4E1313

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# 4E1313

## B. Tech. IV - Sem. (Main / Back) Exam., - 2025

## Agricultural Engineering

## 4AG2-01 Advance Engineering Mathematics-II

## AG, CE, MI

**Time: 3 Hours** **Maximum Marks: 70**

*Instructions to Candidates:*

***Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.***

*Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.*

*Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL 2. NIL

## PART – A

**[10×2=20]**

**(Answer should be given up to 25 words only)**

**All questions are compulsory**

Q.1 Write the Chebyshev's Inequality.

Q.2 If X and Y are two independent random variables and E(X) = ½ and E(Y) = 1, then what will be the value of E(2XY)?

Q.3 Given the function $f(x) = 1 - |1 - x|$, $0 < x < 2$. Is this function a density function?

Q.4 Define Binomial distribution.

Q.5 State the condition when Poisson distribution is a limiting case of Binomial distribution.

Q.6 Calculate Cov (x, y) when, $\sum x = 50$, $\sum y = -30$, $\sum xy = -115$, $n = 10$.

Q.7 If $r = 0.8$ and $b_{xy} = 0.32$, then what will be the value of $b_{yx}$?

Q.8 How many normal equations required for fitting a polynomial of 2n degree, by least square method?

Q.9 If $y = 2x + 10$ is the best fit for 10 pairs of values (x, y) by least square method, and $\sum y = 200$; then find the value of $\sum x$.

Q.10 Write the Spearman's formula for modified rank correlation coefficient for repeated rank.

## PART – B

[5×4=20]

**(Analytical/Problem Solving Questions)**

**Attempt any five questions**

Q.1 In a normal distribution with mean $\mu = 50$ and s. d. $\sigma = 10$, then find $x_1$ such that $P(-\infty \leq x < x_1) = .16$ and $x_2$ such that $P(x_2 \leq x < \infty) = .13$

Q.2 A factory machines A and B are producing springs of the same type. Of this production, machines A and B produce 5% and 10% defective springs respectively. Machines A and B produce 40% and 60% of the total production output of the factory. One spring is selected at random and it is found to be defective. What is the probability that this defective spring was produced by machine A?

Q.3 If $P(X = 2) = 9P(X = 4) + 90P(X = 6)$ in the Poisson distribution then find its mean, variance and standard deviation.

Q.4 Show that the following data are uncorrelated –

| x | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| y | 5 | 4 | 3 | 2 | 6 |

Q.5 Fit a straight line to the following data regarding x as independent variable-

| x | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| y | 1.0 | 1.8 | 3.3 | 4.5 | 6.3 |

Q.6 The coefficient of rank correlation of marks in Statistics and marks in Mathematics obtained by certain group of students is 0.8. If the sum of the squares of the difference in ranks is given to be 33, find the number of students in the group.

Q.7 Find the most likely price in Bombay corresponding to the price of Rs.70 at Calcutta from the following –

| | Calcutta | Bombay |
|---|---|---|
| Average price | 65 | 67 |
| Standard deviations | 2.5 | 3.5 |

Correlation coefficient between the prices of commodities in the two cities is 0.8.

## PART – C

**[3×10=30]**

**(Descriptive/Analytical/Problem Solving/Design Questions)**

**Attempt any three questions**

Q.1 Two balls are selected at random from a box containing three red, two green and four white. If X and Y are the number of red balls and green balls respectively included among the two balls drawn from the box, Find -

(a) Joint probability of X and Y.

(b) Marginal probability of X and Y.

(c) Conditional distribution of X given Y = 1.

Q.2 In sample of 1000 cases, the mean $\mu = 14$ and standard deviation $\sigma = 2.5$. Assuming the distribution to be normal find -

(i) The number of candidates whose score is between 12 and 15.

(ii) Number who score below 10.

(iii) Number who score above 20.

Q.3 If the skulls are classified as A, B and C according as the length-breadth index is under 75, between 75 and 80, or over 80. Using normal distribution find approximately the mean and standard deviation of a series in which A are 58%, B are 38% and C are 4%, being given that –

$$f(t) = \frac{1}{\sqrt{2\pi}} \int_0^t \exp(-x^2/2)\, dx,$$

Then f (0.20) = 0.08 and f (1.75) = 0.46.

Q.4 Calculate the coefficient of correlation from the following data –

| X: | 1 | 3 | 5 | 7 | 8 | 10 |
|---|---|---|---|---|---|---|
| Y: | 8 | 12 | 15 | 17 | 18 | 20 |

Also obtain the equations of line of regression and obtain an estimate of Y which should correspond on the average to X = 6.2.

Q.5 In a year there are 956 births in a town A, of which 52.5% were males, which in town A and B combined, this proportion in a town of 1,406 births was 0.496. Is there any significant difference in the proportion of male births in the two towns?

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# 4E1314

## B. Tech. IV - Sem. (Main / Back) Exam., - 2025

## Civil Engineering

## 4CE3-04 Basic Electronics for Civil Engineering Applications

**Time: 3 Hours** **Maximum Marks: 70**

*Instructions to Candidates:*

***Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.***

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*Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL 2. NIL

## PART – A

**[10×2=20]**

**(Answer should be given up to 25 words only)**

**All questions are compulsory**

Q.1 How do full adder circuit function in binary arithmetic operations? [2]

Q.2 Explain the significance of V-I characteristics in semiconductor diodes. [2]

Q.3 What role does GNSS play in control surveys and coordinate computations? [2]

Q.4 Define gross errors and systematic error in measurement process. [2]

Q.5 How do analog and digital systems differ in data acquisition and processing? [2]

Q.6 What are the applications of displacement sensors in structural monitoring? [2]

Q.7 What are the advantages of using ultrasonic flow sensors in fluid measurement? [2]

Q.8 How do Geometric and radiometric distortions affect remote sensing data? [2]

Q.9 What are the applications of Optical remote sensing in civil engineering? [2]

Q.10 What are the key steps involved in digital image pre-processing for enhancement? [2]

## PART – B

**[5×4=20]**

**(Analytical/Problem Solving Questions)**

**Attempt any five questions**

Q.1 What distinguishes R-S flip flop from J-K flip flop in digital circuits? [4]

Q.2 Explain how the Wheatstone bridge circuit is utilized in conjunction with strain gauges to measure stress in structural elements. Discuss the advantages of this configuration in terms of sensitivity and accuracy. [4]

Q.3 Explain the importance of sensor resolution in data accuracy. [4]

Q.4 Discuss the role of analog to digital converters (ADCs) in integrating analog sensors with digital monitoring systems in civil engineering applications. How does the resolution of an AX affect measurement accuracy? [4]

Q.5 Describe the working principal of a capacitive proximity sensor used to detect the displacement of a building element. How does the change in capacitance related to the displacement measurement? [4]

Q.6 How do atmospheric errors impact remote sensing and how can they be mitigated? [4]

Q.7 Describe the process of digital image classification in remote sensing. [4]

## PART – C

[3×10=30]

**(Descriptive/Analytical/Problem Solving/Design Questions)**

**Attempt any three questions**

Q.1 Compare the configurations of bipolar junction transistors: CC, CB and CE. [10]

Q.2 Explain the working of a digital theodolite and a total stations in civil engineering surveying. How do electronic angle and distance measurements improve precision? [10]

Q.3 What is the significance of Data Acquisition systems (DAQ) in structural health monitoring? Explain the role of ADCs microcontroller and communication modules in real time monitoring. [10]

Q.4 Explain the role of sensors in structural health monitoring. Discuss the working principles, advantages and applications of strain gauges, accelerometers and temperature sensors in civil engineering. [10]

Q.5 A microcontroller-based IoT system is used to real time structural health monitoring. Describe the design and working of the system, including sensor selection, data transmission and cloud storage. [10]

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# 4E1315

## B. Tech. IV - Sem. (Main / Back) Exam., - 2025

## Civil Engineering

## 4CE4-05 Strength of Materials

**Time: 3 Hours** **Maximum Marks: 70**

*Instructions to Candidates:*

***Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.***

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*Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL 2. NIL

## PART – A

**[10×2=20]**

**(Answer should be given up to 25 words only)**

**All questions are compulsory**

Q.1 Illustrate the contraflexure point with suitable example.

Q.2 What is elastic instability in a column?

Q.3 What is slenderness ratio?

Q.4 What is Young's modulus?

Q.5 Explain the complementary shear stress?

Q.6 List the principal methods of computing the deflection of beam.

Q.7 Write any two assumption in the simple theory of bending.

Q.8 What is the concept of torsion in circular bars?

Q.9 Describe the principle of superposition.

Q.10 What is principal stresses?

## PART – B

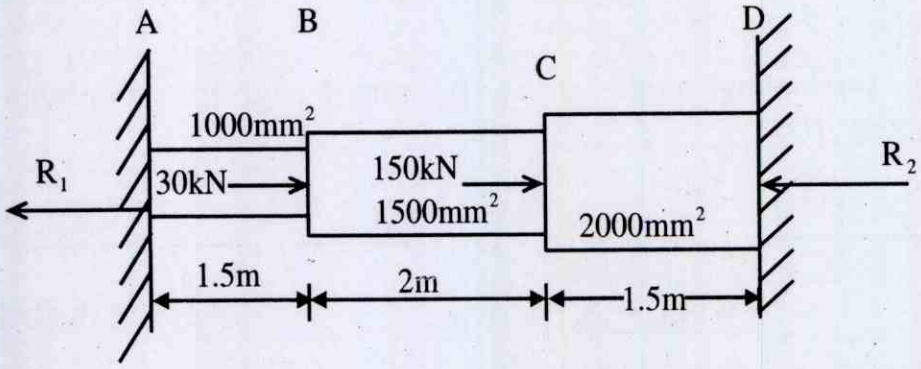
[5×4=20]

**(Analytical/Problem Solving Questions)**

**Attempt any five questions**

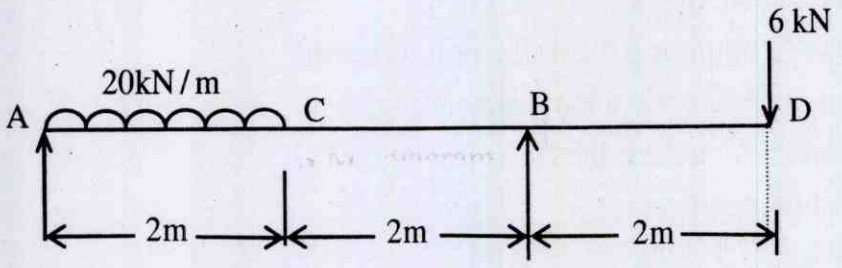
Q.1 Discuss major and minor principal stresses and draw Mohr's circle for two unlike stresses $P_1$ and $P_2$.

Q.2 A circular bar ABCD is rigidity fixed at A and D and is subjected to axial forces as shown in figure. Determine the reactions, the forces in each portion of the bar and the displacement of point B and C. Take E = 200 kN/mm$^2$.




Q.3 Derive the expression for two perpendicular normal stresses accompanied with state of simple shear.

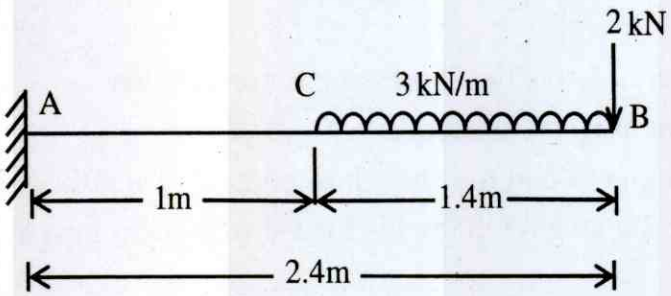
Q.4 Draw the S.F. and B.M. diagrams, indicating principle values, for an overhanging beam shown in figure.



Q.5 A solid shaft of mild steel 240 mm dia. is to be replaced by a hollow shaft of alloy steel for which allowable shear stress is 22 percent greater. The power to be transmitted is to be increased by 20 percent and the speed of rotation increased by 5 percent. Determine the maximum internal diameter of the hollow shaft.

Q.6 What are the equilibrium condition of a column? Define effective length and discuss Rankine's formula for column.

Q.7 A cantilever 2.4m long is loaded as shown in figure. Calculate the deflection at the end if the section is rectangular, 150 mm × 300 mm. Take $E = 0.2\times10^5$ N/mm$^2$




## PART – C

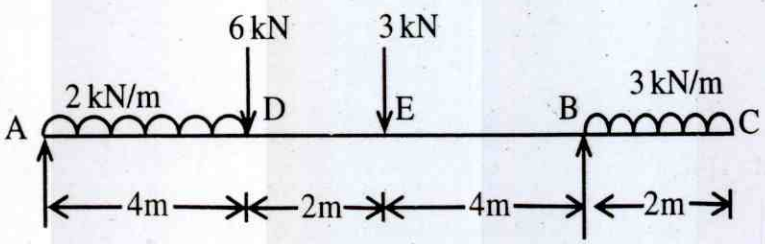
[3×10=30]

**(Descriptive/Analytical/Problem Solving/Design Questions)**

**Attempt any three questions**

Q.1 Derive the expression for the theory of simple bending. Write the assumptions in the simple theory of bending.

Q.2 Draw the S.F. and B.M. diagrams for the beam shown in figure indicating principal values.



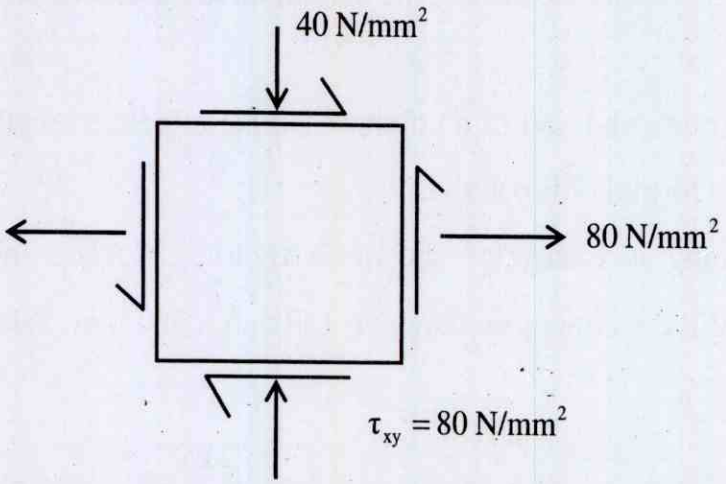
Q.3 For given state of stress, calculate -

(a) Normal and shear stress on oblique plane

(b) Principal stress and its location

(c) Maximum shear stress and its plane

(d) Obliquity and resultant stress



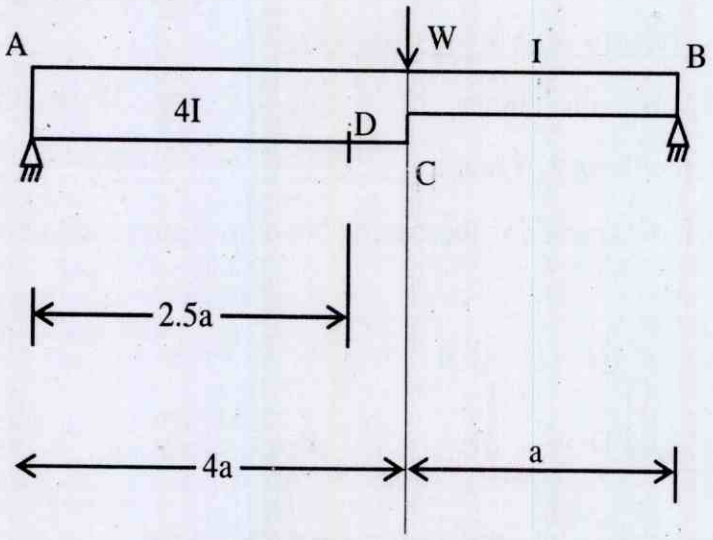

Q.4 Discuss the Euler's theory, derive the expression for critical load. What are the assumption of Euler's theory?

Q.5 A beam ACB, simply supported at the ends, has moment of inertia 4I for the length AC and I for the length CB, and is loaded with point load W at C. Determine -

(i) Slope at end A

(ii) Deflection at mid span and

(iii) Maximum deflection

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# 4E1316

## B. Tech. IV - Sem. (Main / Back) Exam., - 2025

## Civil Engineering

## 4CE4-06 Hydraulics Engineering

**Time: 3 Hours** **Maximum Marks: 70**

*Instructions to Candidates:*

***Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.***

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*Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL 2. NIL

## PART – A

**[10×2=20]**

**(Answer should be given up to 25 words only)**

**All questions are compulsory**

Q.1 Define Dynamic similarity.

Q.2 Define boundary layer.

Q.3 Write the Manning's and Chezy's equations of flow.

Q.4 Define uniform and non-uniform flow.

Q.5 Define specific energy.

Q.6 Write the momentum correction factor formula.

Q.7 Define super critical flow.

Q.8 Define various types of wells.

Q.9 Differentiate between turbines and pumps.

Q.10 Define the Draft tube.

## PART – B

[5×4=20]

**(Analytical/Problem solving questions)**

**Attempt any five questions**

Q.1 In the model test of a Spillway the discharge and velocity of flow over the model were $2m^3/s$ and 1.5m/s respectively. Calculate the velocity and discharge over the prototype which is 36 times the model size.

Q.2 Define displacement thickness. Derive an expression for displacement thickness.

Q.3 Find the discharge through a trapezoidal channel of width 8m and side slope of 1 horizontal to 3 vertical. The depth of flow of water is 2.4m and value of Chezy's constant C=50. The slope of the bed of the channel is given 1 in 4000.

Q.4 Obtain an expression for the force exerted by a jet of water on a fixed vertical plate in the direction of the jet.

Q.5 Describe various types of recording type rain gauges.

Q.6 Explain the various classification of canals.

Q.7 What are the various types of losses which occur in an irrigation canal?

## PART – C

[3×10=30]

**(Descriptive/Analytical/Problem Solving/Design Questions)**

**Attempt any three questions**

Q.1 The frictional torque T of a disc of diameter D rotating at a speed N in a fluid of viscosity $\mu$ and density $\rho$ in a turbulent flow is given by $T = D^5N^2\rho\phi\left[\frac{\mu}{D^2N\rho}\right]$. Prove this by the method of dimensions.

Q.2 Show that velocity distribution for turbulent flow through rough pipe is given by -

$$\frac{u}{u_*} = 5.75\log_{10}(y/k)+8.5$$

Where $u_*$ = shear velocity, y=distance from pipe wall.

k = roughness factor.

Q.3 Explain the term Hydraulic Jump. Derive an expression for the depth of Hydraulic Jump in terms of the upstream Froude number.

Q.4 Explain the unit Hydrograph method for the estimation of runoff and the maximum flood. What are its limitations?

Q.5 Explain in brief Lacey's regime theory. What are regime's conditions? Explain the terms true regime, quasi regime, permanent regime and the final regime conditions.

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**DO NOT WRITE ANYTHING HERE**

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# 4E1317

## B. Tech. IV - Sem. (Main / Back) Exam., - 2025

## Civil Engineering

## 4CE4-07 Building Planning

**Time: 3 Hours** **Maximum Marks: 70**

*Instructions to Candidates:*

***Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.***

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*Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL 2. NIL

## PART – A

**[10×2=20]**

**(Answer should be given up to 25 words only)**

**All questions are compulsory**

Q.1 What do you understand by evaporating cooling?

Q.2 What is reverberation?

Q.3 Name any five common acoustical defects in a public lecture hall.

Q.4 What is surrounding illuminance and its measurement unit?

Q.5 What do you understand by polar winds?

Q.6 How is FSI calculated for multi-storey buildings?

Q.7 How will you define the roominess and grouping in reference to a building?

Q.8 What do you understand by external privacy in planning of a building?

Q.9 Why bioclimatic chart is useful in building planning?

Q.10 How does a lift contribute to functional design in buildings?

## PART – B

[5×4=20]

**(Analytical/Problem solving questions)**

**Attempt any five questions**

Q.1 Compare different types of sun shading devices in terms of effectiveness by using suitable diagram.

Q.2 What is Stack Effect in reference of natural ventilation? Enumerate different ways of natural ventilation.

Q.3 How can an understanding of the earth's axial tilt, equinoxes, and solstices be applied in building, planning to enhance energy efficiency and adaptability to seasonal changes while promoting occupant well-being?

Q.4 Critically analyse the compliance of a building planning with relevant building bye-laws and regulations.

Q.5 What are the general principles and factors to be considered in acoustical design of a hall?

Q.6 Explain different factors affecting building planning - aspect, prospect, furniture requirement, circulation and elegance.

Q.7 What should be your view for the functional design and accommodation requirement of a primary school building?

## PART – C

[3×10=30]

**(Descriptive/Analytical/Problem Solving/Design Questions)**

**Attempt any three questions**

Q.1 How would you analyse and use sun-path diagram methods to optimize natural lighting and minimize solar heat gain in buildings? Draw and illustrate sun-path diagram for latitude N29° and guide to interpretate it correctly.

Q.2 How can a building planner achieve proper and critical illumination in design of lighting in a building? Discuss in detail with required diagram.

Q.3 How do the criteria for location and site selection influence the choice of building types? Provide examples to illustrate how factors such as topography, accessibility and environmental considerations impact the decision making process in site planning and building design.

Q.4 Discuss the rules of Vastu Shastra with the concept of effect of various directions and their characteristics.

Q.5 Being a building planner, how would you analyse and integrate the elemental facets of Climate into building design, ensuring that factors such as temperature, humidity, precipitation, and wind patterns are carefully addressed to optimize sustainability and user comfort?

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# 4E1318

## B. Tech. IV - Sem. (Main / Back) Exam., - 2025

## Civil Engineering

## 4CE4-08 Concrete Technology

**Time: 3 Hours** **Maximum Marks: 70**

*Instructions to Candidates:*

***Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.***

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*Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL 2. NIL

## PART – A

**[10×2=20]**

**(Answer should be given up to 25 words only)**

**All questions are compulsory**

Q.1 List four main compounds of Portland cement.

Q.2 Write percentage passing range values from 600μ sieve for various zones of fine aggregate.

Q.3 Write 28 days characteristic compressive strength value in $N/mm^2$ for M50 grade concrete.

Q.4 If slump values for two concretes A and B are 40mm and 80mm respectively, which of the 'A' and 'B' is more workable.

Q.5 State whether the concrete cube specimens be tested in 'dry' condition or 'wet' condition for compressive strength and why?

Q.6 If rebound hammer readings on two concretes 'P' and 'Q' at site are 20 and 28 respectively, then write comparative evaluation of 'P' and 'Q'.

Q.7 State for which conditions and type of structural members, curing method of 'wet burlap' may not be suitable/sufficient and preferably another method may be more efficient?

Q.8 What do you understand by 'attrition' as regard to concrete road/s?

Q.9 List three 'types' of superplasticizers.

Q.10 Write typical time removal of formwork of a concrete column in Jodhpur in the month of April (with ambient temperature in the range 40°C– 44°C). Size of column is 300×400mm and height of formwork is 1.5m.

## PART – B

**[5×4=20]**

**(Analytical/Problem solving questions)**

**Attempt any five questions**

Q.1 Write typical physical and chemical properties of GGBFS for use in concrete.

Q.2 State sizes (commonly used) of 'needle' vibrators for compacting concrete and their respective applicability/suitability.

Q.3 Discuss applications of rebar and cover meter with fig.

Q.4 Discuss properties of aggregate-hardened cement concrete interface and its effect on properties of concrete with fig.

Q.5 What do you understand by 'manufactured sand'? Discuss its specifications for use in concrete.

Q.6 Discuss any two methods to reduce 'heat of hydration' in concrete.

Q.7 What are the attributes of 'pumpable' concrete?

## PART – C

[3×10=30]

**(Descriptive/Analytical/Problem Solving/Design Questions)**

**Attempt any three questions**

Q.1 Discuss at least one method each for evaluating 'passing ability', 'flowability' and 'segregation resistance' of self-compacting concrete and their relevant norms/specified values. Make figures to illustrate.

Q.2 Describe requirements and issues in 'underwater' concreting and at least one method with figure/s.

Q.3 Draw typical diagram of formwork for concrete slabs illustrating various components with labelling.

Q.4 Determine quantities of ingredients of a M25 grade concrete with following data:

Specific gravities of OPC 43 grade, fine aggregate and coarse aggregate are 3.10, 2.80 and 2.70 respectively. Water absorption in % of fine and coarse aggregates are 0.8% and 0.40% respectively. Both aggregates are in SSD condition. Assume any other required data or condition and state.

Q.5 Describe mechanism of corrosion of steel reinforcement in concrete. What is the effect of 'Carbonation' of concrete on corrosion?

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