Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), MAY 2019

Course Code: CE 302

Course Name: DESIGN OF HYDRAULIC STRUCTURES

Max. Marks: 100 Duration: 4 Hours

Use of Khosla's chart, Blench curve and Montague curve are permitted in the exam hall

PART A

Answer any two full questions, each carries 15 marks.

			Marks
1	a)	Explain the failure of hydraulic structures by sub surface flow.	(4)
	b)	Compare Kennedy's theory and Lacey's silt theory.	(5)
	c)	Explain the different types of weir with neat sketches.	(6)
2	a)	What are the functions of an under sluice and silt excluder in a diversion headwork?	(4)
	b)	Explain the different classifications of canal.	(5)
	c)	Write down the procedure for the design of a vertical drop weir.	(6)
3	a)	Draw the section of unlined canal partly in cutting and partly in filling and explain the parts	(5)
	b)	Two sheet piles of unequal length are provided at the two ends of an impervious floor of 15m length and 1m thick. Total head created on the floor is 3m. Using Khosla's method of independent variables, calculate the uplift pressure at the key points, if the upstream pile is 3m deep and downstream pile is 5m deep.	(10)

PART B

Answer any one full question, each carries 50 marks.

4	a)	Design a suitable cross drainage work for the following hydraulic particulars: Discharge of the canal = 28 cumecs Bed width of the canal = 20m Depth of water in the canal = 1.6m Bed level of canal = 250.00m High flood discharge of the drainage = 400 cumecs High flood level of drainage = 253.00m Bed level of drainage = 248.00m	(25)

General ground level = 250.00m

b) Prepare the following drawings (not to scale) (25)

i. Half plan at top and half at the foundation level.

ii. Longitudinal section along drain.

5 a) Design a 1.2m Sarda type fall for the following data. (25)

Full supply discharge through the canal = 35 cumecs.

Bed level at u/s = 110.00m

Full supply depth at u/s = 1.60m

Bed width u/s and d/s = 26.0m

Safe exit gradient = 1/5

Impervious floor design is to be carried out as per Khosla's theory.

b) Prepare the following drawings (not to scale) (25)

i. Half plan at top and half at the foundation level.

ii. Section through the centre line of the canal.

PART C

Answer any two full questions, each carries 10 marks.

6 a) Derive the most economical central angle of an arch dam. (4)

b) Obtain the condition for no-tension criteria in a gravity dam. (3)

c) Distinguish between a low dam and a high dam (3)

7 a) Write a brief note on joints in gravity dam. (4)

b) Explain chute spillway and side channel spillway. (4)

c) Draw the cross-sections of the zoned earth dam you would select if the materials available are gravel and clayey silt. (2)

8 Check the stability of the gravity dam for the following data. Top width = 5m, freeboard = 3m, u/s FRL depth = 60m, u/s batter =1/10, d/s slope = 0.7H to 1V, u/s remains vertical to a depth of 12m from top. There is no tail water and silt. (10)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION(S), DECEMBER 2019

Course Code: CE 302

Course Name: DESIGN OF HYDRAULIC STRUCTURES

Max. Marks: 100 Duration: 4 Hours

Use of Khosla's chart, Blench curve and Montague curve are permitted in the exam hall

PART A

Answer any two full questions, each carries 15 marks.

Marks

1 a) Distinguish between Bligh's theory and Khosla's theory. (4)

b) Explain the different types of aqueducts. (5)

c) A channel section has to be designed for the following data. Discharge = 300 cumecs, silt factor =1, side slope 0.5:1. Also find the longitudinal slope. (6)

2 a) What are the different types of cisterns used in falls? (4)

b) Distinguish between watershed canal and contour canal (4)

c) Calculate the length of waterway, regime sour depth and the total energy level at the upstream of a vertical drop weir for the following data. Maximum flood discharge = 2600 cumecs, H.FL before construction = 290.0m, minimum water level =d/s bed level = 283.0m, F.S.L of canal =289.0m, allowable flux = 1.0m and f=1. (7)

3 a) What is balancing depth? (2)

b) Two end sheet piles of length 6m and 8m are provided below an impervious floor of 25m length. Total head created on the floor is 5m. Calculate the average hydraulic gradient. Also find the uplift pressures at points 6, 12 and 18m from the u/s end of the floor and find the thickness of the floor at these points using Bligh's creep theory. Take specific gravity of concrete as 2.25. (9)

c) Explain the terms piping and uplift. How can this be controlled? (4)

PART B

Answer any one full question, each carries 50 marks.

4 a) Design a notch fall for the following data: (25)

Full supply discharge = 2 cumecs

Full supply depth =0.8m

Half supply depth = 0.51m

Bed width = 5.5m

Top width of banks = 1.5m

At the proposed site a fall of 1.5m is available. Good foundation is available 1m below natural surface level. The canal section and flow conditions are same below the fall. Assume any other data if required.

b) Prepare the following drawings (not to scale) (25)

i. Half plan at top and half at the foundation level.

ii. Section across the channel through the notch fall.

5 a) Design a suitable cross drainage work for the following hydraulic particulars: (25)

Canal

Full supply discharge = 25 cumecs

Bed level = 112.00

Full supply level = 113.50

Bed width = 18.0m

Side slope =1.5 H :1 V

Left bank is 3.0m wide. Right bank is 4.5m wide and the cross drainage work carries a roadway of 4.5m over it.

Drainage

Catchment area = 175 sq.km

Ryve's coefficient =10

Bed level = 106.80

High flood depth = 3.2m

General ground level = 113.20

b) Prepare the following drawings (not to scale) (25)

i. Half sectional plan at the foundation level.

ii. Section along the centre line of the canal.

PART C

Answer any two full questions, each carries 10 marks.

6 a) What are the design criteria for an earth dam? (5)

b) Distinguish between a gallery and a shaft in a dam. (2)

c) Explain the components provided in a stilling basin for energy dissipation. (3)

7 a) Derive an expression for the thickness of an arch dam using thin cylinder theory (4)

b) Distinguish between a main spillway and an emergency spillway (4)

c) Find the limiting height of a low concrete gravity dam, constructed in concrete having strength equal to 3000KN/m^2 (2)

8 a) How will you estimate the uplift pressure under gravity dams? How the uplift pressure diagram will get modified under (5)

i. The presence of a drainage gallery

ii. Tension crack near the heel of the dam?

b) Explain the term effective length of spillway. Give an expression for ogee spillway. (3)

c) Why are keys provided in a dam? (2)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), MAY 2019

Course Code: CE304

Course Name: DESIGN OF CONCRETE STRUCTURES - II

Max. Marks: 100 Duration: 3 Hours

Use of IS 456, IS 875, IS 1343, IS 3370 , SP 16 and SP 34 are permitted.

Assume any missing data suitably

PART A

Answer any two full questions, each carries 15 marks. Marks

1 a) A short column 300 mm x 600 mm is carrying an axial working load of 700 kN and a moment of 150 kNm at an axis bisecting the depth. Design the reinforcement required if Fy = 250 N/mm^2 and fck 20 N/mm^2, Also sketch the reinforcement. (10)

b) Explain the design procedure of a slender column (5)

2 a) Design and detail a column under biaxial bending with the following data: (15)

Size of column = 40 x 60cm

The column is effectively held in position at both ends but not restrained against rotation. The unsupported length of column is 3.5m

Concrete grade = M20

Grade of Steel = Fe 415

Factored load Pu = 1900 kN

Factored Moment Mux = 150 kNm

Muy = 110kNm

3 a) Design and detail an isolated rectangular footing for a column 400 mm x 600 mm to carry a load of 2000 kN. The SBC of the soil is 180 kN/m^2.Use M20 concrete and Fe 415 grade steel (15)

PART B

Answer any two full questions, each carries 15 marks.

4 a) A cantilever retaining wall is designed to retain earth for a height of 4.4 m. The safe bearing capacity of soil is 200 kN/m^2 and unit weight of soil is 17.5 kN/m^3. Coefficient of friction between soil and concrete is 0.55. Proportion the retaining wall and check for stability. Also design and detail the heel and toe slab of the retaining wall. (15)

5 a) Under what circumstances the counterfort retaining wall is preferred? Give briefly the design procedure of a counterfort retaining wall. Also sketch the reinforcement detail (10)

	b)	Explain the design procedure for spherical dome.	5
6	a)	A circular slab is 5m inside diameter and is fixed at the edges. It is loaded with a live load of 3 kN/m^2. Design the reinforcement for the slab and sketch the details. Assume M 20 concrete and Fe 415 steel.	(15)

PART C

Answer any two full questions, each carries20 marks.

7	a)	Design and detail a circular tank for a capacity of 500000 litres. The depth of water is to be 5m including freeboard of 30cm. The tank is supported on ground. Design using M20 concrete and 415 grade steel.	(20)
8	a)	Discuss in detail the losses involved in prestressing	(5)
	b)	A post-tensioned cable of a beam 9 m long initially tensioned to a stress of 1000 N/mm^2 at one end. If the tendons are curved so that the slope is 1 in 24 at each end with an area of 600 mm^2. Calculate the loss of prestress due to the following data Coefficient of friction between duct and cable – 0.25 Friction coefficient for wave effect - 0.0091/m During anchorages if there is a slip of 3 mm at the jacking end, calculate the final force in the cable and the percentage of loss due to friction and slip. Es= 210 ×10^3 N/mm^2	15
9	a)	Explain the principle of prestressing	4
	b)	Explain the reasons for using high strength materials in prestressed concrete	6
	c)	A rectangular concrete beam 250 mm wide and 550 mm deep is prestressed by means of 4 numbers 12 mm diameter high tensile bars located at 200 mm from the soffit of the beam. If the effective stress in the wire is 700 N/mm^2, what is the maximum bending moment that can be applied at the soffit of the beam	10

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION(S), DECEMBER 2019

Course Code: CE304

Course Name: DESIGN OF CONCRETE STRUCTURES - II

Max. Marks: 100 Duration: 3 Hours

Use of IS 456, IS 875, IS 1343, IS 3370 , SP 34 and SP 16 are permitted.

Assume any missing data suitably,.

PART A

Answer any two full questions, each carries 15 marks. Marks

1 a) Design a RCC rectangular column to carry an axial load of 1200 kN and a moment of 70 kNm, The length of the column is 3.5m. The one end is fixed and the other end is hinged. The width of the column is restricted to the wall thickness of 24 cm. (10)

b) Discuss the analysis of a trapezoidal combined footing and sketch the plan and elevation. (5)

2 a) Design a slender braced circular column under uniaxial bending with the following data: 15

Size of column = 40 cm
Concrete grade = M20
Steel grade = Fe 415
Effective length ratio = 0.85
Unsupported length = 7m
Factored load Pu = 1000 kN
Factored Moment Mux = 60kNm at Top
= 30 kNm at Bottom

3 a) Design and detail an isolated footing for a square column 400 mm x 400 mm carrying a load of 2100 kN. The SBC of the soil is 280 kN/m^2.Use M20 concrete and Fe 415 grade steel 15

PART B

Answer any two full questions, each carries 15 marks.

4 a) A cantilever retaining wall is designed to retain earth for a height of 4 m. Assume good soil for foundation is at a depth of 1m below the ground level. The safe bearing capacity of soil is 180 kN/m^2 and unit weight of soil is 16.5 kN/m^3. Coefficient of friction between soil and concrete is 0.5 and angle of shearing resistance of 30^o. Proportion the retaining wall and check for stability. Also design and detail the stem slab and toe slab of the retaining wall. (15)

5 a) Explain the different types of retaining wall. Discuss the design procedure in detail of a counterfort retaining wall. Also sketch the reinforcement detail (10)

b) Briefly explain the use and design of ring beam in dome structure. 5

6 a) A circular slab is 6 m diameter and is simply supported at the edges. It is loaded with a live load of 4 kN/m^2. Design the reinforcement for the slab and sketch the details. Assume M 20 concrete and Fe 415 steel. 15

PART C

Answer any two full questions, each carries20 marks.

7 a) Design and detail a circular tank with fixed base for a capacity of 6 lakh litres. The depth of water is to be 5m including freeboard of 250mm. The tank is supported on ground. Design using M20 concrete and 415 grade steel. (20)

8 a) Differentiate between pre-tensioning and post-tensioning. (5)

b) Determine the extreme fibre stresses developed at the mid span section of a simply supported prestressed concrete beam of rectangular section 250 mm x 600 mm prestressed using high tensile steel of cross sectional area 1000 mm^2 stressed to 1500 N/mm^2. The center of gravity of the steel is 150 mm above the soffit of the beam. The superimposed load is 16kN/m . Span of the beam is 12 m .Draw the stress diagram at mid span. 15

9 a) Explain the various losses of prestress. 5

b) A prestressed concrete beam 250mm wide and 350 mm deep is prestressed by 12 wires of 6mm diameter located at an eccentricity of 40 mm and carrying a initial stress of 1500 N/mm^2. The span of the beam is 8m. Calculate the percentage of losses in wires if it is pretensioned Es =210 KPa and Ec = 35 Kpa, relaxation of steel stress = 5% of the initial stress, total shrinkage strain is 200 $\times 10^{-6}$. 15

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), MAY 2019

Course Code: CE306

Course Name: COMPUTER PROGRAMMING AND COMPUTATIONAL TECHNIQUES

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

1 a) Write short notes on usage of Preprocessor directives in C++ (4)

b) What are manipulators in C++. Explain with suitable examples. (4)

c) Write a program to accept the height of a person in centimetres and convert and display the height in feet and inches (7)

2 a) Explain in detail the use of *break* and *continue* statements in C++ with suitable examples. (7)

b) Write a program to read a 2D array of size m x n and prepare a 1 D array that will store all the elements of the 2D array as if they were stored in the row major form. (8)

Sample: if the 2 D array is $\begin{bmatrix}1 & 2 & 3\\4 & 5 & 6\\7 & 8 & 9\end{bmatrix}$ the 1 D array having the elements of 2D array in row major form is $[1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \; 7 \quad 8 \quad 9]$

3 a) Explain any four string handling functions. (8)

b) Write a program to check whether a given character is a vowel, using switch statement. (7)

PART B

Answer any two full questions, each carries 15 marks.

4 a) Explain the call by value and call by reference methods of function invoking. (5)

b) Write a program using functions to find the largest and smallest number in a 2D array. Note: The function should accept the 2D array from the main function and return the maximum and minimum number. (10)

5 a) Write and explain the general form of a structure definition, declaration & initialisation with proper examples. (7)

b) Write a program (using structure) to read the details of m students in a class including Roll no., name and marks of **3** subjects and print average mark of each student. (8)

6 a) Explain the various file input and output streams commonly used in C++? (7)

b) Bring out the difference between procedure oriented programming and object oriented programming (8)

PART C

Answer any two full questions, each carries20 marks.

7 a) Using method of successive approximations find a real root of the equation $x - sinx - {}^{1}/_{2} = 0$. For iteration the trial value of root may be taken as 1.0. (10)

b) Develop a program to fit a straight line to a given set of coordinates. (10)

8 a) The following table gives the results of the measurements of resistance felt by a running train, where *V* the velocity of travel in km/hr and *R* is the resistance in kN. (10)

V	20	40	60	80	100	120
R	5.5	9.1	14.9	22.8	33.3	46

Develop a 2nd degree polynomial (parabola) relationship connecting *R* and *V* using the method of least squares.

b) Write a program to perform numerical integration using Trapezoidal rule when the function is tabulated as data points. (10)

9 a) Solve the following simultaneous system of equations using Gauss elimination method. $3x_1 - 0.1x_2 - 0.2\,x_3 = 7.85$; (10)

$0.1\,x_1 + 7\,x_2 - 0.3\,x_3 = -19.3$; $0.3\,x_1 - 0.2\,x_2 + 10\,x_3 = 71.4$.

b) Demonstrate the finite difference method of numerical solution of partial differential equations for the case of a Laplace equation given by $\frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2} = 0$ (10)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION(S), DECEMBER 2019

Course Code: CE306

Course Name: COMPUTER PROGRAMMING AND COMPUTATIONAL TECHNIQUES

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

			Marks
1	a)	Explain the use of *switch* statement in C++ with suitable example.	(5)
	b)	Write a C++ program to sort an array of integers in ascending order using selection sorting concept.	(10)
2	a)	Explain in detail the three looping statements used in C++, with example for each.	(10)
	b)	Write a C++ program to read a single word as a string and count the number of characters without using string function.	(5)
3	a)	Differentiate between input stream & output stream. Explain any two stream functions used for console I/O operation.	(7)
	b)	Write a program to read a one dimensional array of integers and print the odd & even numbers separately.	(8)

PART B

Answer any two full questions, each carries 15 marks.

4	a)	What are the key features of an object oriented programming? Explain any two features in detail.	(5)
	b)	Write a program to read an array from the user, pass it to a user defined function and print the even numbers present in it.	(10)
5	a)	Explain various storage classes used in C++.	(8)
	b)	Explain the concept of file. Explain the file input and output streams (any three) commonly used in C++?	(7)
6	a)	What is recursion? Explain with an example.	(5)
	b)	Write a C++ program to define a structure to store the student roll number, and the marks obtained in 6 subjects and display each roll number & Total mark of corresponding student. Accept the number of students, roll number and the marks from the user.	(10)

PART C

Answer any two full questions, each carries 20 marks.

7 a) Using Newton-Raphson find a real root of the equation $e^{-x} = 3\ log\ x$. (10)

b) Develop a program to fit a linear model (straight line) to a given set of data using linear regression equations. (10)

8 a) Fit a 2nd degree polynomial of the form $y = a +$ b x + c x^2 to the following data (10)

x	-3	-2	-1	0	1	2	3
y	4.63	2.11	0.67	0.09	0.63	2.15	4.58

Develop a 2nd degree polynomial (parabola) relationship connecting *R* and *V* using the method of least squares.

b) Develop a program to solve transcendental equation using Regula falsi method method. (10)

9 a) Evaluate the following integral using 2 point and 3 point Gauss quadrature and compare the results. (10)

$$I = \int_1^3 \frac{dx}{(x^4+1)^{1/2}}$$

Gauss points for n=2 are 0.5773, -0.5773 and weights are 1.0, 1.0

Gauss points for n=3 are -0.7746, 0.0, 0.7746 and weights are 0.5556, 0.8889 and 0.5556.

b) Demonstrate the finite difference method of numerical solution of partial differential equations for the case of a Laplace equation given by $\frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2} = 0$ (10)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), MAY 2019

Course Code: CE308

Course Name: TRANSPORTATION ENGINEERING - I

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks. Marks

1 a) Explain briefly the classification of highways by Nagpur Road Plan. How is this system of classification modified as per the Third Twenty Year Road Development Plan? (8)

b) What are the requirements of an ideal alignment? What are the precautions to be observed while aligning hill roads? (7)

2 a) What are the factors influencing the geometric design of highways? Explain how these factors influence the geometric design standards of a highway. (8)

b) Find safe over taking sight distance for a highway having a design speed of 80 kmph. Maximum acceleration of overtaking vehicle is 1.5 kmph per sec. (7)

3 a) Enumerate the steps for practical design of super elevation of a highway under mixed traffic conditions. (4)

b) A National Highway passing through plain terrain (Design speed 100 kmph) in a heavily rainfall area has a horizontal curve of radius 500 m. Design the length of transition curve. Allowable rate of introduction of super elevation is 1 in 150. (6)

c) A vertical summit curve is formed when an ascending gradient of 1 in 40 meets a descending gradient of 1 in 80. Find the length of summit curve to provide the required stopping sight distance for a design speed of 80 kmph. (5)

PART B

Answer any two full questions, each carries 15 marks.

4 a) Explain the desirable properties of aggregates as a highway material. (9)

b) State the major differences between flexible and rigid pavements. (6)

5 a) What are the factors to be considered in design of flexible pavements and indicate their significance. (8)

b) Design the flexible pavement for the construction of a new highway with the following data (Follow guidelines as per IRC 37 2012): (7)

Category of road- Four lane dual carriageway

Number of commercial vehicles in the year of completion of construction- 2400 CVPD per direction

Annual growth rate of commercial vehicles-5%

Design life – 15 years

Design CBR value of subgrade soil – 5%

Vehicle damage factor – 3.5

Lane distribution factor – 0.75

For CBR 5%

Traffic msa	5	10	20	30	50	100
GSB(mm)	250	300	300	300	300	300
GB(mm)	250	250	250	250	250	250
DBM(mm)	55	70	100	120	125	130
BC(mm)	25	40	40	40	50	50

6 a) Briefly illustrate the various steps in construction of a bituminous pavement. (6)

b) Mention the major failures in flexible pavements and their causes. (9)

PART C

Answer any two full questions, each carries20 marks.

7 a) What are traffic characteristics? Explain the influence of different traffic characteristics on traffic performance. (10)

b) The average normal flow of traffic on cross roads A and B during design period are 400 and 250 PCU per hour respectively. The saturation flow values on these roads are estimated as 1850 and 1400 PCU per hour respectively. The all red time required for pedestrian crossing is 16 seconds. Design a two-phase traffic signal by Webster's method. (10)

8 a) Explain following aircraft characteristics and their influence in planning and design of an airport: (12)

(i) Type and size of aircraft

(ii) Weight and wheel configuration

(iii) Speed of aircraft

(iv) Minimum turning radius

b) What is a wind rose diagram? How is it useful in fixing the best orientation of runway? (8)

9 a) Length of a runway at Mean Sea Level (MSL), standard temperature and zero gradients is 1500 m. The site has an elevation of 1000 m above MSL, with a reference temperature of 34^0C. The runway has to be constructed with an effective gradient of 0.26%. Determine the actual length of the runway at the site. (10)

b) What are the design considerations applicable to runway lighting? Explain with neat sketches. (10)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B. TECH DEGREE EXAMINATION(S), DECEMBER 2019

Course Code: CE308

Course Name: TRANSPORTATION ENGINEERING -I

Max. Marks: 100 Duration: 3 Hours

Students are permitted to use IRC37-2012 in examination hall

PART A

Answer any two full questions, each carries 15 marks.

Marks

1 a) What are the basic requirements for an ideal highway alignment? Describe the factors considered in finalising the alignment. (5)

b) Define stopping sight distance. Derive an expression for stopping sight distance on an ascending gradient. (5)

c) Determine the super elevation required for a horizontal curve of radius 300 m with a design speed of 80kmph under mixed traffic condition in an urban area. (5)

2 a) List out the engineering surveys conducted in fixing the alignment of a highway. What are the different kinds of data that are collected in a detailedsurvey? (5)

b) Determine the length of overtaking zone required for one-way traffic condition with design speed of 100kmph. Acceleration of overtaking vehicle is 0.9m/sec^{2}and speed of slow-moving vehicle is 80kmph. Illustrate the details of overtaking zone witha neat sketch. (10)

3 a) Why are transition curves provided on a horizontal curve? What are the requirements for an ideal transition curve? Identify the steps for determining the length of transition curve? (7)

b) A descending gradient of 1 in 30 meets an ascending gradient of 1in 25. Determine the length of valley curve required for a design speed of 65 kmph, to satisfy stopping sight distance requirements.Assume coefficient of friction as 0.35. Assume data, suitably, if required. (8)

PART B

Answer any two full questions, each carries 15 marks.

4 a) Explain the effect of various vehicular characteristics on traffic stream behaviour. (7)

b) A flexible pavement is to be constructed with granular base and sub-base and bituminous surfacing for a state highway in rolling terrain. The existing soil has a (8)

CBR value 5%. The borrow material has a CBR value of 12%. The traffic volume on a two lane single carriage way in both directions at last count is 1200commercial vehicles per day. Design a flexible pavement as per IRC37 - 2012. Traffic growth rate is 6% .

5 a) Explain the procedure for determination of CBR value of a subgrade soil. (7)

b) Discuss the various causes of failures in flexible pavements. With the help of sketches explain any five types of flexible pavement failures. (8)

6 a) Describe the specifications of materials and construction steps of bituminous concrete pavements. (7)

b) Discuss any five properties of bitumen and their effect on the performance of bituminous mixes in pavements. Explain the laboratory teststo be conducted to assess these properties. (8)

PART C

Answer any two full questions, each carries 20 marks.

7 a) With neat sketches, explain different at grade intersections. (6)

b) What are the factors that are to be considered for site selection of an airport. (4)

c) Two roads A and B meet at right-angles. The normal flow and saturated flow on road A are 750PCU/hr and 3600 PCU/hr respectively. On road B normal flow is 550 PCU/hr and saturated flow is 2700PCU/hr. Theall red time is 10sec. Design a two-phase isolated traffic signal for the intersection and sketch the phase diagram. (10)

8 a) With sketches,list out any six types of warning signs on highways. (6)

b) What is wind rose diagram? Explain how Type 1 wind rose diagram is used for determination of runway orientation. (7)

c) Discuss how various aircraft characteristics influence the planning of airport. (7)

9 a) What are the different systems of signal coordination? (4)

b) Discuss the facilities to be provided and factors considered for planning an airport terminal building. (6)

c) Runway of an airport is situated at an elevation of 250m and has an effective gradient of 0.3%. Airport reference temperature is 18^{o}C. The basic runway length is 2500m. Determine the actual required length of runway. (10)

Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE COMPREHENSIVE EXAMINATION, MAY 2019

Course Code: CE352

Course name: COMPREHENSIVE EXAM (CE)

Max. Marks: 50 Duration: 1Hour

Instructions: ***(1) Each question carries one mark. No negative marks for wrong answers***
(2) Total number of questions: 50
(3) All questions are to be answered. Each question will be followed by 4 possible answers of which only ONE is correct.
(4) If more than one option is chosen, it will not be considered for valuation.
(5) Calculators are not permitted

PART A- COMMON COURSES

1. The radius of convergence of the series $\sum_{k=1}^{\infty} \frac{(x-5)^k}{k^2}$ is

   a) 1 b) 2 c) 3 d) 0

2. Solution of $y''' - y' = 0$ is

   a) $c_1 + (c_2 + c_3 x)e^x$ b) $c_1 e^x + c_2 e^{-x}$ c) $c_1 + c_2 e^x + c_3 e^{-x}$ d) $c_1 + (c_2 + c_3 x)e^{-x}$

3. A mass m is attached to two identical springs having spring constant k. Natural frequency of the single degree of freedom system is

   a) $\sqrt{2k/m}$ b) $\sqrt{3k/m}$ c) $\sqrt{4k/m}$ d) $\sqrt{k/m}$

4. A ball of weight 100N is tied to a smooth wall by a cord making an angle of 30 degree to the wall. Tension in the cord is

   a) 86.6 b) 50 c) 75.5 d) 0

5. The desired features or characteristics of the design that determine its ultimate effectiveness or suitability for a given task

   a) Design Function b) Design Constraints c) Design analysis d) Design Functions

6. In 'House of Quality' the roof represents:

   a) Relationship between customer and manufacturer b) Inter–relationship between technical requirements c) Relation between customer and technical requirements d) Customer requirements

7. Lowest atmospheric temperature is observed in ----------

   a) Troposphere b) Stratosphere c) Thermosphere d) Mesosphere

8. Industrial Symbiosis aims at

a) zero waste generation b) energy efficiency c) high employment generation d) industrial mechanisation

9. A 5 cm long line is parallel to VP and inclined at 30° to HP. What is its length in the front view?

a) 4.33 cm b) 2.5 cm c) 5 cm d) 2.88 cm

10. A cylinder is placed on H.P on its base and section plane is inclined to V.P and perpendicular to H.P cutting the solid the section gives

a) parabola b) circle c) rectangle d) ellipse

PART B- CORE COURSES

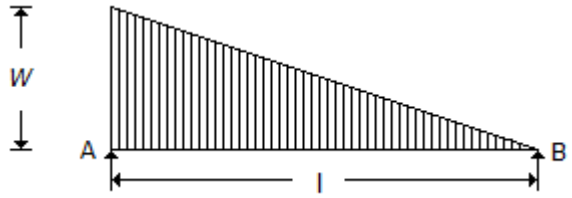
11. The relationship between the linear elastic properties Young's modulus (E), rigidity modulus (N) and bulk modulus (K) is

a) $E = \frac{KN}{3K+N}$ b) $E = \frac{9KN}{K+N}$ c) $E = \frac{9KN}{K+3N}$ d) $E = \frac{9KN}{3K+N}$

12. If two equal tensile stresses σ that are mutually perpendicular act on a rectangular parallelopiped bar with material properties E and μ , the resulting strain of the bar is given by

a) $\frac{\sigma}{E}(1+\mu)$ b) $\frac{\sigma}{E}(1-\mu)$ c) $\frac{\sigma}{E}(1+2\mu)$ d) $\frac{\sigma}{E}(1-2\mu)$

13. For the beam shown in the below figure, the shear force at *A* is equal to



a) wl/6 b) wl/3 c) wl d) 2wl/3

14. The maximum shear stress in a rectangular cross section is _____ average shear stress

a) ¾ times b) 4/3 times c) 3/2 times d) 2/3 times

15. The simply supported beam '*A*' of length *l* carries a central point load *W*. Another beam '*B*' is loaded with a uniformly distributed load such that the total load on the beam is *W*. The ratio of maximum deflections between beams *A* and *B* is

a) 5/8 b) 8/5 c) 5/4 d) 4/5

16. According to Euler's column theory, the crippling load for a column of length (l) fixed at both ends is _____ the crippling load for a similar column hinged at both ends.

a) equal to b) two times c) four times d) eight times

17. For a circular shaft subjected to torsion, the variation of shear stress across the section is

a) Parabolic with maximum stress at centre b) uniform over the section c) Linear with zero at centre d) linear with maximum at centre

18. In the 'method of joints' for the analysis of truss, the number of equilibrium equations at each

joint is

a) 1 b) 2 c) 3 d) 4

19. The prop reaction of a propped cantilever of span L, subjected to udl of intensity *w* over full span is

a) 3 wL/8 b) 5wL/8 c) wL/8 d) 9wL/8

20. A simply supported beam AB has a span of 5m. The ordinate of influence line diagram for bending moment at C, 1m from A is maximum at -------- and its value is ----------

a) Midspan, 1.0 b) C, 0.8 c) supports, 0.5 d) Midspan, 0.2

21. Horizontal component of the force along the length of a cable carrying a UDL over the entire span is

a) zero b) constant c) increasing uniformly with minimum at support d) decreasing uniformly with maximum at support

22. A 3-hinged arch with span L and rise h carries a concentrated load P at quarter span. The third hinge is at the crown. Horizontal reaction at the hinged supports which are at the same level

a) PL/4h b) PL/8h c) PL/4 d) PL/h

23. The analysis of a statically indeterminate beam can be done by

a) Equations of equilibrium b) Equations of displacements or deformations c) Both (a) and (b) d) None of the above.

24. A beam AB (span L, flexural rigidity EI) is fixed at A and B. The support B settles by Δ. The effect is

a) A moment of $\frac{6\,EI\,\Delta}{L^2}$ is induced at A only b) A moment of $\frac{6\,EI\,\Delta}{L^2}$ is induced at B only c) Moment of $\frac{6\,EI\,\Delta}{L^2}$ is induced at A and B d) Moment of $\frac{6\,EI\,\Delta}{L^2}$ at A and $\frac{3\,EI\,\Delta}{L^2}$ at B

25. The discharge of a broad crested weir with an available head H is maximum when the depth of water h is

a) H/3 b) 2H/5 c) 2H/3 d) H/2

26. The free vortex flow forms

a) straight lines b) concentric circles c) parabola d) hyperbola

27. The imaginary line drawn in the fluid in such a way that the tangent to any point gives the direction of motion at that point, is known as

a) Path line b) Stream line c) Steak line d) Potential line

28. Darcy- Weisbach equation gives relation between

a) Pressure and temperature b) Mass, volume and pressure c) Head loss and pressure loss d) Pressure loss only

29. With the boundary layer separation, displacement thickness

a) Increases b) Decreases c) Remains Same d) Independent

30. Boundary layer thickness is the distance from the boundary to the point where velocity of the fluid is

a) equal to 10% of free stream velocity b) equal to 50% of free stream velocity c) equal to 90% of free stream velocity d) equal to 99% of free stream velocity

31. Ingredients of gauged mortar are

a) Cement, sand, water b) Lime , sand, water c) Lime,cement,sand, water d) Clay, water

32. For good concrete fineness modulus of coarse aggregate is between

a) 3 to 4.5 b) 2 to 3.5 c) 6 to 8.5 d) None of the above

33. Most commonly used admixture in concrete to reduce the setting time of cement is

a) Calcium sulphate b) Calcium chloride c) Natural wood resins d) Pozzolana

34. ----------foundations are most suited for the expansive soils

a) Under reamed pile b) Timber pile c) Well foundation d) Stepped footing

35. The member which is placed horizontally to support common rafter of a sloping roof is?

a) Purlin b) Batten c) Strut d) Cleat

36. The process of injecting mortar with low water cement ratio at a high pressure through a nozzle to repair cracks in concrete is called

a) Grouting b) Shortcreting c) Guniting d) None of the above

37. The ratio of saturated unit weight to dry unit weight of a soil is 1.25. The water content of the soil is

a) 10% b) 25% c) 50% d) 100%

38. The liquid limit (LL), plastic limit (PL) and shrinkage limit (SL) of a cohesive soil satisfy the relation

a) LL > PL < SL b) LL > PL > SL c) LL > PL < SL d) LL > PL < SL

39. A flow is taking place in a soil for which porosity is ‘n’. If the discharge velocity is ‘v’, then the seepage velocity will be

a) n. v b) n/v c) v/n d) v/n^2

40. Quick sand is occurring when its

a) Effective pressure is equal to atmospheric pressure b) Effective pressure equal to seepage pressure c) Effective pressure is reduced to zero d) None of the above

41. Primary Consolidation is due to expulsion of

a) Air b) Water c) Both Air and Water d) None of the above

42. In the stability analysis of finite slopes, the Swedish Circle method assumes that the surface of sliding is

a) An Arc of a parabola b) Straight line c) An arc of a Circle d) An elliptical arc

43. With the increase in the amount of compaction energy

a) OMC increases but MDD decreases b) OMC decreases but MDD increases c) Both OMC and MDD increase d) Both OMC and MDD decrease

44. As per IS 456 2000, permissible tensile stress in concrete made of M25 concrete is

a) 3.5 N/mm^2 b) 60 N/mm^2 c) 2.5 N/mm^2 d) None of these

45. As per IS 456-2000, in the limit state design of flexural member, the strain in reinforcing bars under tension at ultimate state should not be less than

a) $\frac{fy}{Es}$ b) $\frac{fy}{Es}$+ 0.002 c) $\frac{fy}{1.15\,Es}$ d) $\frac{fy}{1.15Es}$+0.002

46. The minimum area of tension reinforcement in a beam shall be greater than

a) $\frac{0.85\,bd}{fy}$ b) $\frac{0.87fy}{bd}$ c) 0.04bd d) $\frac{0.4bd}{fy}$

47. For limit state of collapse in flexure of singly reinforced beams, if the strain in concrete reaches the limiting value earlier than that in steel, the beam section is called

a) Under reinforced section b) Critical section c) Over reinforced section d) Balanced section

48. Side face reinforcement shall be provided in the beam when depth of the web in a beam exceeds

a) 50cm b) 100cm c) 75cm d) 120cm

49. If d is the diameter of a bar, $f_t$is allowable tensile stress and fb is allowable bond stress, the bond length is given by

a) $\frac{ft\,d}{4\,fb}$ b) $\frac{\pi ft\,d}{4\,fb}$ c) $\frac{\pi ft\,d^2}{fb}$ d) $\frac{\pi ft\,d^2}{4\,fb}$

50. The load carrying capacity of a helically reinforced column as compared to that of a tied column is about

a) 5% less b) 10% less c) 5% more d) 10% more

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), MAY 2019

Course Code: CE362

Course Name: Ground Improvement Techniques

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

1 a) Write on Ground Improvement potential. (5)

b) What are the applications of grouting? Describe with the help of neat diagrams. (10)

2 a) Give notes on different types of ground improvement techniques. (8)

b) Discuss on permeation grouting. (7)

3 a) What are the aspects and factors affecting grouting? (8)

b) Write short note on jet grouting. (7)

PART B

Answer any two full questions, each carries 15 marks.

4 a) What are different mechanisms involved in lime stabilization? (5)

b) What are ground anchors? What are its components and applications? (10)

5 a) Write short note on lime fixation point and optimum lime content. (6)

b) List out and explain the effect of lime on physical and engineering properties of soil. (9)

6 a) Discuss the process of cement stabilization in the field. (7)

b) Write short note on soil nailing. (8)

PART C

Answer any two full questions, each carries20 marks.

7 a) What is the range of depth of penetration of compaction if a weight of 40,000 kg is dropped from a height of 20 m on the ground surface? (8)

b) Write short note on the methods of dewatering. (12)

8 a) What are different compaction control tests in the field? Explain. (10)

b) Write short note on well point systems. (10)

9 a) Discuss on the properties of compacted soil. (10)

b) Differentiate between vacuum dewatering and electro osmosis. (5)

c) List out different types of compaction techniques for ground improvement. (5)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION(S), DECEMBER 2019

Course Code: CE362

Course Name: GROUND IMPROVEMENT TECHNIQUES

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

			Marks
1	a	Classify the major soil deposits in India based on different climatic conditions and amount of rainfall.	(8)
	b	What do you mean by the term "reclaimed" soil? Mention any two materials with specifications that are used in practice for reclamation purposes along with their drawbacks.	(7)
2	a	Which are the various approaches incorporated in association with ground improvement potential? Identify the various ground/soil conditions on the basis of these approaches.	(9)
	b	List the various ground modification techniques practiced in Engineering works. Explain any two ground modification techniques and its suitability in the field.	(6)
3	a	What is the principle behind the technique of grouting? According to Koerner, which are the basic functions of soil and rock grouting?	(5)
	b	What do you mean by "one shot" and "two shot" systems? Explain with neat sketches.	(5)
	c	Discuss the advantages and disadvantages of compaction grouting.	(5)

PART B

Answer any two full questions, each carries 15 marks.

4	a	How do polymers stabilize soil? Mention five natural resins used to stabilize soil along with their functions.	(9)
	b	Differentiate between cement and bituminous stabilization of soil	(6)
5	a	Explain the step – wise procedure for the construction of soil asphalt. Also mention the tests conducted to control the quality of work.	(8)
	b	Mention any four basic types of lime. How is lime stabilized base constructed?	(7)
6	a	Explain the procedure for the construction of soil nail. Also mention the various	(8)

materials used for soil nailing.

b What is the significance of addition – removal technique in mechanical stabilization of soil? (7)

PART C

Answer any two full questions, each carries 20 marks.

7 a How does particle size distribution affect moisture - density relationship when densified? Explain with suitable curves/ plots. (16)

b What are the suitability criteria for the various shallow surface compaction methods? (4)

8 a How can we check or control the quality of compaction? (5)

b Mention the various deep compaction techniques. Explain any two in detail with suitable sketch. (15)

9 a How does compaction affect the shear strength of soil? (4)

b Differentiate between progressive system and ring system of well point installation. (6)

c How is single stage well point system different from multi- stage well point system. Explain with the help of suitable diagrams. (10)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), MAY 2019

Course Code: CE366

Course Name: TRAFFIC ENGINEERING AND MANAGEMENT

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

			Marks
1	a)	Explain the techniques of travel demand management.	(10)
	b)	Explain the various measures for traffic calming.	(5)
2	a)	Define tidal flow operation.	(3)
	b)	Explain the methods of implementing tidal flow operation.	(2)
	c)	Explain the various applications of ITS.	(10)
3	a)	Explain the various regulations concerning the driver.	(10)
	b)	Write short notes on Motor vehicle Act.	(5)

PART B

Answer any two full questions, each carries 15 marks.

4	a)	Define basic capacity, possible capacity and practical capacity.	(5)
	b)	With neat sketches illustrate the concept of LOS.	(10)
5	a)	List the factors that influence the capacity of signalised intersection.	(10)
	b)	Explain the procedure for computation of capacity of rotary intersection using Wardrops formula.	(5)
6	a)	A three-phase traffic signal is to be installed at a right angled crossing of two city streets. The site is average and the approaches are 12m wide between kerbs. The approaches are straight and level and parking is prohibited on them. One of the phases is to be pedestrian only phase occurring at the end of each cycle. Starting delay maybe taken as 2seconds. An all-red period of 4seconds is to be provided after each vehicle phase to allow clearance of right turning vehicles left over in the crossing. The design hour traffic volumes in PCU/hour are given in the following time	(10)

From	N			E			S			W		
To	E	S	W	S	W	N	W	N	E	N	E	S
PCU/hr	40	800	70	60	500	50	60	660	60	70	680	60

Calculate the optimum cycle time for fixed time installation. Sketch the phasing diagram for each phase. Draw a diagram showing the timings for all three aspects of a complete cycle. Make suitable assumptions for amber and pedestrian interval.

b) Explain the warrants for installation of traffic signals (5)

PART C

Answer any two full questions, each carries20 marks.

7 a) Explain the roadway factors that influences road accidents. (12)

b) With neat sketches differentiate between collision and condition diagrams (8)

8 a) Describe the measures that can be adopted to prevent accidents (12)

b) List the assumptions made in simple queuing approach as applied to traffic flow (8)

9 a) A toll booth at the entrance to bridge can handle 120 veh/hour, the time to process a vehicle being exponentially distributed. The flow is 90veh/hour with a Poissonian arrival pattern. Determine: (i) the average number of vehicles in the system (ii) the length of the queue (iii) the average time spent by the vehicle in the system (iv)average time spent by the vehicle in the queue. (8)

b) With neat sketches illustrate the fundamental diagrams of traffic flow. (12)

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