks)**

b. Evaluate : $\int_0^2 \frac{x^4}{\sqrt{4-x^2}}\cdot dx$. **(06 Marks)**

c. Evaluate : $\int_1^2\int_1^3 xy^2\,dx\,dy$. **(07 Marks)**

6 a. Evaluate : $\int_0^1\int_0^{\sqrt{1-x^2}}\int_0^{\sqrt{1-x^2-y^2}} x\,y\,z\,dz\,dy\,dx$. **(07 Marks)**

b. Prove that $\Gamma\left(\frac{1}{2}\right)=\sqrt{\pi}$. **(06 Marks)**

c. Prove that $\beta(m,n)=\frac{\Gamma_m\Gamma_n}{\Gamma(m+n)}$. **(07 Marks)**

7 a. Solve : $\frac{dy}{dx} = e^{x-y} + x^2e^{-y}$. **(07 Marks)**

b. Solve $x^2y\,dx - (x^3 + y^3)\,dy = 0$. **(06 Marks)**

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

8 a. Solve : $\frac{d^2y}{dx^2} + \frac{4dy}{dx} + 4y = 0$. **(05 Marks)**

b. Solve $\frac{d^2y}{dx^2} - \frac{6dy}{dx} + 9y = 3e^{-4x}$. **(05 Marks)**

c. Solve : $y'' + 2y' + y = e^{-x} + \cos 2x$. **(05 Marks)**

d. Solve : $\frac{d^2y}{dx^2} - 4y = x\sin 2x$. **(05 Marks)**

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