2018-2019
B. TECH AUTUMN (III-SEMESTER) EXAMINATION
(CIVIL ENGINEERING)
MATHEMATICS-III
AM-211
Credits-04

Maximum Marks: 60
Duration: Two Hours

Answer all questions:

1(a) Find the values of the constants \( a, b, c \) so that the directional derivatives of \( f = axy^2 + byz + cz^2x^3 \) at \((1, 2, -1)\) has a maximum magnitude 64 in the direction parallel to z-axis.

OR

(a') A field is generated by certain distribution of charge given by \( \vec{F} = (x + 2y + az)\hat{i} + (bx - 3y - z)\hat{j} + (4x + cy + 2z)\hat{k} \). Find the values of \( a, b, c \) so that \( \vec{F} \) is irrotational. Hence find the scalar potential function.

(b) Find the value of \( \Delta^2 (r^n) \) and show that \( \nabla^2 \left( \frac{1}{r} \right) = 0 \), where \( r = |\vec{r}| = \sqrt{x^2 + y^2 + z^2} \).

\[ [8, 7] \]

2.(a) Use divergence theorem to evaluate the surface integral \( \iint_S (x^3 \, dy \, dz + x^2y \, dz \, dx + x^2z \, dx \, dy) \), where \( S \) is the sphere \( x^2 + y^2 + z^2 = 1 \).

OR

(a') Verify Green’s theorem in a plane to evaluate \( \int_C [(2x^2 - y^3) \, dx + (x^2 + y^2) \, dy] \), where \( C \) is the boundary of the surface in xy-plane between \( x^2 = y \) and \( y^2 = x \).
(b) Verify Stoke’s theorem for the function \( \mathbf{F} = x^2 \mathbf{i} + xy \mathbf{j} \) integrated round the square in the plane \( z = 0 \) and bounded by the lines \( x = 0, y = 0, x = a, \text{ and } y = a. \) 

\[\text{(7, 8)}\]

3.(a) Examine the analyticity of the function \( f(z) = \begin{cases} \frac{x^2 y^5 (x + iy)}{x^4 + y^{10}}, & z \neq 0 \\ 0, & z = 0 \end{cases} \)

in the region including the origin.

OR

(a') If \( f(z) = u + iv \) is an analytic function of \( z \) and \( u - v = \frac{\cos x + \sin x - e^{-x}}{2 \cos x - e^y - e^{-y}}, \)

find \( f(z) \) subject to the condition \( f(\pi/2) = 0. \)

(b) Use Cauchy’s integral formula to evaluate \( \int_c \frac{\cos \pi z^2 + \sin \pi z^2}{(z-1)(z-2)} \, dz, \)

where \( c \) is a circle (i) \( |z| = \frac{3}{2} \) (ii) \( |z| = 3. \)

\[\text{(8, 7)}\]

4.(a) Form the partial differential equations by eliminating the arbitrary constants and arbitrary function from the following relations:

(i) \( z = ae^{-b^2 t} \cos bx \)

(ii) \( f(x^2 + y^2, z - xy) = 0 \)

(b) A tightly stretched flexible string has its ends fixed at \( x = 0 \) and \( x = l. \) At time \( t = 0 \) the string is given a shape defined by \( F(x) = \mu x(l - x), \) where \( \mu \) is a constant, and then released. Find the displacement of any point \( x \) of the string at any time \( t > 0. \)

OR

(b') A rod of length \( L \) has its ends \( A \) and \( B \) kept at \( 0^\circ C \) and \( 100^\circ C, \) respectively, until steady state conditions prevail. If the temperature of \( B \) is then reduced suddenly to \( 0^\circ C \) and kept so, while that of \( A \) is Maintained, find the temperature \( u(x, t) \) at distance \( x \) from \( A \) at time \( t. \)

\[\text{(6, 9)}\]
2018-2019
B. TECH AUTUMN (III-SEMESTER) EXAMINATION
(CIVIL ENGINEERING)
MATHEMATICS-III
AMS-2110
Credits-03

Maximum Marks: 60

Answer all questions:

1(a) Find the values of the constants a, b, c so that the directional derivatives of \( f = axy^2 + byz + cz^2x^3 \) at \((1, 2, -1)\) has a maximum magnitude 64 in the direction parallel to z-axis.

OR

(a') A field is generated by certain distribution of charge given by \( \vec{F} = (x + 2y + az)\hat{i} + (bx - 3y - z)\hat{j} + (4x + cy + 2z)\hat{k} \). Find the values of a, b, c so that \( \vec{F} \) is irrotational. Hence find the scalar potential function.

(b) Find the value of \( \Delta^2(r^n) \) and show that \( \nabla^2 \left( \frac{1}{r} \right) = 0 \), where \( \vec{r} = x\hat{i} + y\hat{j} + z\hat{k} \), \( r = |\vec{r}| = \sqrt{x^2 + y^2 + z^2} \).

(c) Verify Green's theorem in a plane to evaluate \( \int_C [(2x^2 - y^3)dx + (x^2 + y^2)dy] \), where \( C \) is the boundary of the surface in xy-plane between \( x^2 = y \) and \( y^2 = x \). \[6+7+7\]

2.(a) Examine the nature of the function \( f(z) = \begin{cases} \frac{x^2y^5(x+iy)}{x^4+y^{10}}, & z \neq 0 \\ 0, & z = 0 \end{cases} \) in the region including the origin.

(b) If \( f(z) = u + iv \) is an analytic function of \( z \) and \( u - v = \frac{\cos x + \sin x - e^{-y}}{2\cos x - e^y - e^{-y}} \),

find \( f(z) \) subject to the condition \( f(\pi/2) = 0 \).

OR

(b') If \( f(z) \) is an analytic function of \( z \), prove that \( \left( \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right) |f(z)|^2 = 4|f'(z)|^2 \).

\[\text{Contd...}2\]
(c) Use Cauchy's integral formula to evaluate $\int \frac{\cos \pi z^2 + \sin \pi z^2}{(z-1)(z-2)} \, dz$,
where $c$ is a circle (i) $|z| = \frac{3}{2}$ (ii) $|z| = 3$.

3.(a) Form the partial differential equations by eliminating the arbitrary constants and arbitrary function from the following relations:
(i) $z = ae^{-b^2t} \cos bx$
(ii) $f(x^2 + y^2, z - xy) = 0$

(b) Use the method of separation of variables, to solve the partial differential equation:
$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$$

(c) A tightly stretched flexible string has its ends fixed at $x = 0$ and $x = l$. At time $t = 0$ the string is given a shape defined by $F(x) = \mu x(l - x)$, where $\mu$ is a constant, and then released. Find the displacement of any point $x$ of the string at any time $t > 0$.

OR

(c') A rod of length $L$ has its ends $A$ and $B$ kept at $0^0C$ and $100^0C$, respectively, until steady state conditions prevail. If the temperature of $B$ is then reduced suddenly to $0^0C$ and kept so, while that of $A$ is Maintained, find the temperature $u(x, t)$ at distance $x$ from $A$ at time $t$.
2018-19
B. TECH. IIIrd SEMESTER (AUTUMN SEMESTER) EXAMINATION
CIVIL ENGINEERING
CIVIL ENGINEERING MATERIALS
CE 212

Maximum Marks: 60  Credits: 04  Duration: Two Hours

Answer all the questions. Sketch neat diagrams, if necessary.

Q. No.  Question  M.M.
1(a)  State the most appropriate type of cement used for the following conditions. Also give the reasons.
(a) Mass concrete works
(b) Under water construction
(c) Repair of concrete roads
(d) Prestressed concrete duct

1(b)  Calculate the percentage of main compounds of cement for the following chemical composition of cement.
CaO = 60%; SiO₂ = 17%; Al₂O₃ = 3%; Fe₂O₃ = 0.5%; MgO = 0.5%; SO₃ = 2.0%; K₂O & Na₂O = 0.3%

1(c)  How do size and shape of the coarse aggregate influence the properties of concrete? Also give the limitations of maximum size aggregate (MSA) & shape for concrete and reinforced concrete.

2(a)  What is purpose of compaction in concrete construction? Describe various types of methods of compaction.

2(b)  Describe different types of shrinkage of concrete and their detrimental effect on concrete.

OR

2(a)' Describe the following:
(i) Measurement of workability of concrete with the help of flow table test.
(ii) Effect of water quality on properties of concrete.

2(b)' Differentiate between the following:
(i) Moist and membrane concrete.
(ii) High strength and high performance concrete.

3  Discuss the importance of bond in brick masonry construction? Also, draw and describe different types of brick masonry bond.
4(a) Write the objects of preservation of timber. Describe different methods of preservation of timber.

4(b) Write short notes on the following:
(i) Plywood
(ii) Fibre Board

OR

4(b)' Describe the following methods of testing of wood:
(i) Moisture content test
(ii) Specific gravity test

5(a) Describe the characteristics of any two of the following:
(i) Sheet glass
(ii) Laminated glass
(iii) Insulating glass
(iv) Heat absorbing glass

5(b) Define plastics. Describe the functions of constituents of plastics.
<table>
<thead>
<tr>
<th>Q.No.</th>
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<tbody>
<tr>
<td>1(a)</td>
<td>What is difference between surface tension and capillarity? Develop expression for capillarity when a capillary tube is inserted in a pot containing water.</td>
<td>[04]</td>
</tr>
<tr>
<td>1(b)</td>
<td>Develop expression for power required to rotate a circular disc with radius R over a fixed bed at a distance b apart. The gap between disc and the bed is filled by a lubricating oil with viscosity μ.</td>
<td>[08]</td>
</tr>
<tr>
<td>1(c)</td>
<td>What is flow net? What are its practical significances?</td>
<td>[03]</td>
</tr>
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</table>

**OR**

1'(a)  | Differentiate between convective and local accelerations. If velocity vector is expressed as \( \mathbf{V} = 2x\mathbf{i} - x^2\mathbf{y}\mathbf{z}\mathbf{j} \), find component of acceleration along \( x \) direction at point \( P (1,1,1) \). | [07] |
1'(b)  | Explain velocity potential and stream function. If velocity potential is defined as \( \phi = 3x^3 - 2xy^2 + 3yz^3 \), find stream function \( \phi \). | [08] |
2(a)   | Sketch the manometer used for measuring large pressure. Write pressure equation also. | [02] |
2(b)   | Check the stability of dam section shown in Fig.1 against sliding and overturning. Take coefficient of friction \( \mu \) at the base as 0.65 and specific gravity of concrete as 2.4. | [06] |
2(c)   | A quarter cylindrical gate BC of radius 2 m and length 6 m is hinged at C. as shown in Fig.2. Determine the horizontal force \( P \) required to hold the gate stationary. | [07] |

**OR**

Contd....
2'(a) Explain the terms centre of pressure, centre of buoyancy and metacentre. 

2'(b) A cylinder of specific gravity 0.6 is required to float with its vertical in a liquid specific gravity 0.9. Determine L/D ratio of cylinder for stable equilibrium, where L is the length and D is the diameter of cylinder. 

2'(c) An open rectangular tank 7 m long 2 m wide and 1.5 m deep contains water to a depth of 1.0 m. If the tank is given a horizontal acceleration of 2.5 m/s² along its length, calculate the amount of water spilled and pressure on the bottom of the tank at its front and rear ends. 

3(a) Find the power of the turbine as shown in Fig.3 

3(b) Find the force of the water on the nozzle as shown in Fig.4. 

3(c) Derive torque equation for the sprinkler as shown in Fig.5. 

4(a) Classify mouthpiece based on position and discharging conditions. 

(b) A tank in the form of cone having radius 2m and height 3m is kept with its axis vertical and apex downwards. The tank is filled with water. It is to be emptied using an orifice of diameter 5cm fitted at its apex. Determine the time of emptying if C_d is 0.62. Centre of the orifice may be assumed as the apex of cone. 

(c) Derive the relation for computing discharge over a triangular notch.

---

[3]

[06]

[06]

[06]

[03]

[03]

[07]

[05]

contd.... 3.
Fig. 1

\[ p_A = 112.78 \, kN/m \]
\[ p_B = -27.46 \, kN/m \]

\[ \phi = 30^\circ \, \text{em} \]
\[ \phi = 50^\circ \, \text{em} \]

Fig. 2

\[ \phi = 10^\circ \, \text{em} \]
\[ \phi = 20^\circ \, \text{em} \]

\[ Q = 10 \, \text{m/s} \]

Fig. 3

\[ V_{RB} = 6 \, \text{m/s} \]

Fig. 4

\[ p_A = 10 \, kN/m^2 \]
\[ p_B = 0 \]

Fig. 5

\[ V_{RA} = 6 \, \text{m/s} \]
\[ R_A = 16 \, \text{em} \]
\[ R_B = 14 \, \text{em} \]

Pivot
B. Tech. (AUTUMN), IIIrd SEMESTER EXAMINATION, 2018
(CIVIL ENGINEERING)
ENGINEERING GEOLOGY (CE – 215)

MAXIMUM MARKS: 60 Duration: Two Hours

Note: Answer all questions.

1. Give a short account of origin and physical properties of minerals. (15)

OR

1’a. Give a brief classification of sedimentary rocks, what factors control their mineral composition and texture. (15)

2. What are faults? Give their classification scheme and significance in mega civil engineering construction projects. (15)

3. Write short notes on any two of the followings:
(a) Geotectonic Divisions of India and its importance (7.5)
(b) Occurrence and movement of Groundwater (7.5)
(c) Rock Quality Designation (7.5)

4. Write a short account of geological investigations for a major dam site. (15)

OR

4’. Give a short account of earthquake occurrence in Indian Sub-Continent and remedial measures for minimizing the effect of earthquakes. (15)
2018-19
B.TECH. (AUTUMN SEMESTER) EXAMINATION
CIVILENGINEERING
QUANTITY SURVEY
CE – 220/CEC2150

Maximum Marks: 60       Credits: 04       Duration: Two Hours

Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No.       Question                                             M.M.

1. (a) What do you mean by orientation in civil engineering structures? Explain. [12]

(b) Write the least dimensions of Front, Side and Rear Setback for a residential building
    in a plot size of:
    (i) 250 m² to 499 m²  (ii) 500 m² to 999 m²  (iii) 1000 m² or more [03]

2(a) Draw a neat sketch of the wall section and write the dimensions of its component if
    the width of the wall in superstructure is of 1 ½ brick of standard size. [10]

(b) Write the least dimensions of the following [5]
    (i) Bed Room  (ii) Drawing cum Dining Room  (iii) Kitchen  (iv) Store
    (v) Bathroom  (vi) Tread and riser in a stair case

OR

2'(a) Explain, in detail what do you mean by Curing of roof slab? [05]

(b) How do you construct a floor of a room in a building? Giving a neat sketch write the
    thickness of its components. [05]

(c) What are the different types of Stair Cases? Which one of them is the best
    Staircase? [03]

(d) Write the advantages of a dog-legged stair case [02]

3(a) Briefly describe the principles adopted for writing of the specifications [7]

(b) What is the purpose of rate analysis? Determine the quantity of materials required
    for 50 m³ of Cement Concrete having a ratio of 1:2:4 [08]

OR

3’ Write short notes on the following: [15]
    (a) Earnest Money and Security Deposit
    (b) Capital Cost of Project

4 Write short notes on the following: [15]
    (a) Contract Document
    (b) Lump Sum Contract
1. Write a short account of origin and classification of minerals. What are the important physical properties of minerals? \(15\) marks

2. Give a short account of geomorphological work carried out by rivers. Discuss the civil engineering issues pertaining to river system. \(15\) marks

OR

2'. How joints are classified? What are the important properties related to joints which are important in civil engineering works in rocky terrains? \(15\) marks

3a Give a short account of vertical distribution of groundwater. \(7.5\) marks

3b Explain fundamental concepts of stratigraphy. \(7.5\) marks

4a Discuss uses of rocks in construction industry mentioning important physic mechanical properties for specific uses. \(15\) marks

OR

4'a Give a brief classification of dams and important geological investigations for their construction. \(15\) marks

4b. Write short notes on any two of the followings:

   (i) Unconformity \(7.5\) marks

   (ii) Earthquake Zonation \(7.5\) marks

   (iii) Construction issues in permafrost regions \(7.5\) marks
# 2018-2019

**B.TECH. (AUTUMN SEMESTER) EXAMINATION**  
**CIVIL ENGINEERING**  
**FLUID MECHANICS (CE2130)**

Maximum Marks: 60  
Credits: 04  
Duration: Two Hours

*Answer all the questions.*  
*Assume suitable data if missing.*  
*Notations used have their usual meaning.*

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<td>1(a)</td>
<td>On stress-strain diagram show Bingham plastic, dilatants and thixotropic fluids. Give two examples of each fluids.</td>
<td>[04]</td>
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<td>1(b)</td>
<td>Develop expression for power required to rotate a circular disc with radius $R$ over a fixed bed at a distance $b$ apart. The gap between disc and the bed is filled by a lubricating oil with viscosity $\mu$.</td>
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<td>1(c)</td>
<td>What are the applications of flow net? Differentiate between free and forced vortex motions. Draw the velocity distribution in these cases.</td>
<td>[04]</td>
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<td>[07]</td>
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<td>1'(b)</td>
<td>Explain velocity potential and stream function. If velocity potential is defined as $\phi = 3x^2 - 2xy^2 + 3yz^2$, find stream function $\varphi$.</td>
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<td>2(a)</td>
<td>Water is flowing in the pipeline from A towards B as shown in Fig.1. Calculate the pressure difference ($p_A - p_B$) in kPa.</td>
<td>[04]</td>
</tr>
<tr>
<td>2(b)</td>
<td>A square plug $AB$ in the side of the tank shown in Fig. 2 will pop out when hydrostatic force on it is 20 kN. For this condition, determine the depth of water $H$ in the tank.</td>
<td>[03]</td>
</tr>
<tr>
<td>2(c)</td>
<td>The quarter cylindrical gate $BC$ shown in Fig. 3 is hinged at $C$. Find the horizontal force $P$ required to hold the gate stationary. The radius of gate is 2m and length into the paper is 6m.</td>
<td>[08]</td>
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<td>2'(a)</td>
<td>List the various forces that temporarily cause heeling of floating bodies.</td>
<td>[02]</td>
</tr>
<tr>
<td>2'(b)</td>
<td>A cube of side ‘a’ floats in water with its two faces horizontal in a liquid of</td>
<td><strong>Contd...</strong></td>
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relative density $S_r$. If the relative density of cube material is $S_c$, find the condition for metacentric height to be zero.

2'(c) For the U-tube containing mercury shown in Fig. 4, what speed of rotation causes the difference in limb levels as indicated.

3(a) Find the power of the pump as shown in Fig. 5.

3(b) Find the force of the water on the bend as shown in Fig. 6.

3(c) Mention practical applications of momentum and torque equations.

4(a) Differentiate between an orifice and a mouthpiece.

4(b) A swimming pool 50 m long and 20 m wide is to be emptied using 2 identical orifices fitted at the bottom corners of deeper side as shown in Fig. 7. Compute the time of emptying of swimming pool. The diameter of orifice is 20 cm and $C_d$ is 0.62.

4(c) Water is flowing over a 4m long Cippoletti weir under a head of 1m. Compute the discharge if $C_d = 0.68$. 

Fig. 1

Fig. 2

Fig. 3

Fig. 4
Fig. 5

$H_{LA} \rightarrow C = 0.2 \text{ m}$

$H_{LD} \rightarrow E = 0.6 \text{ m}$

$H_{LC} \rightarrow D = 0.1 \text{ m}$

$\phi = 20 \text{ cm}$

$E_L = 240 \text{ cm}$

$\phi_A = \phi_B = 10 \text{ cm}$

$Q = 15 \text{ l/s}$

$P_D = 5000 \text{ kgf/m}^2$

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Fig. 7

50 m

20 m

5 m

4 m

2 nos. orifices
2018-19
B. TECH. IIIrd SEMESTER (AUTUMN SEMESTER) EXAMINATION
CIVIL ENGINEERING
CIVIL ENGINEERING MATERIALS AND CONSTRUCTION PRACTICE
CEC-2160/CE-221

Maximum Marks: 60  Credits: 04  Duration: Two Hours

Answer all the questions.
Sketch neat diagrams, if necessary.

Q. No.  Question  M.M.

1(a)  State the most appropriate type of cement used for the following conditions. Also give the reasons.
(a) Mass concrete works
(b) Under water construction
(c) Repair of concrete roads
(d) Prestressed concrete duct
(e) Marine works

1(b)  How do size and shape of the coarse aggregate influence the properties of concrete? Also give the limitations of maximum size aggregate (MSA) & shape for plain and reinforced concrete.

1(c)  What is purpose of compaction in concrete construction? Describe different types of methods of compaction.

OR

1(c)'  Describe various types of shrinkage of concrete and their detrimental effect on concrete.

2(a)  What are the different types of bricks? Explain their specific use in masonry construction.

2(b)  Write the objects of preservation of timber. Describe different methods of preservation of timber.

OR

2(b)'  Discuss the importance of bond in brick masonry construction? Also, draw and describe rat-trap bond and stretcher bond.

3  Explain the following with the help of neat sketches.
(a) Trapezoidal Combined Footing
(b) Bored Compaction Pile

contd....
3’ Explain the following with the help of neat sketches.
(a) Lantern Window
(b) Structural barriers in anti-termite treatment
(c) Classification of columns on the basis of end conditions

4 Explain the following with the help of neat sketches.
(a) Dead shores
(b) Box Sheeting
(c) Well point system of dewatering