2018-2019
B.E. (III-SEMESTER) EXAMINATION
(CIVIL ENGINEERING)
MATHEMATICS-III
EAM-211
Credits-04

Maximum Marks: 60

Duration: Two Hours

Answer all questions:

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

OR

(a') Show that \(\vec{F} = (2xy + z^3)i + x^2j + 3z^2xk\) is a conservative field. Find its scalar potential and also the work done in moving a particle from \((1, -2, 1)\) to \((3, 1, 4)\).

(b) Find \(n\) such that \(\vec{F} = \frac{r}{r^n}\) is solenoidal, (where \(\vec{r} = xi + yj + zk\), \(r = |\vec{r}|\)).

2.(a) Use divergence theorem to evaluate the surface integral \(\iint_S \vec{F} \cdot d\vec{s}\),
where \(\vec{F} = x^3i + x^2yj + x^2zk\) and \(S\) is the surface of the sphere \(x^2 + y^2 + z^2 = 1\)

(b) Verify Green's theorem in a plane for \(\int_C [(2x^2 - y^2)dx + (x^2 + y^2)dy]\),
where \(C\) is the boundary of the surface in the \(xy\) -Plane enclosed by the \(x\)-axis and the semi-circle \(y = \sqrt{(1 - x^2)}\).
OR

(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 \( x = 0, \ y = 0, \ x = a \) and \( y = a \). [7+8]

3. (a) Verify that the function \( f(z) = \begin{cases} \frac{x^3 y}{x^6 + y^2}, & z \neq 0 \\ 0, & z = 0 \end{cases} \) is analytic at \( z = 0 \).

OR

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

(b) Evaluate, using Cauchy integral formula, the integral \( \int_C \frac{\cos \pi z^2 + \sin \pi z^2}{(z-1)(z-2)} \, dz \), where \( C \) is a circle (i) \(|z| = \frac{3}{2}\) (ii) \(|z| = 3\). [7+8]

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

(i) \((x - h)^2 + (y - k)^2 + z^2 = c^2\)

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

(b) A tightly stretched string with fixed end points \( x = 0 \) and \( x = l \) is initially in a position given by \( y(x, 0) = y_0 \sin \left( \frac{nx}{l} \right) \). If it released from rest from this position, find the displacement \( y \) at any distance \( x \) from one end at any time \( t \).

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 \( t \). [6+9]
2018-2019
B. E AUTUMN (III-SEMESTER) EXAMINATION
(CIVIL ENGINEERING)
MATHEMATICS-III
EAMS-2110
Credits-03

Maximum Marks: 60
Duration: Two Hours

Answer all questions:

1. (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.

OR

(a') Show that \( \vec{F} = (2xy + z^3)\hat{i} + x^2\hat{j} + 3z^2x\hat{k} \) is a conservative field. Find its scalar potential and also the work done in moving a particle from \( (1, -2, 1) \) to \( (3, 1, 4) \).

(b) Find \( n \) such that \( \vec{F} = \frac{\vec{v}}{r^n} \) is solenoidal, (where \( \vec{r} = x\hat{i} + y\hat{j} + z\hat{k}, \quad r = |\vec{r}| \)).

(c) Verify Green's theorem in a plane for \( \int_C [(2x^2 - y^2)dx + (x^2 + y^2)dy] \), where \( C \) is the boundary of the surface in the xy-plane enclosed by the x-axis and the semi-circle \( y = \sqrt{(1 - x^2)} \).

[7+6+7]

2. (a) Verify that the function \( f(z) = \begin{cases} 
\frac{x^3y(y-ix)}{x^6+y^2}, & z \neq 0 \\
0, & z = 0 
\end{cases} \)
is analytic at \( z = 0 \).

(b) If \( f(z) = u + iv \) is an analytic function of \( z \) and \( u + iv = \frac{2\sin2x}{e^{2y}+e^{-2y}-2\cos2x} \),
find \( f(z) \) in terms of \( z \).

cont'd...
(c) Evaluate $\int_{1-i}^{2+3i} (z^2 + z)dz$, along the straight line joining the point (1, -1) to (2, 3).

OR

(c') 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) $|z| = 3$.

[7+7+6]

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

(i) $(x - h)^2 + (y - k)^2 + z^2 = c^2$
(ii) $f(x^2 + y^2, z - xy) = 0$

(b) Use the method of separation of variables, to solve the partial differential equation: \[ \frac{\partial^2 u}{\partial x^2} + 4 \frac{\partial^2 u}{\partial x \partial y} = 0 \]

(c) A tightly stretched string with fixed end points $x = 0$ and $x = l$ is initially in a position given by $y(x, 0) = y_0 \sin \left( \frac{nx}{l} \right)$. If it released from rest from this position, find the displacement $y$ at any distance $x$ from one end at any time $t$.

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 $t$.

[6+6+8]
2018-19  
B.E (AUTUMN SEMESTER) EXAMINATION  
CIVIL ENGINEERING  
FLUID MECHANICS (ECE-213)  

Maximum Marks: 60  
Credits: 04  
Duration: Two Hours  

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

<table>
<thead>
<tr>
<th>Q.No.</th>
<th>Question</th>
<th>M.M.</th>
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<tbody>
<tr>
<td>1(a)</td>
<td>Derive the expressions for surface tension of a soap bubble and a liquid jet.</td>
<td>[4]</td>
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<tr>
<td>1(b)</td>
<td>The velocity vector is defined as ( V = x^2 y^2 z^2 i - 2xyz^2 j + yz^2 k ), find acceleration component along z-direction at point P (1,2,1) at time ( t = 5 ) seconds.</td>
<td>[4]</td>
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<tr>
<td>1(c)</td>
<td>A two-dimensional flow can be described by ( u = -y/b^2 ) and ( v = x/a^2 ). Verify that this is the flow of an incompressible fluid and that the ellipse ( x^2/a^2 + y^2/b^2 = 1 ) is a stream line.</td>
<td>[7]</td>
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OR

| 1'(a) | Explain:  
\( (i) \) Unsteady flow  
\( (ii) \) Potential Flow  
\( (iii) \) Circulation  
\( (iv) \) Stream Function  
\( (v) \) Flow net | [5] |
<table>
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<tr>
<td>1'(b)</td>
<td>A 3.0 m long reducer with 40 cm diameter at inlet and 20 cm diameter at outlet, carries water at a rate of 100 l/s. It is found that the discharge is increasing at the uniform rate of 10 l/s/s in the reducer. Find the convective acceleration at a distance 0.5 m from the inlet after 2 seconds.</td>
<td>[7]</td>
</tr>
<tr>
<td>1'(c)</td>
<td>What is flow net? Mention its practical applications.</td>
<td>[3]</td>
</tr>
<tr>
<td>2(a)</td>
<td>Where will you prefer inclined manometer, differential U - tube manometer and micrometer? Two pipe lines A and B are connected by means of a U- tube manometer as shown in Fig.1. Find difference of pressure between two pipes.</td>
<td>[7]</td>
</tr>
<tr>
<td></td>
<td>A 6 m long cylindrical gate with 1 m radius retains water on its one side as shown in Fig. 2. Calculate the magnitude of total hydrostatic force on the gate.</td>
<td>[8]</td>
</tr>
</tbody>
</table>
2'(a) Explain the terms centre of buoyancy, metacentre and meta centric height. [3]
2'(b) Derive the expression for meta-centric height taking suitable notations. How the study of exact calculations of this parameter is significant? [10]
2'(c) What is neutral equilibrium? Give few examples of this. [2]
3(a) Explain energy correction factor. Find the horse power delivered by the turbine as shown in Fig.3. Pressures at point A and B are 1500 kgf/m² and – 3525 kgf/m² respectively. [6]
3(b) State momentum principle. Find the components of hydrodynamic force on the bend as shown in Fig.4. The bend is kept in horizontal plane. Head losses may be neglected. [6]
3(c) For a lawn sprinkler as shown in Fig. 5 has 1 cm diameter nozzle at the end of a rotating arm and discharges water at the 8 m/s relative to rotating arms. Determine the torque to hold the rotating arm stationary. Equal discharge is entering into all arms of the sprinkler. [3]
4(a) Differentiate among:
   (i) Small and large orifices
   (ii) Nozzle and a mouthpiece
   (iii) Weir and sluice gate [3]
4(b) Derive the expression for emptying a rectangular tank by means of an orifice fitted at its bottom. [6]
4(c) Derive the discharge equation for Borda’s mouth piece. [6]
B. E. AUTUMN (III SEMESTER) EXAMINATION-2018
(CIVIL ENGINEERING)
ENGINEERING GEOLOGY
(ECE – 215)

MAXIMUM MARKS: 60 Credits: 04 Duration: Two Hours

Note: Answer all questions.

1. Write a short account of origin and classification of rocks. (15)

OR

1'. Write a short account of internal structure of the earth linking it with the plate tectonic operation. (15)

2. What do you understand by deformation of rocks? Draw labeled diagrams of important deformation structures and write their importance in civil engineering. (15)

3a. Give a short account of hydrological cycle and its elements. (7.5)

3b. Geological investigations for tunnel construction (7.5)

4. Write short notes on any two of the followings:
   (a) Fundamentals of stratigraphy (7.5)
   (b) Uses of as rock material and properties (7.5)
   (c) Construction problems of permafrost regions (7.5)
   (d) Unconformity (7.5)
2018-19
B.E. (AUTUMN SEMESTER) EXAMINATION
CIVIL ENGINEERING
CIVIL ENGINEERING MATERIALS AND CONSTRUCTION PRACTICE

ECE-221

Maximum Marks: 60
Answer all the questions.

Q.No. Question MM

1(a) Define Bogue Compounds. Name the four important constituents of cement and explain the manufacturing of cement by dry process. Also describe briefly how Rapid Hardening Portland Cement is manufactured. Write its advantages. [07]

1(b) Describe any FOUR of the following:
   (a) Hydrophilic and Hydrophobic cement
   (b) Bulking of sand
   (c) Methods of Curing of concrete
   (d) Laitance
   (e) Rebound Hammer test on hardened concrete [08]

2(a) Describe the qualities of good brick earth and write short notes on types of kilns [07]

2(b) Discuss the classification of Timber and defects of timber. [08]

OR

2(b') What are the requirements of a good preservative for timber? Explain the treatment of timber by the ASCU Process. [08]

3(a) What are building bye-laws and its objectives? Write down the criteria for site selection? [07]

OR

3(a') What do you understand by orientation of a building? What are the main considerations of planning? [07]

3(b) Describe any FOUR of the following:
   (i) Lattice window
   (ii) Double hinged door
   (iii) Damp proofing in buildings
   (iv) Termite proofing in buildings
   (v) Fire protection of buildings [08]

4(a) What is Scaffolding and why is it required? Describe any two types of scaffolds with neat sketches. [07]

OR

4(a') Define Dewatering. Write down the different types of dewatering methods and explain any one of them with neat sketch. [07]

4(b) What do you understand by Underpinning of structures? Also explain the pile driving mechanism by drop hammer method with neat diagrams. [08]
Note: Answer all questions. The marks are given in parenthesis.

1. Give a short account of internal structure of the earth and its operation within the
   purview of plate tectonics. (15)

   OR

1'a. Enumerate different types of metamorphism and resultant rocks with their
    characteristics. (7.5)

1'b. What are different types of igneous rocks? List different textural characteristics of these
    rocks. (7.5)

2. What are folds? Give their classification scheme and significance in civil engineering. (15)

3. Write short notes on any two of the followings:
   a. Stratigraphy and its fundamental concepts (7.5)
   b. Groundwater in un consolidated and consolidated medium (7.5)
   c. Core Recovery Percent and Rock Quality Designation (7.5)
   d. Endogenous and exogenous processes (7.5)

4. Enumerate different uses of rocks in civil engineering and important physic-mechanical
   properties to be ensured. (15)

   OR

4'. List different causes of earthquakes. Briefly explain seismic zoning of India with respect
   to the geotectonic setup of India. (15)
2018-19
B.E. (AUTUMN SEMESTER) EXAMINATION
CIVIL ENGINEERING
FLUID MECHANICS - I ECEC-2130

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)    Derive the expression for viscous torque for a frustum of cone having radii R1 and R2 kept in a conical bearing by taking suitable symbols. If the angle of cone is 90°, viscosity of oil is 10 poise, gap between cone and bearing is 2 mm and cone is rotating at 100 rpm, find the viscous torque.                  7
1(b)    The velocity vector is defined as \( V = x^2 y^3 z \times i - 2 x y z^2 j \), find:
(i) Acceleration along \( y \)-direction at \( p(1,1,3) \)
(ii) rotation component along \( z \)-direction at \( Q(1,2,1) \)
(iii) Circulation component along \( z \) direction at \( R(1,1,2) \)                      6

OR

1'(b)   Explain velocity potential and stream function. Show that \( \phi \) lines and \( \psi \) lines intersect each other orthogonally.                                           6
1(c)    What is a flow net? What are its practical utilities?                                               2
2(a)    List out various types of manometers. Explain the working of a differential U-tube manometer.     4
2(b)    Differentiate among gauge pressure, atmospheric pressure and vapour pressure.                        3
2(c)    A 4 m long cylindrical gate with diameter 1.0m is subjected with water as shown in Fig 1. Find the resultant force on the gate.                                  8

OR

2'(a)   Explain the terms centre of pressure, centre of buoyancy and metacentre.                           3
2'(b)   A rectangular pontoon floating in sea water (sp. Gr. =1.025) is 20m x 8m x3m deep and weighs 1600 kN. It carries on its deck a load of 1000 kN. The C.G. of the load is 2.5 m above the deck and that of the pontoon at 1.5 m below the deck. Find the metacentric height.  9
2'(c)   Explain various types of equilibrium.                                                                3

contd...
3(a) Write all three forms of Bernoulli's equation. How this equation may be written when pump and turbine are also joined in pipe lines. If 115 l/s water is pumped from the reservoir as shown in Fig. 2, what will be pressure at points A and B if the pump supplied 17.65 kW energy.

OR

3'(a) Find the hydrodynamic force of circular water jet on the curved vane as shown in Fig. 3.

3(b) If R be the range of a jet on the horizontal plane through the point of projection and h is the maximum height reached, show that the maximum horizontal range is \(2h + \frac{R^2}{8h}\)

3(c) For a lawn sprinkler (Fig. 4) with four equal arms, rotating at N rpm, develop the expression for hydraulic torque. The diameters of all nozzles are same and equal amount of discharge is passing through each nozzle.

4(a) How orifices are classified based on their shape, size and submergence?

4(b) A tank has two cylindrical orifices, each 5cm in diameter, in one of its vertical sides and are situated one above the other. The upper orifice is 4m below the water surface and the lower one is 6m below the water surface. The coefficient of contraction and velocity are 0.64 and 0.98 for both the orifices. Find:
   (i) The combined rate of discharge from the both the orifices and
   (ii) The distance of point of interaction of the two jets from the vertical side.

4(c) A contracted weir 1.2 m high is to be installed in a channel 3.5 m wide. The maximum flow over the weir is 4m³/s when the total depth on the upstream of the weir is 2.25 m. What length of the weir should be installed?

... contd. 3.
Fig. 1

\( Q = 50 \text{ l/s} \)
\( v = 8 \text{ m/s} \)

Fig. 3

Fig. 2

Fig. 4
2018-19
B.E. (AUTUMN SEMESTER) EXAMINATION
(CIVIL ENGINEERING)
ECEC-2150/ECE-220(OLD COURSE)
QUANTITY SURVEY
Credits: 04

Maximum Marks: 60
Note: Attempt all questions. Assume suitable data, if required.

Q1 Determine the total number of bricks to be used in the superstructure and foundation of a building having plan and wall section as shown in Fig.1. (15)

OR

Q1'(a) What do you understand by estimate? Enumerate different methods for estimate and explain any one of them in detail. (7.5)

Q1'(b) Briefly discuss the different rules of measurement given by Bureau of Indian Standards. (7.5)

Q2(a) Prepare the analysis of rates for first class brick laid in cement mortar 1:6 in the superstructure. Adopt the present market rates. (7.5)

Q2(b) Write down the requirements of the following elements of a residential building as per NBC-2016:
(i) Habitable rooms
(ii) Kitchen
(iii) Bathroom and W/C
(iv) Store room
(v) Garage

Q3(a) What do you understand by term specification? Differentiate between general and detailed specification. (7.5)

Q3(b) Calculate the quantities of materials required for 50 cubic metre of reinforced cement concrete in beams and slabs in the ratio of 1:1.5:3. (7.5)

OR

Q3'(b) Briefly discuss the following terms:
(i) Plinth area
(ii) Earnest money
(iii) Security deposit
(iv) Floor area ratio

Q4(a) What is the departmental procedure for execution of a civil engineering project? (7.5)

Q4(b) What is a contract? List different types of contract and explain any one of them in detail. (7.5)

Contd.....2
Maximum Marks: 60

Answer all the questions.

Q.No. | Question | MM
--- | --- | ---
1(a) | Name the four important constituents of cement and their proportions expressed as percentages stating the role of each in achieving its properties. Also describe briefly how Portland slag cement is manufactured. Write its three advantages over Ordinary Portland cement. | [07]
1(b) | Describe any FOUR of the following:  
(a) Hydraulic and Non Hydraulic cement  
(b) Bulking of fine aggregates  
(c) Methods of Curing of concrete  
(d) Segregation and Bleeding of concrete  
(e) Los Angeles Test for aggregates  
(f) Pull out and Penetration tests on hardened concrete | [08]
2(a) | Describe the steps involved in Brick manufacturing. | [07]
2(b) | Describe the properties of timber and explain FOUR common defects of timber. | [08]

OR

2(b') | What are the requirements of a good preservative for timber? Explain the treatments of timber by Creosoting and by the ASCU Process. | [08]
3(a) | What are building bye-laws and its objectives? Write down the criteria for site selection? | [07]

OR

3(a') | What do you understand by Planning of a building? What are the main considerations of planning? Describe any four principles of planning. | [07]
3(b) | Describe any FOUR of the following:  
(i) Bay window  
(ii) Louvered door  
(iii) Composite columns  
(iv) Damp proofing in buildings  
(v) Termite proofing in buildings  
(vi) Fire protection of buildings | [08]

4(a) | What is Shoring and why is it required? Describe Flying Shore types with neat sketch. | [07]

OR

4(a') | Define Scaffolding. Write down the different types of scaffolding and explain Double pole scaffold with neat sketch. | [07]
4(b) | What is the difference between a Cofferdam and Caisson? Explain their uses. Also explain the pile driving mechanism with neat diagrams. | [08]