

2023-204

**B.TECH. (III- SEMESTER) EXAMINATION
(CIVIL ENGINEERING)
APPLIED MATHEMATICS-III**

AMS-2110

Credits-03

Maximum Marks: 60

Duration: Two Hours

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Note: Answer all questions:

Q.1 (a) Find the directional derivative at $(1, -2, 1)$ on the sphere $x^2 + y^2 + z^2 = 6$ in direction normal to the surface $z = 2x^2 + y^2 - 5$ at the point $(1, -2, 1)$. [6]
CO-1

(b) If \vec{r}_1 and \vec{r}_2 are the vectors joining the fixed points (x_1, y_1, z_1) and (x_2, y_2, z_2) respectively to variable point (x, y, z) , prove that [7]
CO-1
(i) $\text{grad}(\vec{r}_1 \cdot \vec{r}_2) = \vec{r}_1 + \vec{r}_2$ (ii) $\text{curl}(\vec{r}_1 \times \vec{r}_2) = 2(\vec{r}_1 - \vec{r}_2)$.

OR

(b') Show that a vector field $\vec{F} = (y \sin z - \sin x)\hat{i} + (x \sin z + 2yz)\hat{j} + (xy \cos z + y^2)\hat{k}$ is irrotational and hence find its scalar potential ϕ , given that $\phi = 0$ at the origin.

(c) Verify Green's theorem in the plane for $\int_C (y - \sin x)dx + \cos x dy$, where C is the triangle with vertices $(0, 0)$, $(\pi/2, 0)$ and $(\pi/2, 1)$. [7]
CO-1

Q.2(a) Show that the polar form of Cauchy-Reimann equation is [6]

$$\frac{\partial u}{\partial r} = \frac{1}{r} \frac{\partial v}{\partial \theta}, \quad \frac{\partial v}{\partial r} = -\frac{1}{r} \frac{\partial u}{\partial \theta}. \quad \text{CO-2}$$

(b) If $f(z)$ is an analytic function of z , prove that [7]
CO-2
 $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) |f(z)|^p = p^2 |f'(z)|^2 |f(z)|^{p-2}$.

OR

(b') Determine the analytic function $f(z) = u + iv$ in terms of z , if $u - v = (x - y)(x^2 + 4xy + y^2)$.

(c) (i) Use Cauchy's integral theorem to evaluate the integral $\int_C \frac{z}{z^2+1} dz$, where C is $|z + i| = 1$.

(ii) Evaluate the following integral using Cauchy's integral formula $\int_C \frac{\sin^2 z}{(z-\pi/6)^3} dz$, where $C: |z| = 1$. [7]
CO-2

contd....2.

Q.3(a) Find the partial differential equation by eliminating the arbitrary functions from $z = f(x + ct) + g(x - ct)$.

[5]
CO-3

(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 μ is a constant and then released. Find the displacement of any point x of the string at any time $t > 0$.

[7]
CO-3

OR

(b') A rod of length l with insulated sides is initially at a uniform temperature u_0 . Its ends are suddenly cooled to 0°C and are kept at that temperature. Find the temperature function $u(x, t)$.

(c) A long rectangular plate of width a cm with insulated surfaces has its temperature v equal to zero on both long sides and one of the short sides so that $v(0, y) = 0$, $v(a, y) = 0$, $v(x, \infty) = 0$, $v(x, 0) = kx$. Show that the steady state temperature within the plate is $v(x, y) = \frac{2ak}{\pi} \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n} e^{-\frac{n\pi y}{a}} \sin \frac{n\pi x}{a}$.

[8]
CO-3

2023-24

**B. TECH. (AUTUMN SEMESTER) EXAMINATION
DEPARTMENT OF CIVIL ENGINEERING
ENGINEERING GEOLOGY (CEA-2140)**

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.	COs
1	Write a brief classification of minerals. How different physical properties of minerals control the engineering properties of rocks?	15	1
2 (a)	Give a short account of deformation of rocks. Draw neat diagrams to show different parameters of these deformation structures.	07	2
2(b)	Discuss the factors controlling the evolution of landforms. How anthropological interventions are affecting the geomorphic processes?	08	2
OR			
2(b')	Define "Endogenous" and "Exogenous" processes. How they help in landform evolution?	08	2
3(a)	Define earthquake and related parameters. How Plate Tectonics can be linked with different types of earthquakes?	07	3
OR			
3(a')	Define landslides with brief classification. What kind of remedial measures can be adopted to lessen this problem?	07	3
3(b)	Define Core Recovery Percent and Rock Quality Designation. How these tests are use full in Rock mass investigation and characterization?	08	3
4(a)	Discuss the importance of parameters taken into consideration for Rock Mass Rating System and significance of classes.	08	4
4(b)	How Rock Mass Quality is calculated? How many classes it has and how it is used for tunnel support design?	07	4

2023-24

**B.TECH. (CIVIL ENGINEERING) III SEMESTER
END SEMESTER EXAMINATION
FLUID MECHANICS (CEC-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.	COs
1(a)	Discuss any <u>Three</u> of the following: (i) Stream line and streak line (ii) Circulation and vorticity (iii) Kinetic energy and momentum correction factors (iv) Velocity potential, stream function and flow net (v) Newtonian and non-Newtonian fluids	09	CO1
1(b)	Differentiate between the local and convective accelerations. Show that tangential acceleration α_t is given by: $\alpha_t = \frac{\partial V}{\partial t} + V \frac{\partial V}{\partial s}$	06	CO1
2(a)	Define meta-center. A wooden block of specific gravity 0.75 floats in water. If the size of the block is 1m x 0.5 m x 0.4 m, find its meta centric height.	08	CO2
2(b)	What is vortex flow? An open cylinder of 18 cm diameter and 120 cm long contains water up to a height of 90 cm. Find the maximum speed at which the cylinder to be rotated about its vertical axis so that no water spills.	07	CO2
3(a)	Derive the equation for momentum correction factor (β) and discuss its significance. From a reservoir, water is pumped at the rate of 220 litre/sec under the given condition as shown in Figure 1. If the pump supplies energy to the flow at a rate of 18 kW, find the pressure intensities at points A and B.	08	CO3

OR

Contd...20

- 3(a') Derive the Euler's equation for flow of real fluid. A 250 litre/sec of water is flowing in a pipe having a diameter of 300 mm. If the pipe is bent by 135°, find the magnitude and direction of the resultant force on the bend. The pressure of water flowing is 39.24 N/cm². 08 CO3
- 3(b) Explain momentum principle. Find the speed of rotation for the sprinkler system as shown in Figure 2. Given data: Diameter of each nozzle is 10 cm; Total discharge is 1.5 litre/sec. All arm lengths are equal. 07 CO3
- 4(a) Define different type of hydraulic coefficients. A circular tank of diameter 4 m contains water upto a height of 5 m. The tank is provided with an orifice of diameter 10 cm at the bottom. Find the time taken by water for completely emptying the tank. Take $C_d = 0.6$ 07 CO4
- 4(b) Differentiate between weirs and notches? Water is flowing at a head of 1.2 m over a 5.0 m long rectangular weir. If the coefficient of discharge for the weir is 0.65, find the rate of flow. 08 CO4

OR

- 4(b') Classify the mouthpiece on the basis of position and discharging condition. Calculate the coefficient of velocity through an external cylindrical mouth piece. 08 CO4

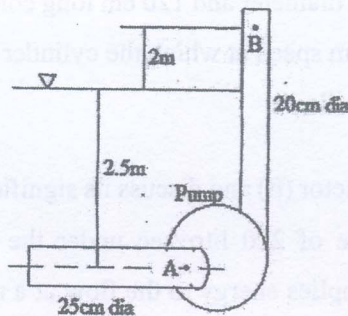


Figure. 1

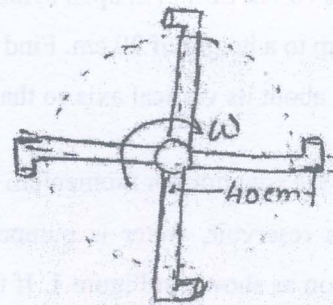


Figure. 2

2023-24
B.TECH. (AUTUMN SEMESTER) EXAMINATION
CIVIL ENGINEERING
QUANTITY SURVEY
CEC 2150

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	COs	M.M
1 (a)	Discuss various principles of planning for a residential building complex.	CO1	[05]
OR			
1(a')	Describe the types of staircases with the help of neat sketches.	CO1	[05]
1(b)	Give the geometric design of dog-legged stairs for a single storey of residential building of 3.0 m floor height and staircase size of 2 m x 4.5 m. Also, draw Plan and Section details of the staircase.	CO1	[5+5]
2	Prepare a detailed estimate for the following items required in a R.C.C. Roof Slab of 3 m clear span and 6 m long (Fig. 1).	CO2 CO3	[15]
	(i) R. C. C. work (1:1.5:3) [Rs. 4500/cu.m]		
	(ii) Main and Distribution reinforcement steel bars [12mm dia bar @ 0.9 kg/m: Rs. 37/kg] [6 mm dia bar @ 0.22 kg/m: Rs. 35/kg]		
3	What is meant by Specifications and why they are necessary in construction work?	CO3	[15]
OR			
3'(a)	What is the purpose of Rate Analysis? Determine the quantity of materials to construct a 500 m long, 8 m wide and 25 cm thick cement concrete road of M20 grade concrete	CO2 CO3	[10]
3'(b)	Write short notes on <u>any two</u> of the following	CO2	[05]
	(a) Administrative Approval and Technical Sanction		
	(b) Quantity survey and its requirement		
	(c) Capital Cost of Project		
4	Write short notes on the following:-	CO4	[15]
	(a) Contract Document		
	(b) Percentage Rate Contract		

Contd...2

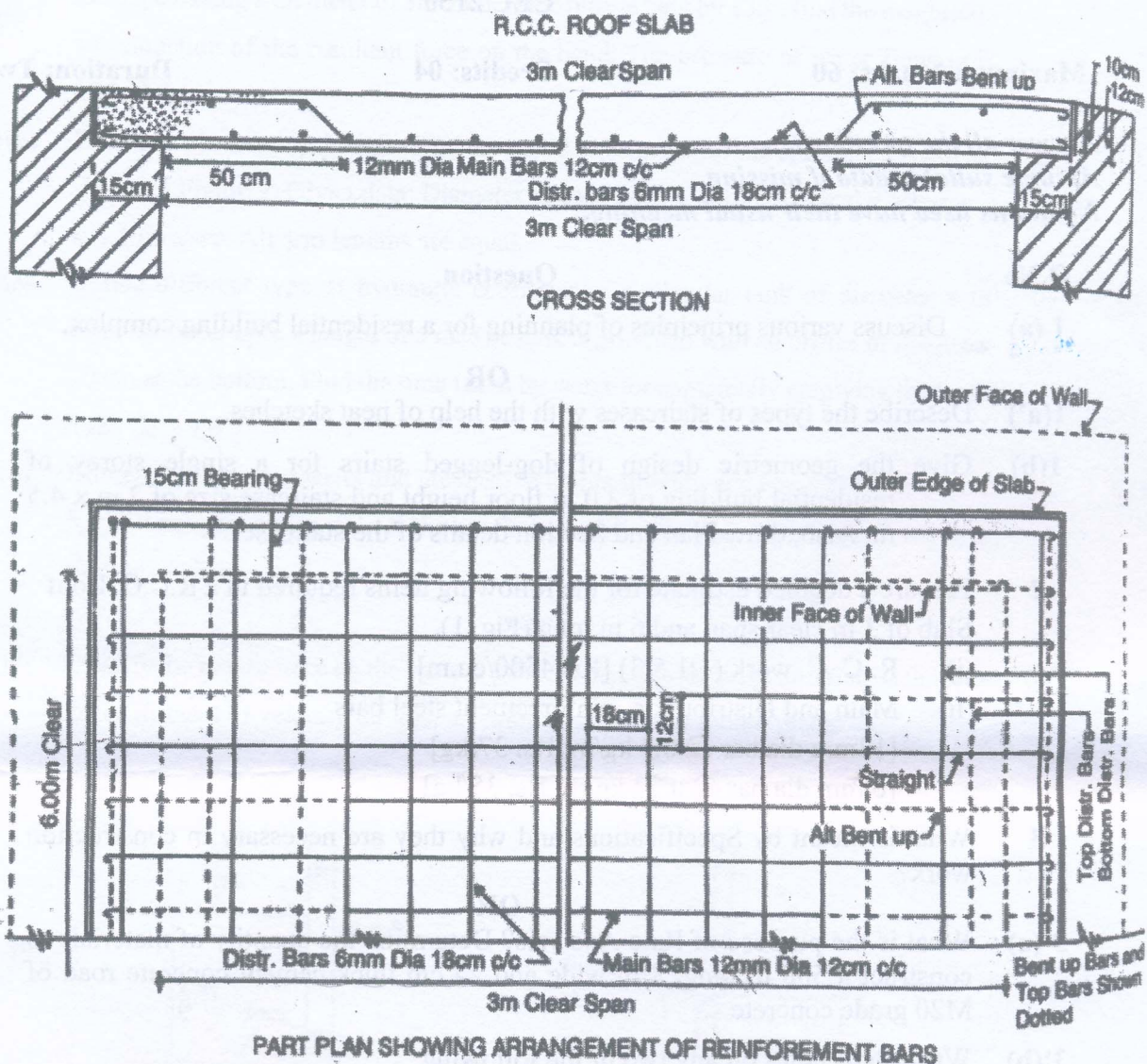


Fig. 1 Framing Plan and Section of Roof Slab with reinforcement details

2023-24
B. TECH. III SEMESTER (AUTUMN SEMESTER) EXAMINATION
CIVIL ENGINEERING
CIVIL ENGINEERING MATERIALS AND CONSTRUCTION PRACTICE
CEC 2160

Maximum Marks: 60

Credits: 04

Duration: Two Hours

Answer all the questions.

Sketch neat diagrams, if necessary.

Q. No.	Question	M.M.	CO's
1 (a).	What do you mean by OPC 43 grade of cement? Describe the characteristics of any two of the following cement. (i) Portland Pozzolana cement (ii) Blast furnace slag cement (iii) Expansive cement (iv) Oil well cement	[1+2×2.5=6]	1
1 (b).	Answer any three of the following: (i) With the help of neat sketches, discuss the influence of size and shape of aggregate on the design and construction of concrete structures. (ii) Use of objectionable water and sea water in concrete construction. (iii) Differentiate between segregation and bleeding in concrete and discuss their effects on the production of concrete. (iv) What do you mean by compaction of concrete? Discuss various methods of compaction used in concrete construction. (v) For any concrete mix design, discuss the adjustment of the quantity of maximum mixing water per unit volume of concrete for shapes of aggregate, slump values, and dosage of superplasticizer.	[3×3=9]	1
2.	Answer any three of the following: (i) Describe field tests for soil required for the manufacturing of brick. Also, discuss the classification of bricks. (ii) With the help of neat sketches, discuss the importance of king and queen closure in brick masonry construction. (iii) With the help of neat sketches, discuss the defects in timber developed during the growth of the tree and after the tree fell. (iv) Describe the characteristics of reinforcing steel bars, and also discuss their classifications.	[3×5=15]	2
3.	Explain the following with the help of neat sketches:	[3×5=15]	3

Contd ... 2.

- (i) Grillage Foundation
- (ii) Bored Compaction Pile
- (iii) Well Foundation

OR

- 3'. Explain the following with the help of neat sketches: [3×5=15] 3
- (i) Collapsible Steel Door
 - (ii) Double Hung Window
 - (iii) Effect of Dampness
4. Explain the following with the help of neat sketches: [3×5=15] 4
- (i) Raking Shores
 - (ii) Vertical Sheeting
 - (iii) Well Point System