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10MAT31

# Third Semester B.E. Degree Examination, Dec.2014/Jan.2015
## Engineering Mathematics – III

Time: 3 hrs. Max. Marks:100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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### PART – A

1 a. Expand $f(x)=\sqrt{1-\cos x}$, $0 < x < 2\pi$ in a Fourier series. Hence evaluate $\frac{1}{1.3}+\frac{1}{3.5}+\frac{1}{5.7}+\ldots$ **(07 Marks)**

b. Find the half-range sine series of $f(x) = e^x$ in (0, 1). **(06 Marks)**

c. In a machine the displacement y of a given point is given for a certain angle x as follows:

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 0 | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 | 330 |
| y | 7.9 | 8 | 7.2 | 5.6 | 3.6 | 1.7 | 0.5 | 0.2 | 0.9 | 2.5 | 4.7 | 6.8 |

Find the constant term and the first two harmonics in Fourier series expansion of y. **(07 Marks)**

2 a. Find Fourier transform of $e^{-|x|}$ and hence evaluate $\int_0^\infty \frac{\cos xt}{1+t^2}dt$. **(07 Marks)**

b. Find Fourier sine transform of $f(x)=\begin{cases} x, & 0<x\le 1 \\ 2-x, & 1\le x<2 \\ 0, & x>2 \end{cases}$. **(06 Marks)**

c. Solve the integral equation $\int_0^\infty f(x)\cos\lambda x\,dx = e^{-\lambda}$. **(07 Marks)**

3 a. Find various possible solution of one-dimensional heat equation by separable variable method. **(10 Marks)**

b. A rectangular plate with insulated surface is 10cm wide and so long compared to its width that it may be considered infinite in length without introducing an appreciable error. If the temperature of the short edge y = 0 is given by

$u = 20x,\ 0 \le x \le 5$
$\quad = 20\,(10 - x),\ 5 \le x \le 10$

and the two long edges x = 0, x = 10 as well as the other short edge are kept at 0°C. Find the temperature u(x, y). **(10 Marks)**

4 a. Fit a curve of the form $y = ae^{bx}$ to the data: **(07 Marks)**

| | | | | | |
|---|---|---|---|---|---|
| x | 1 | 5 | 7 | 9 | 12 |
| y | 10 | 15 | 12 | 15 | 21 |

b. Use graphical method to solve the following LPP:
Minimize $Z = 20x_1 + 30x_2$
Subject to $x_1 + 3x_2 \ge 5$;
$2x_1 + 2x_2 \ge 20$;
$3x_1 + 2x_2 \ge 24$;
$x_1, x_2 \ge 0$. **(06 Marks)**

c. Solve the following LPP by using simplex method:
Maximize $Z = 3x_1 + 2x_2 + 5x_3$
Subject to $x_1 + 2x_2 + x_3 \le 430$
$3x_1 + 2x_3 \le 460$
$x_1 + 4x_2 \le 420$
$x_1 \ge 0,\ x_2 \ge 0.$ **(07 Marks)**

## PART – B

5 a. Use the Gauss-Seidal iterative method to solve the system of linear equations. $27x + 6y - z = 85$; $6x + 15y + 2z = 72$; $x + y + 54z = 110$. Carry out 3 iterations by taking the initial approximation to the solution as (2, 3, 2). Consider four decimal places at each stage for each variable. **(07 Marks)**

b. Using the Newton-Raphson method, find the real root of the equation $x\sin x + \cos x = 0$ near to $x = \pi$, carryout four iterations (x in radians). **(06 Marks)**

c. Find the largest eigen value and the corresponding eigen vector of the matrix $A = \begin{pmatrix} 4 & 1 & -1 \\ 2 & 3 & -1 \\ -2 & 1 & 5 \end{pmatrix}$ by power method. Take $\begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$ as the initial vector. Perform 5 iterations. **(07 Marks)**

6 a. Find f(0.1) by using Newton's forward interpolation formula and f(4.99) by using Newton's backward interpolation formula from the data: **(07 Marks)**

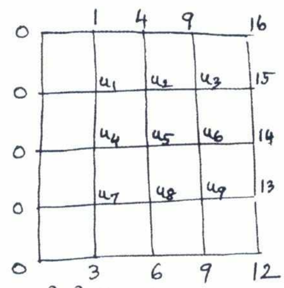
| x | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| f(x) | -8 | 0 | 20 | 58 | 120 | 212 |

b. Find the interpolating polynomial f(x) by using Newton's divided difference interpolation formula from the data: **(06 Marks)**

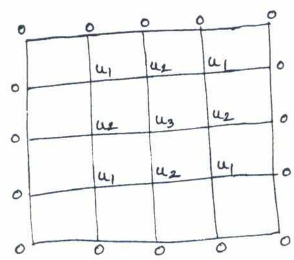
| x | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| f(x) | 3 | 2 | 7 | 24 | 59 | 118 |

c. Evaluate $\int_0^{1.2} e^x\,dx$ using Weddle's rule. Taking six equal sub intervals, compare the result with exact value. **(07 Marks)**

7 a. Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ in the following square mesh. Carry out two iterations. **(07 Marks)**




b. Solve the Poisson's equation $\nabla^2 u = 8x^2y^2$ for the square mesh given below with u = 0 on the boundary and mesh length, h = 1. **(06 Marks)**



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

8 a. Find the Z-transforms of i) $\left(\frac{1}{2}\right)^n + \left(\frac{1}{3}\right)^n$ ii) $3^n \cos\frac{\pi n}{4}$. **(07 Marks)**

b. State and prove initial value theorem in Z-transforms. **(06 Marks)**

c. Solve the difference equation
$u_{n+2} - 2u_{n+1} + u_n = 2^n$; $u_0 = 2, u_1 = 1$. **(07 Marks)**

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## Third Semester B.E. Degree Examination, Dec.2014/Jan.2015
# Building Materials and Construction Technology

Time: 3 hrs. Max. Marks:100

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

### PART – A

1 a. Discuss various functions and requirements of a good foundation. **(10 Marks)**
b. With the help of neat sketch. Explain: i) Mat foundation; ii) Pile foundation. **(05 Marks)**
c. Find the dimensions of a combined rectangular footing for two columns A and B carrying loads of 500kN and 700kN respectively. Column A is 30cm × 30cm in size and column B is 40cm × 40cm in size. The centre to centre spacing of columns is 3.4 metres. The safe B capacity of the soil may be taken as $150kN/m^2$. **(05 Marks)**

2 a. Explain the classification of masonry briefly explain with neat sketch: i) Stretcher; ii) Types of closure; iii) Header; iv) Quoin. **(10 Marks)**
b. With a neat figure explain various types of joints used in stone masonry. **(10 Marks)**

3 a. Distinguish clearly between a lintel and an arch. How does a flat stone arch differ from a stone lintel? **(10 Marks)**
b. Briefly explain the functions of Chejja, Canopy and Balcony. **(10 Marks)**

4 a. Explain briefly with neat sketches: i) Pitched roofs; ii) Flat roofs. **(10 Marks)**
b. Explain types of flooring and factors affecting selection of flooring materials. **(10 Marks)**

### PART – B

5 a. What are the requirements of a good stair and plan a dog legged stair for a building in which the vertical distance between the floor is 3.6m. The stair hall measures 2.5m × 5m. **(10 Marks)**
b. Explain briefly any 5 with neat sketch: i) Landing; ii) Newel post; iii) Hand rail; iv) Flight; v) Baluster; vi) Riser and tread. **(10 Marks)**

6 a. Explain in brief with neat sketch any five:
i) Casement window.
ii) Sash doors.
iii) Battened and ledged doors.
iv) Framed and paneled doors.
v) Dormer window.
vi) Corner window. **(15 Marks)**
b. Define with neat sketch: i) Frame; ii) Shutter; iii) Panel; iv) Style. **(05 Marks)**

7 a. Explain purpose of plastering. Explain methods of plastering. **(10 Marks)**
b. Explain in brief defects in painting and constituents of a paint. **(10 Marks)**

8 a. Define: i) Smart materials; ii) Form work and scaffolding. **(10 Marks)**
b. Explain in brief causes and effects of Dampness in a building. **(10 Marks)**

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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# Third Semester B.E. Degree Examination, Dec.2014/Jan.2015
## Strength of Materials

Time: 3 hrs. Max. Marks:100

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

### PART – A

1 a. Draw a neat sketch of stress-strain curve for mild steel specimen in tension. Mark the salient points on it. **(05 Marks)**

b. Derive the relationship between Young's modulus, and bulk modulus of a material. **(05 Marks)**

c. A 1.5 m long steel bar having uniform diameter of 40 mm for a length of 1 m and in the next 0.5 m its diameter gradually reduces to 20 mm. Determine the elongation of the bar when subjected to an axial tensile load of 160 kN. Take E = 200 GPa. **(10 Marks)**

2 a. A concrete column is of square section with 250 mm size and is reinforced with 08 steel bars of 16 mm diameter. The member supports an axial load of 270 kN. Evaluate the stresses in steel and concrete assuming a modular ratio as 18. **(08 Marks)**

b. A flat bar of alluminium alloy 24 mm wide and 6 mm thick is placed between steel bars each 24 mm wide and 9 mm thick to form a composite bar (24 × 24) mm as shown in Fig. 2(b). The three bars are fastened together at their ends when the temperature is 10°C. Find the stresses in each of the material when the temperature of the whole assembly is raised to 50°C. If at the new temperature a compressive load of 20 kN is applied to the composite bar, what are the final stresses in steel and alluminium? Take $E_s = 2 \times 10^5$ N/mm$^2$, $E_a = 2/3 \times 10^5$ N/mm$^2$, $\alpha_s = 1.2 \times 10^{-5}$ per degree C ; $\alpha_a = 2.3 \times 10^{-5}$ per degree C. **(12 Marks)**

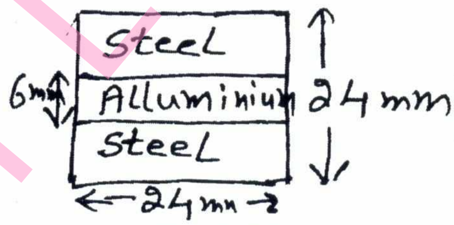

Fig. Q 2(b)

3 a. Define principal stresses and principal planes. **(03 Marks)**

b. A rectangular block of a material is subjected to tensile stresses of 120 N/mm$^2$ and 60 N/mm$^2$ on mutually perpendicular planes together with a shear stress of 70 N/mm$^2$. Find : i) The principal stresses ii) The principal planes iii) The maximum shear stress. Verify the results by constructing Mohr's circle. **(12 Marks)**

c. The stresses acting in a strained material is as shown in Fig. 3(c). Find the normal and tangential stress acting on a plane AB. **(05 Marks)**

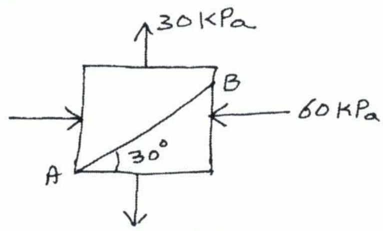

Fig. Q3(c)



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4 a. Derive the relationship between intensity of load, shear force and bending moment. **(05 Marks)**

b. Show that the maximum bending moment in a beam subjected to udl throughout is $w\ell^2/8$, with usual notations. **(05 Marks)**

c. For the beam shown in Fig. 4(c), draw shear force and bending moment diagram. Mark the values at salient points. **(10 Marks)**

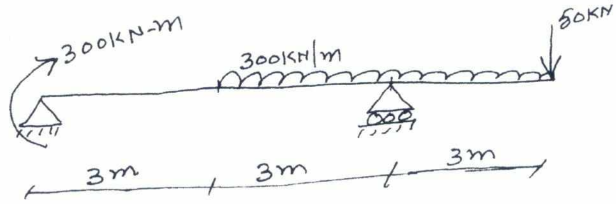


Fig. Q4(c)

## PART – B

5 a. Explain the term "beam of uniform strength" with the help of neat sketches. **(03 Marks)**

b. Define : i) Neutral axis ii) Section modulus iii) Flexural rigidity iv) Modulus of rupture. **(06 Marks)**

c. A rolled steel joist of I section used as a simply supported beam has the following dimensions : flange – (250 × 25)mm, web – 15 mm thick, overall depth – 50 mm. If this beam carries a udl of 50 kN/m on a span of 4m, calculate maximum stress produced due to bending. **(11 Marks)**

6 a. Determine the slope and deflection for a cantilever beam subjected to clockwise moment at its free end. **(08 Marks)**

b. Determine the deflection at B and D for the beam shown in Fig. Q6(b). Take E = 210 GPa and I = $1.6 \times 10^7$ $mm^4$. **(12 Marks)**

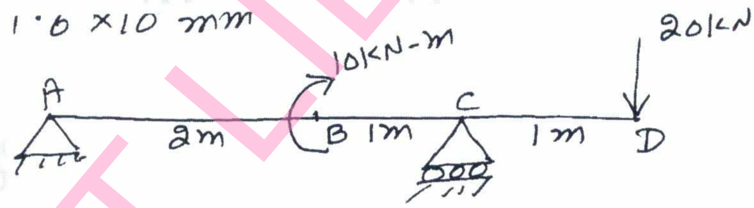


Fig. Q6(b)

7 a. Derive the expression for the theory of pure torsion, with usual notations. **(08 Marks)**

b. A solid circular shaft has to transmit power of 1000 KW at 120 rpm. Find the dia of the shaft if the shear stress must not exceed 80 $N/mm^2$. Maximum torque is 1.25 times the mean, what percentage in material could be obtained if the shaft is replaced by a hollow one, whose internal dia is 0.6 times the external dia. The length of material and maximum shear stress being same. **(12 Marks)**

8 a. Write short notes on limitations of Euler's formula. **(05 Marks)**

b. Define buckling load and slenderness ratio. **(03 Marks)**

c. Compare the crippling loads given by Euler's and Rankinn's formula for a tubular steel column 2.5 m long having outer and inner dia as 40 mm and 30 mm respectively loaded through pin jointed ends. Take yield stress = 320 $N/mm^2$, a = 1/7500 and E = 210 GPa. For what length of the column this cross section the Euler's formula cease to apply? **(12 Marks)**

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# Third Semester B.E. Degree Examination, Dec.2014/Jan.2015

## Surveying – I

Time: 3 hrs. Max. Marks:100

**Note: 1.** ***Answer FIVE full questions, selecting at least TWO questions from each part.***
**2.** ***Assume missing data suitably.***

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## PART – A

1 a. What is surveying? Explain the basic principles of surveying. **(08 Marks)**
b. Differentiate between plan and map. **(02 Marks)**
c. Give the broad classification of surveying. **(10 Marks)**

2 a. What are the different types of chains and tapes used in surveying? **(06 Marks)**
b. Explain the method of direct ranging by the use of time ranger with a neat sketch. **(06 Marks)**
c. The distance between the points measured along a slope is 800 m. Find the distance between the points, if
i) The angle of slope between the points is 10°.
ii) The difference in level between the point is 60 m. **(08 Marks)**

3 a. Explain the basic principle of EDM devices. **(04 Marks)**
b. Explain with a neat sketch, the construction and working of an optical square. **(08 Marks)**
c. Two stations P and Q, on the main survey line, were taken on the opposite sides of a pond. On the right of PQ, a line PR, 210 mt long was laid down and another line PS, 260 mt long was laid down on the left of PQ. The points R, Q and S are on the same straight line. The measured lengths of RQ and QS are 85 m and 75 m, respectively. What is the length of PQ? **(08 Marks)**

4 a. Distinguish between:
i) Magnetic bearing and time bearing.
ii) Whole circle bearing and reduced bearing.
iii) Isogonic line and Agonic line. **(06 Marks)**
b. Differentiate between prismatic compass and surveyor's compass. **(06 Marks)**
c. The following bearings were observed with a compass. Calculate the interior angles. **(08 Marks)**

| Line | AB | BC | CD | DE | EA |
|---|---|---|---|---|---|
| Fore Bearing | 60°30′ | 122°0′ | 46°0′ | 205°30′ | 300°0′ |

## PART – B

5 a. What is local attraction? How it detected and eliminated? **(04 Marks)**
b. A closed compass traverse was conducted round a forest and the following whole circle bearings were observed. Determine which of the stations suffer from local attraction and compute the value of corrected bearing. **(08 Marks)**

| Line | Fore bearing | Back bearing |
|---|---|---|
| AB | 74°20′ | 256°0′ |
| BC | 107°20′ | 286°20′ |
| CD | 224°50′ | 44°50′ |
| DA | 306°40′ | 126°0′ |

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

| Line | Length (M) | Bearing |
|---|---|---|
| AB | 204.0 | 87°30′ |
| BC | 226.0 | 20°20′ |
| CD | 187.0 | 280°0′ |
| DE | 192.0 | 210°3′ |
| EA | ? | ? |

6 a. Define the following terms:
  - i) Backsight
  - ii) Fore sight
  - iii) Bench mark
  - iv) Reduced level. **(08 Marks)**

b. Explain the temporary adjustments of Dumpy level. **(04 Marks)**

c. The following readings were observed successively with a levelling instrument. The instrument was shifted after 5$^{th}$ and 11$^{th}$ readings. Draw a page of level book and determine the R.L of various points by H.I method if the R.L of the I$^{st}$ point was 264.350 mt.
0.485, 1.020, 1.787, 3.395, 3.875, 0.360, 1.305, 1.785, 2.675, 3.385, 3.885, 1.835, 0.435 and 1.705 **(08 Marks)**

7 a. List the advantages and disadvantages of plane table surveying. **(08 Marks)**

b. What is meant by orientation? List the different methods of orientation. **(04 Marks)**

c. Explain radiation method of plane table surveying with a neat sketch. **(08 Marks)**

8 a. Define a contour. List the uses of contour maps. **(06 Marks)**

b. Explain the characteristics of contour. **(06 Marks)**

c. Following observations were taken in reciprocal levelling.

| Instrument @ | Staff reading on | | Remains |
|---|---|---|---|
| | A | B | |
| A | 1.545 | 2.565m | Dist AB = 1420 m |
| B | 0.725 m | 1.935m | RL of A = 108.360 m |

i) Find the reduced level of B (Time RL)
ii) Combined correction for curvature and refraction. **(08 Marks)**

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# Third Semester B.E. Degree Examination, Dec.2014/Jan.2015
## Fluid Mechanics

Time: 3 hrs. Max. Marks:100

**Note: 1.** ***Answer FIVE full questions, selecting at least TWO questions from each part.***
**2.** ***Assume missing data, if any, suitably.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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## PART – A

**1** a. State and prove Newton's law of viscosity. **(04 Marks)**

b. The space between two square flat parallel plates is filled with oil. Each side of the plate is 60 cm. The thickness of the oil film is 12.5 mm. The upper plate, which moves at 2.5 metre per sec requires a force of 98.1 N to maintain the speed. Determine i) the dynamic viscosity of the oil in poise and ii) the kinematic viscosity of the oil in stokes if the specific gravity of oil is 0.95. **(06 Marks)**

c. Define capillarity and derive an expression for capillary rise. **(05 Marks)**

d. Calculate the capillary effect in mm in a glass tube of 4 mm diameter, when immersed in, i) water and ii) mercury. The temperature of the liquid is 20°C and the values of the surface tension of water and mercury at 20°C in contact with air are 0.073575 N/m and 0.51 N/m respectively. The angle of contact for water is zero and that for mercury is 130°. Take density of water at 20°C as equal to 998 $kg/m^3$. **(05 Marks)**

**2** a. Derive Pascal's law for the intensity of pressure at a point in a static fluid. **(06 Marks)**

b. Differentiate between: i) Absolute pressure and Gauge pressure ii) Simple manometer and differential manometer. **(06 Marks)**

c. A differential manometer is connected at the two points A and B of two pipes. The centre of pipe A is 3 m above centre of pipe B. Pipe A contains liquid of sp.gr. 1.5 while pipe B contains a liquid of sp.gr. 0.9. The manometric liquid mercury is 5 m below the centre of pipe A. The pressure at A and B are 1 $Kgf/cm^2$ and 1.8 $Kgf/cm^2$ respectively. Find the difference in mercury level in the differential manometer. **(08 Marks)**

**3** a. Derive an expression for total pressure and centre of pressure for a vertical plane surface submerged in liquid. **(08 Marks)**

b. Determine the total pressure and centre of pressure on an isosceles triangular plate of base 4 m and altitude 4 m when it is immersed vertically in an oil of sp.gr. 0.9. The base of the plate coincides with the free surface of oil. **(06 Marks)**

c. An inclined rectangular sluice gate AB, 1.2 m by 5 m size as shown in Fig. Q3(c) is installed to control the discharge of water. The end A is hinged. Determine the force normal to the gate applied at B to open it. **(06 Marks)**

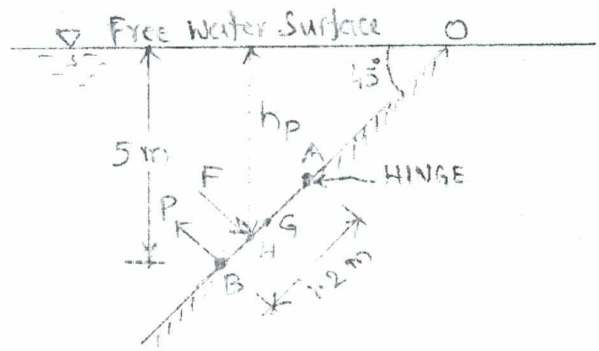


Fig. Q3 (c)



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4 a. Define equation of continuity. Derive an expression for continuity equation for a three-dimensional flow. **(08 Marks)**

b. A Fluid flow field is given by,

$$V = x^2yi + y^2zj - (2xyz + yz^2)k$$

Prove that it is a case of possible steady incompressible fluid flow. Calculate the velocity and acceleration at the point (2, 1, 3) **(12 Marks)**

## PART – B

5 a. Derive Euler's equation of motion. **(06 Marks)**

b. The water is flowing through a pipe having diameters 20 cm and 10 cm at sections 1 and 2 respectively. The rate of flow through pipe is 35 litres/s. The section 1 is 6 m above datum and section 2 is 4 m above datum. If the pressure at section 1 is 39.24 N/cm$^2$, find the intensity of pressure at section 2. **(07 Marks)**

c. The inlet and throat diameters of a horizontal venturimeter are 30 cm and 10 cm respectively. The liquid flowing through the meter is water. The pressure intensity at inlet is 13.734 N/cm$^2$ while the vacuum pressure head at the throat is 37 cm of mercury. Find the rate of flow. Assume that 4% of the differential head is lost between the inlet and throat. Find also the value of $C_d$ for the venturimeter. **(07 Marks)**

6 a. An oil of sp.gr. 0.9 and viscosity 0.06 poise is flowing through a pipe of diameter 200 mm at the rate of 60 litres/s. Find the head lost due to friction for a 500 m length of pipe. Find the power required to maintain this flow. **(06 Marks)**

b. At a sudden enlargement of water main from 240 mm to 480 mm diameter, the hydraulic gradient rises by 10 mm. Estimate the rate of flow. **(08 Marks)**

c. Water is flowing through a horizontal pipe of diameter 200 mm at a velocity of 3 m/s. A circular solid plate of diameter 150 mm is placed in the pipe to obstruct the flow. Find the loss of head due to obstruction in the pipe if $C_C = 0.62$. **(06 Marks)**

7 a. Explain any five methods of measuring water depth with the help of neat sketch. **(10 Marks)**

b. Describe the area velocity method to measure discharge through a stream section. **(05 Marks)**

c. A pitot-static tube having a coefficient of 0.98 is used to measure the velocity of water in a pipe. The stagnation pressure recorded is 3 m and the static pressure 2 m. Determine the velocity. **(05 Marks)**

8 a. Explain the procedure to measure discharge using i) Triangular notch ii) Cipolletti notch iii) Orificemeter. **(12 Marks)**

b. A broad-crested weir of 50 m length, has 50 cm height of water above its crest. Find the maximum discharge. Take $C_d = 0.60$. Neglect velocity of approach. Also, if the velocity of approach is to be taken into consideration, find the maximum discharge when the channel has a cross sectional area of 50 m$^2$ on the upstream side. **(08 Marks)**

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**10CV36**

# Third Semester B.E. Degree Examination, Dec.2014/Jan.2015
# Applied Engineering Geology

Time: 3 hrs. Max. Marks:100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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## PART – A

1 a. Briefly explain the internal structure of the earth based on different uncomformities and add a note on its composition. **(08 Marks)**
b. Explain the role of geology in the field of civil engineering. **(08 Marks)**
c. Write a note on rock forming mineral. **(04 Marks)**

2 a. Explain the primary structures in sedimentary rock with neat sketch. **(08 Marks)**
b. What is mineral? Describe the following physical properties of a mineral:
i) Form ii) Hardness iii) Fracture iv) Clevage **(08 Marks)**
c. Explain road metals. **(04 Marks)**

3 a. What are metamorphism agents of metamorphism? Describe the types of metamorphism with examples. **(10 Marks)**
b. Write short otes on Dyke, Sill and fissures. **(05 Marks)**
c. Explain porphysitic and poikoilitic textures. **(05 Marks)**

4 a. What are folds? How are they caused? Describe the various types of folds noticed in rocks. **(08 Marks)**
b. What is a normal fault? Add a note on Horst and Graben. **(04 Marks)**
c. Explain the types of uncomformities. **(08 Marks)**

## PART – B

5 a. What is an epicenter? Describe the methods of locating the intensity and add a note on seismic resistant structures. **(08 Marks)**
b. Define weathering. Explain types of weathering and add a note on its importance. **(08 Marks)**
c. Explain DIP and strike. **(04 Marks)**

6 a. What is a river capture? Explain how it occurs. **(06 Marks)**
b. Discuss briefly the geological consideration in selecting site for Dam construction. **(08 Marks)**
c. Explain silting of reservoir and its control. **(06 Marks)**

7 a. Explain the electrical resistivity method for exploration of ground water. **(08 Marks)**
b. Write a note on spacing of wells. **(04 Marks)**
c. Write a note on methods of artificial recharge of ground water. **(08 Marks)**

8 Explain :
a. Landsat imageries.
b. Impact of quarrying.
c. Application of GPS and GIS in civil engineering.
d. Tunneling in folded rocks. **(20 Marks)**

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USN

MATDIP301

# Third Semester B.E. Degree Examination, Dec.2014/Jan.2015
## Advanced Mathematics – I

Time: 3 hrs. Max. Marks:100

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

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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1 a. Express : $\dfrac{(3+i)(1-3i)}{2+i}$ in the form x + iy. **(05 Marks)**

b. Find the modulus and amplitude of the complex number $1+\cos\alpha+i\sin\alpha$. **(05 Marks)**

c. If $(3x-2iy)(2+i)^2 = 10(1+i)$, then find the values of x and y. **(05 Marks)**

d. Prove that $(\cos\theta_1+i\sin\theta_1)(\cos\theta_2+i\sin\theta_2)=\cos(\theta_1+\theta_2)+i\sin(\theta_1+\theta_2)$. **(05 Marks)**

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

b. If $y = a\cos(\log x)+b\sin(\log x)$ prove that $x^2y_{n+2}+(2n+1)xy_{n+1}+(n^2+1)y_n=0$. **(07 Marks)**

c. Compute the $n^{th}$ derivatives of sin x sin 2x sin 3x. **(07 Marks)**

3 a. With usual notations prove that $\dfrac{1}{p^2}=\dfrac{1}{r^2}+\dfrac{1}{r^4}\left(\dfrac{dr}{d\theta}\right)^2$. **(06 Marks)**

b. Prove that the curves cuts $r^n = a^n\cos n\theta$, and $r^n = b^n\sin n\theta$ orthogonally. **(07 Marks)**

c. Expand $\log(1+\sin x)$ in powers of x by Maclaurin's theorem up to the terms containing $x^3$. **(07 Marks)**

4 a. If $u = x^2y+y^2z+z^2x$, prove that $\dfrac{\partial u}{\partial x}+\dfrac{\partial u}{\partial y}+\dfrac{\partial u}{\partial z}=(x+y+z)^2$. **(06 Marks)**

b. If $u = f(x-y, y-z, z-x)$, prove that $\dfrac{\partial u}{\partial x}+\dfrac{\partial u}{\partial y}+\dfrac{\partial u}{\partial z}=0$. **(07 Marks)**

c. If $u = e^x\cos y$, $v = e^x\sin y$, find $J=\dfrac{\partial(u,v)}{\partial(x,y)}, J'=\dfrac{\partial(x,y)}{\partial(u,v)}$ and verify $JJ' = 1$. **(07 Marks)**

5 a. Obtain a reduction formula for $\int \sin^n x\ dx$. **(06 Marks)**

b. Evaluate : $\displaystyle\int_0^1\int_x^{\sqrt{x}}(x^2+y^2)dxdy$. **(07 Marks)**

c. Evaluate : $\displaystyle\int_0^a\int_0^x\int_0^{x+y} e^{x+y+z}\ dz\ dy\ dx$. **(07 Marks)**

6 a. Define Gamma function. Prove that $\Gamma(n+1)=n\Gamma(n)$. **(06 Marks)**

b. With usual notation prove that : $\beta(m,n)=\dfrac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. **(07 Marks)**

c. Prove that $\beta\left(m,\frac{1}{2}\right)=2^{2m-1}\beta(m,m)$. **(07 Marks)**

7 a. Solve : $\sec^2 x \tan y\, dx + \sec^2 y \tan x\, dy = 0$. **(05 Marks)**

b. Solve : $\dfrac{dy}{dx} = 1 + \dfrac{y}{x} + \left(\dfrac{y}{x}\right)^2$. **(05 Marks)**

c. Solve : $\dfrac{dy}{dx} + y \cot x = \sin x$. **(05 Marks)**

d. Solve : $(x^2 + y)dx + (y^3 + x)dy = 0$. **(05 Marks)**

8 a. Solve : $\dfrac{d^3y}{dx^3} - 6\dfrac{d^2y}{dx^2} + 11\dfrac{dy}{dx} - 6y = 0$. **(06 Marks)**

b. Solve : $y'' - 6y' + 9y = e^x + 3^x$. **(07 Marks)**

c. Solve : $\dfrac{d^2y}{dx^2} + 4y = x^2 + \sin 3x$. **(07 Marks)**

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