2014-15
B.E. III SEMESTER EXAMINATION
CIVIL ENGINEERING
MATHEMATICS-III
EAM-211

Maximum Marks: 60
Credits: 04
Duration: Three Hours

Answer all questions.
Programmable calculators are not allowed.
Write answers up to four decimals.
Notations and symbols used have their usual meaning.

Q. No. Question M.M.
1(a) Find the directional derivative of the divergence of the vector field \( \mathbf{F} = xy\mathbf{i} + xy^2\mathbf{j} + z^2\mathbf{k} \) at the point (2,1,2) in the direction of the outer normal to the sphere \( x^2 + y^2 + z^2 = 9 \) at the same point. [05]

1(b) For any vector field \( \mathbf{A} \) prove that \[ \nabla (\mathbf{A})^2 = 2 (\mathbf{A} \cdot \nabla)\mathbf{A} + 2 \mathbf{A} \times (\nabla \times \mathbf{A}). \]

OR

1'(b) For any vector field \( \mathbf{F} \) prove that \( \text{Curl} \text{Curl} \mathbf{F} = \text{grad} \text{div} \mathbf{F} - \nabla^2 \mathbf{F}. \) [05]

1(c) A fluid motion is given by \( \mathbf{V} = (y \sin z - \sin x)\mathbf{i} + (x \sin z + 2yz)\mathbf{j} + (xy \cos z + y^2)\mathbf{k}. \) Is the motion irrotational? If so, find the scalar potential. [05]

2(a) Evaluate the integral \( \iint_S \mathbf{F} \cdot \mathbf{n} \, dS \), where \( \mathbf{F} = x^2\mathbf{i} + x^2y\mathbf{j} + x^2z\mathbf{k} \) and \( S \) is the surface of the cylinder \( x^2 + y^2 = a^2 \) bounded by \( z = 0, z = b. \) [05]

2(b) Verify divergence theorem for \( \mathbf{F} = 4xz\mathbf{i} - y^2\mathbf{j} + yz\mathbf{k} \) over the cube bounded by \( x = 0, x = 1, y = 0, y = 1, z = 0, z = 1. \)

OR

2'(c) Verify Stokes theorem for \( \mathbf{F} = x^2\mathbf{i} + xy\mathbf{j} \) in the square region in XOY plane bounded by the lines \( x = 0, x = a, y = 0, y = a. \) [10]

Contd...
3(a) Show that the function that the function
\[ f(z) = \begin{cases} \frac{x^2(1+i) - y^2(1-i)}{x^2 + y^2}, & z \neq 0 \\ 0, & z = 0 \end{cases} \]
satisfies the Cauchy–Riemann equations at \( z = 0 \). Is the function analytic at \( z = 0 \)? Justify your answer.

3(b) Is the function \( u = \frac{1}{2} \log(x^2 + y^2) \) harmonic? If so, determine its conjugate function.

OR

3′(b) If \( u - v = (x - y)(x^2 + 4xy + y^2) \), and \( f(z) = u + iv \) is an analytic function, find \( f(z) \) in terms of \( z \).

3(c) Evaluate the integral \( \int_C \frac{3z + 1}{z^2 - 1} \, dz \) where \( C \) is the circle \( |z| = 2 \).

4(a) Form the partial differential equation by eliminating \( f' \) from
\[ f'(x^2 + y^2, z - xy) = 0. \]

4(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

4′(b) A rectangular plate with insulate surfaces is 10 cm wide and so long compared to its width that it may be considered infinite in length without introducing an appreciable error. If the temperature along the short edge \( y = 0 \) is given by
\[ u(x, 0) = \begin{cases} 20x, & 0 \leq x \leq 5 \\ 20(10 - x), & 5 \leq x < 10 \end{cases} \]
While the two long edges \( x = 0 \) and \( x = 10 \) as well as the other short edge \( s \) are kept at \( 0^\circ \)C. Find the steady state temperature \( u(x, y) \) at any point \( p(x, y) \) of the plate.
AUTUMN 2014-15
B. E. (WINTER SEMESTER) EXAMINATION
CIVIL ENGINEERING
CIVIL ENGINEERING MATERIAL
ECF 212

Maximum Marks: 60 Credits: 04 Duration: Three Hours

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

Q. No. Question M.M.
(a) With the help of flow chart diagram, describe the manufacture of Portland cement by dry and wet process. Also make a comparative statement between two processes. 08

(b) Describe the characteristics of any two of the following:
(i) Rapid hardening Portland cement
(ii) Portland Pozzolana cement
(iii) High alumina cement
(iv) Portland slag cement 04

2(a) What is mean by workability of concrete? Describe the factors affecting the workability of concrete. 06

(b) Differentiate between segregation and bleeding of concrete. Write the circumstances in which the segregation and bleeding take place. 06

OR

2'(a) What is mean by curing of concrete? Describe the methods of curing of concrete. 06

(b) What does shrinkage of concrete mean? Discuss the classification of shrinkage of concrete. 06

3(a) Write the compositions of good brick-earth and describe the properties of the constituents. 06

(b) What are the classifications of bricks? Discuss their characteristics and uses. 06

3'(a) Describe the characteristics and uses of different types of bricks. OR

3'(b) What is lime? Describe the specifications and characteristics of lime. 06

4(a) What are the characteristics of good timber? Discuss the various defects of timber. 06

(b) What is seasoning of timber? Discuss the various methods of seasoning of timber. OR

4'(a) What is mean by preservation of timber? Describe the various methods of preservation of timber. 06

(b) Describe the characteristics and uses of different types of steel used in civil engineering structures. 06

5(a) Discuss the functions of various constituents of glass. Also describe the characteristics of sheet, laminated and insulating glass. 08

(b) Define bitumen and describe the properties and uses of various kinds of bitumen. 04
**2014-15**  
**B.E. (AUTUMN SEMESTER) EXAMINATION**  
**CIVIL ENGINEERING**  
**ENGINEERING GEOLOGY**  
**ECE 215**  

**Maximum Marks: 60**  
**Credits: 04**  
**Duration: Three Hours**

*Answer all the questions.*  
*Assume suitable data if missing.*

<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>Define and differentiate between &quot;Fracture&quot; and &quot;cleavage&quot; with example of minerals.</td>
<td>[06]</td>
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<td>1(b)</td>
<td>What do you understand by &quot;Form&quot; of rocks. Give examples from igneous rocks.</td>
<td>[06]</td>
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<td>2</td>
<td>Enumerate different geomorphic processes. In what ways knowledge of these processes are important for civil engineers?</td>
<td>[12]</td>
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<td><strong>OR</strong></td>
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<td>2'</td>
<td>What are the factors which cause deformation of rocks? Show with neat diagrams important deformation structures and their parts.</td>
<td>[12]</td>
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<td>3</td>
<td>Give a pictorial account of vertical distribution of groundwater in unconsolidated medium, showing different types of aquifers.</td>
<td>[12]</td>
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<td>4</td>
<td>Discuss various geological factors to be taken into consideration for construction of tunnels.</td>
<td>[12]</td>
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<td><strong>OR</strong></td>
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<td>4'</td>
<td>What are the causes of landslides. What are the civil engineering measures are taken to mitigate this problem.</td>
<td>[12]</td>
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<td>5</td>
<td>Write short notes on any two of the followings:</td>
<td>[2 x 6]</td>
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<td>(a) Uncertainty</td>
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<td>(b) Core Recovery and Rock Quality Designation</td>
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<td>(c) Qualities of Building Stones</td>
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<td>(d) Geotechnical Units</td>
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1. Determine the number of bricks for the room as shown in Fig 1, required in:
   (i) Superstructure of height 4000 mm and wall thickness of 229 mm
   (ii) Plinth of height 1000 mm
   (iii) Second footing of thickness equal to two bricks
   (iv) First footing of thickness equal to two bricks
   (v) The pumphet wall of height 600 mm

2(a) Draw a neat sketch of the wall section and write the dimensions of its components.

2(b) What is DPC? Write its purpose and dimensions.
2'(a) Draw a neat sketch of the foundation plan of the rooms as shown in Fig. 1.

2'(b) Write the standard sizes of:
(i) Door
(ii) Window
(iii) Ventilator

3(a) What is the purpose of rate analysis?

3(b) Analyse the rates for 1st class brickwork in foundation and plinth with 20x10x10 cm bricks per cubic metre with 1:6 cement sand mortar.

OR

3 Write short notes on the following
(i) Contract Document (ii) Earnest Money and Security Deposit

4(a) Write the least dimensions of the front setback, side setbacks and courtyard in a residential building for a plot size of:
(i) 250 sq. m
(ii) 500 sq.m

4(b) Write the least dimensions of
(i) Bed Room (ii) Drawing cum Dining Room (iii) Kitchen
(iv) Wash Room (v) Store (vi) Width of Internal and External Verandah

4(c) Write short notes on:
(i) Quantity Survey and its Requirement (iii) Different areas in a Building

5 What is a contract? Discuss in detail the essential requirements of contract