

B. TECH.
THIRD SEMESTER THEORY EXAMINATION, 2022-23
KCE 302
SURVEYING & GEOMATICS

Max. Marks: 100

Time: 03 Hours

e:

- Attempt all questions. All questions carry equal marks.
1. Attempt any **TWO** parts of the following: 2×10
- a. Write in detail about the term surveying and it's CO1 classification. Also, describe about the chain survey? $\frac{q}{g}$
- b. The following successive readings were taken with a dumpy CO1 level along a chain line at common interval of 20m. The first reading was taken on a chainage of 140m. The RL of the second change point was 107.215m. The instrument was shifted after the third and seventh readings. Calculate the RLs, of all the points.
3.150, 2.245, 1.125, 3.860, 2.125, 0.760, 2.235, 0.470, 1.935, 3.225 and 3.890 m.
- Create a level book with Rise and fall method. $\checkmark 2$
- c. Describe about Theodolite survey and it's instrument. Also CO1 discuss about the Trigonometric levelling. $\odot u$
2. Attempt any **TWO** parts of the following: 2×10
- a. Explain in detail about the curve and it's types. Also, write CO2 about the construction of simple curve with the help of its diagram.
- b. Find out the Intrinsic equation of ideal transition curve. CO2 Also discuss about the types of transition curve.

¹
15

(10)

- c. Two tangents intersect at a chainage of 1000m, the deflection angle being 30°. Calculate all the necessary data for setting out a circular curve of radius 200 m by the method of offsets from the chord produced. Taking a peg interval of 20m. CO2

3. Attempt any **TWO** parts of the following: 2×10
- Explain about the 'Total Station' with neat sketch. Also, write it's merits and demerits. X CO3
 - What is EDM? Describe it's principle and various types? CO3
 - Introduce GPS with it's application with advantages/ disadvantages.

15

4. Attempt any **TWO** parts of the following: 2×10
- What is Photogrammetric Surveying? Explain in detail, advantage and distance of photogrammetry. Also describe the classification and it's application?
 - Explain about relief displacement on vertical photographs with suitable diagram. CO4
 - Describe about the terminologies of aerial surveying with suitable diagrams
- 3
 i) Scale of photograph
 ii) Average scale of photograph
 iii) Flying height

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5. Attempt any **TWO** parts of the following: 2×10
- Write about the basic concept of remote sensing. Also discuss about its advantages and limitation. CO5
 - What is EMR Spectrum? Explain in detail. CO5
 - What are the various applications of remote sensing in Civil Engineering Field? Explain with the help of suitable examples.

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(Roll No. to be filled by candidate)

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B. TECH.
THIRD SEMESTER THEORY EXAMINATION, 2021-22

KVE-301

UNIVERSAL HUMAN VALUE AND PROFESSIONAL ETHICS

Max. Marks: 100

Time: 03 Hours

Note:

- Attempt all questions. All questions carry equal marks.
- Assume missing data suitably.

1. Attempt any **FOUR** parts of the following: 4×5 CO
 a. What do you know about family? Discuss family as a basic unit of interaction? CO4
 b. Explain the concept of harmony in family in detail.? CO2
 c. What are the basic guidelines of value education ? CO1
 d. What are the basic requirements to fulfill human aspirations? CO2
 e. Differentiate between needs of the self and needs of the body? CO5
 f. Differentiate between moral values and human values.? CO3
2. Attempt any **TWO** parts of the following: 2×10 CO
 a. Explain the concept of understanding human being? CO3
 b. Explain the term "Sanyama" with their aspect.? CO4
 c. Differentiate between intention and competence? CO5
3. Attempt any **TWO** parts of the following: 2×10 CO
 a. Differentiate between Prosperity and wealth? CO2

- b. Importance of Health ? explain it with current scenario ? CO3
- c. What is ethics ? how ethics is different from Value? CO1
4. Attempt any **TWO** parts of the following: 2×10 CO
a. Explain harmony in society and its importace? CO2
b. Provide the distinction between self and body in terms of CO1
needs, activities and type.? CO3
c. 'I am the seer,doer and enjoyer,Body is my instrument'
Explain? CO3
5. Attempt any **TWO** parts of the following: 2×10 CO
a. What is self-exploration process .Explain it with suitable CO1
example ?
b. Define the various orders present in nature. Briefly explain CO5
the activities(kriya), innateness (Dharna) and Natural
characteristics (Svabhava) of all these orders?
c. What are the different ways in which people differentiate CO2
today? Explain the problems that occur due to
differentiation?

(Roll No. to be filled by candidate)

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B. TECH.

THIRD SEMESTER THEORY EXAMINATION, 2021-22
KNC-302
PYTHON PROGRAMMING

Time: 02 Hours

Max. Marks: 50

Note:

- Attempt all questions. All questions carry equal marks.
1. Attempt any **FOUR** parts of the following: 4×2.5 CO
a. Differentiate between procedures oriented and object CO1 oriented programming languages.
b. What do you understand by open source software? Write CO1 any five open source software name.
c. What do you mean by Operators? Explain each part in CO1 details
d. What is an algorithm? Make an algorithm to find the largest CO1 number among three numbers.
e. Differentiate between mutable and immutable data type CO1 used in Python.
f. What is the Indentation? How it is useful in Python CO1 Programming? Explain with suitable example.
2. Attempt any **TWO** parts of the following: 2×5 CO
a. Write a Python program to convert capital letter into small CO2 letter and vice-versa
b. Differentiate between break and continue with suitable CO2 example

- c. Write a Python program to calculate actual price on CO2 purchase of computer

Price(Rs)	Discount (%)
Upto 10,000	4
>10,000 to 25,000	7
>25,000 to 40,000	9
>40,000 to 70,000	12
>70,000 to 1 lac	15
>1 lac	25

3. Attempt any **TWO** parts of the following: 2×5 CO
- a. Differentiate between for and while loop with suitable example. CO3
 - b. Write a Python program to check Prime number or not. CO3
 - c. Write a Python program to check whether your number is palindrome number or not. CO3
4. Attempt any **TWO** parts of the following: 2×5 CO
- a. What do you mean by Function in Python? Differentiate between actual argument and formal argument with suitable example. CO4
 - b. Find factorial of given number using function. CO4
 - c. What is recursion? Print Fibonacci series up to n term using recursion. CO4
5. Attempt any **TWO** parts of the following: 2×5 CO
- a. Differentiate class, object, abstraction, polymorphism, encapsulation And inheritance with suitable example. CO5
 - b. What is file in python programming? Explain various operations performed on file CO5
 - c. How many operations are performed on a list? Explain any one of the following. CO5

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B. TECH.
THIRD SEMESTER THEORY EXAMINATION, 2021-22
KCE-302
SURVEYING & GEOMATICS

Time: 03 Hours**Max. Marks: 100****Note:**

- Attempt all questions. All questions carry equal marks.
- Assume missing data suitably.

- 1. Attempt any *FOUR* parts of the following: 4×5 CO**
- a. From a topographic map, the areas enclosed by contour lines for a proposed dam are given below. Find the volume of impounded water using Trapezoidal formula.

Contours (m)	Area enclosed (hectares)
500	20
505	100
510	400
515	900
520	1100

- b. Explain in brief the characteristics of contour lines. CO1
- c. Determine the value of included angles in a closed compass traverse ABCD conducted in clockwise direction, given the following fore bearings of the respective lines.

Line	F.B.
AB	40°
BC	70°
CD	210°
DA	280°

- d. Explain the resection after orientation by two points in plane table surveying.
- e. Explain the definitions (a) Telescope Normal (b)Swinging the Telescope (c) Axis of Telescope (d) Vertical axis (e) Line of Sight.

- f. Following is a page of a level field book. Fill in the missing reading and calculate the reduced level of all the points. Apply the usual checks.

Station	B.S.	I.S.	F.S.	Rise	Fall	R.L.	Reduced Level
on							
1	3.25				?		
2	1.755	?		0.75	?	B.M.	
3		1.950			?	C.P.	
4	?		1.920		?		
5		2.340		1.500	?		
6		?		1.000	?		
7	1.850		2.185		250.0	C.P.	
8		1.575			?		
9		?			?		
10	?		1.895	1.650	?	C.P.	
11			1.350	0.750	?	Last Point	

2. Attempt any **TWO** parts of the following:

2x10 CO
CO2

- a. A circular curve has a 200 m radius and 65° deflection angle. What is its degree (a) by arc definition and (b) by chord definition.

Also calculate (a) length of curve, (b) tangent length, (iii) length of long chord, (iv) apex distance, and (v) mid-ordinate

- b. Derive the equation of perpendicular offsets from tangents method in setting out a simple circular curve.
- c. Derive the equation of offsets from the long chord method in setting out a simple circular curve.

- e. Explain the definitions (a) Telescope Normal (b)Swinging the Telescope (c) Axis of Telescope (d) Vertical axis (e) Line of Sight.

- f. Following is a page of a level field book. Fill in the missing reading and calculate the reduced level of all the points. Apply the usual checks.

3. Attempt any **TWO** parts of the following:
- a. Explain the GIS application in civil engineering. 2x10 CO
- b. What are the representation of features in GIS? CO3
- c. Explain the advantage and application of total station. CO3

4. Attempt any **TWO** parts of the following:
- a. Two points A and B having elevations of 650 m and 250 m, respectively, above datum, appear on a vertical photograph obtained with a camera of focal length of 250 mm and flying altitude of 2700 m above datum. Their correlated photographic coordinates are as follows:

Point	Photographic coordinate
a	x(cm)
b	+3.65 +2.54

- Determine the length of the ground line AB.

- b. Derive the equation of relief displacement with fig. CO4

$$d = \frac{f^2 \cdot d}{f - d}$$

- c. Explain the definitions with fig. (a)Exposure station, CO4 (b)Flying height, (c)Altitude, (d)Tilt, (e)Tip, (f)Principal point, (g)Isocentre (h)Nadir point (i)Homologous point

5. Attempt any **TWO** parts of the following:
- a. What are the applications of remote sensing to civil engineering? 2x10 CO
- b. Explain the electromagnetic spectrum. CO5
- c. Explain the effect of atmosphere on electromagnetic radiation. CO5

(Roll No. to be filled by candidate)

B. TECH,

THIRD SEMESTER THEORY EXAMINATION, 2021-22
KCE-303
FLUID MECHANICS

Time: 03 Hours

Max. Marks: 100

Note:-

- Attempt all questions. All questions carry equal marks.
 - Support your answer with suitable sketches and examples wherever you found necessary./Assume missing data suitably.

1. Attempt any **FOUR** parts of the following: 4×5 CO

 - Show that the center of pressure always lies below the center of gravity for a wholly submerged plain surface. CO1
 - If the velocity distribution over a solid surface is given by $u = 30 y - 200 y^2$. what would be the shear stress at the flat surface and at an elevation of 50 mm from it.
Take $\mu = 0.048 \text{ kg/m s}$. CO1
 - State and explain Archimedes' principle and mention some of its practical applications. Describe the equilibrium conditions of a floating body. CO1
 - A piece of wood (specific gravity = 0.6) of 10 cm square in cross-section and 2.5 m long floats in water. How much lead (specific gravity = 12) need to be fastened at the lower end of stick so that if flows upright with 0.5 m length out of water? CO1
 - Explain: (i) Cavitation, (ii)Capillary rise and fall. CO1

- f. A U-tube differential manometer is attached to sections A and B in a horizontal pipe in which oil of specific gravity 0.8 is flowing. The deflection in the mercury in the manometer is 60 cm, and the level nearer to A being the lower one. Calculate the difference of pressure between A and B.

2. Attempt any **FOUR** parts of the following: 4×5 CO

a. Distinguish between steady and unsteady flows, uniform and non-uniform flows and laminar and turbulent flows with suitable examples.

b. The component in a two dimensional flow are; CO_2 $u = 8x^2y - 8/3y^3$, $v = -8xy^2 + 8/3x^3$. Show that these velocity components represents a possible case of an irrotational flow.

5. Write a short note on:-

(i) Source

(ii) Sink

(iii) Doublet

- d. Derive the continuity equation in Cartesian coordinates for CO₂

- e. Two velocity components are given below, find the third CO₂ velocity component in 3-D flow satisfying the continuity equation.

$$u = \frac{-2xy^2}{(x^2+y^2)^{3/2}} \quad \& \quad w = \frac{y}{(x^2+y^2)}$$

- f. In 2-D incompressible flow show that the flow rate per unit width between two stream-lines is equal to the difference

between the values of stream function corresponding to these stream lines.

3. Attempt any **TWO** parts of the following:

2×10 CO

a. A venture meter is to be fitted in a pipe 0.25 m diameter where the pressure head is 7.6 m of flowing liquid and the

CO₂

$$f = \frac{fV^2}{2gD}$$

4. Attempt any **TWO** parts of the following:

a. Explain minor and major losses in pipe flow. A compound CO₄

piping system consists of 1800 m long of diameter of 0.30 m and 1200 m long of 0.40 m diameter and 600 m long of 0.30 m diameter in series, is to be replaced by a single pipe

of diameter 0.40 m. Find the length of the pipe.

b. Explain the Prandtl's mixing length theory to describe the turbulent flow. Discuss the hydraulically smooth and rough boundaries.

c. Two reservoirs are connected by a pipe 2250 m long and 0.225 m diameter, the difference in water level being 7.5 m. Determine the flow through the pipe in liters/minute. Take $f = 0.03$.

CO₄

CO₄

5. Attempt any **TWO** parts of the following:

a. Discuss the concept of boundary layer. Explain, CO₅

displacement thickness, energy thickness and momentum thickness in brief.

b. The velocity distribution in boundary layer is given as:

$$v = \frac{3}{2} \eta - \frac{1}{2} \eta^2$$

CO₅

(Roll No. to be filled by candidate)

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B.TECH.**THIRD SEMESTER THEORY EXAMINATION, 2021-22****KCE-301****ENGINEERING MECHANICS****Time: 03 Hours****Max. Marks: 100****Note:**

- Assume missing data suitably

1. Attempt any **FOUR** parts of the following: 4×5 CO
- Explain the classification of the force system. CO1
 - Derive the centroid location in rectangular plane area whose width = B and length = L . Assume one corner of rectangle as an origin. CO2
 - A block of weight W is placed on a rough horizontal plane surface as shown in Fig. 1 and a force P is applied at an angle θ with the horizontal such that the block just tends to move. Prove that the force P will be the least if the angle θ is equal to the angle of friction ϕ . CO3
 - Determine the position ' x ' of the triangular load on the beam shown in Fig. 2 such that the resultant couple moment about point 'A' is 0. CO3

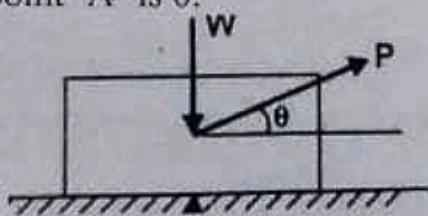


Fig. 1

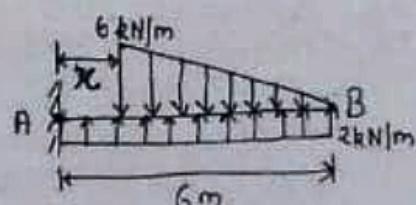


Fig. 2

- List out different types of beams and support with neat sketch. CO3
 - Derive and state the parallel axis theorem for moment of inertia for a plane area. CO2
2. Attempt any **TWO** parts of the following: 2×10 CO
- Two forces $P = 240$ N and $Q = 200$ N are acting at a point O as shown in Fig. 3. If the resultant of the forces R is equal to 400 CO1

in which $\eta = (y/\delta)$. Compute (δ^*/δ) and (θ/δ) .

- c. A submarine which may be supposed to approximate a C05 cylinder 3 m in diameter and 15 m long travels submerged at 1.54 m/s in sea water at 4°C. Find the drag exerted on it. Take kinematic viscosity at 4°C is 1.67×10^{-6} m²/s and mass density as 1.025 kg/m³. Also find the friction drag.

40 m from the ground its engine fails (Fig. 12). Determine the maximum height s_B reached by the rocket and its speed just before it hits the ground. While in motion the rocket is subjected to a constant downward acceleration of 9.81 m/s^2 due to gravity. Neglect the effect of air resistance.

- b. Two blocks of masses M_1 and M_2 are connected by a flexible but inextensible string as shown in Fig. 13. Assume the coefficient of friction to be μ , find the acceleration of the masses and the tension in the string. Assume $M_1=10\text{Kg}$, $M_2=5\text{ Kg}$ and $\mu=0.25$.
- c. The 30-kg disk is originally spinning at $\omega = 125 \text{ rad/s}$. If it is placed on the ground, for which the coefficient of kinetic friction is $\mu_c = 0.5$, determine the time required for the motion to stop. What are the horizontal and vertical components of force which the member AB exerts on the pin at A during this time (Fig. 14)? Neglect the mass of AB.

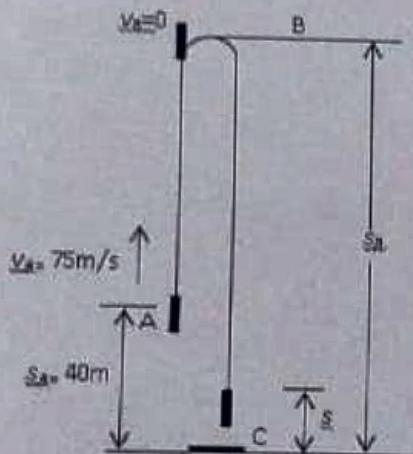


Fig. 12

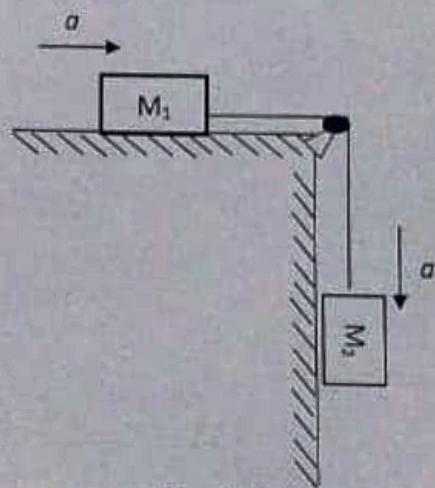


Fig. 13

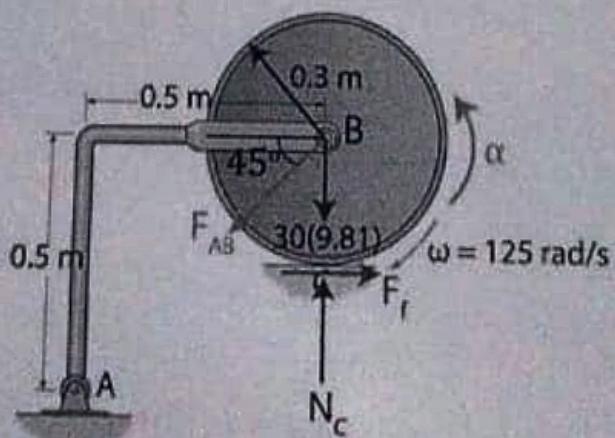


Fig. 14

Bundelkhand Institute of Engineering and Technology, Jhansi

Department of Information Technology

Class Test I (2021-2022)

B.Tech III Semester(EE+CE+CH)

Sub Code: KNC-302
Time: 1 Hours

Sub: Python Programming
Max. Marks: 15

INSTRUCTION: Attempt all the questions.

Roll No.

Q. No.	Question	Marks	CO
1	Attempt all parts of the following: a Explain the term object oriented concepts with suitable example. b What are the differences between Tuple, List, SET and Dictionary? c What is an Algorithm? make an algorithm for swap of two value	02 02 02	1 1 1
2	Attempt all parts of the following: a What do you mean by comment in python? Explain with suitable example. b Find the output of the following 1. $9 \% 2$ 2. $a = 8.6 \ b = 2 \ print \ a/b$ 3. $a='student', \ b='rollno'$ then what is the output of $c = a-b \ print(c)$	02 03 04	1 1 1
3	Write a Python program to calculate actual salary of an employee when HRA is 7.5 %, TA is 8.5%, DA is 9.5% and Income tax is 10.5% of Basic salary.	04	1

Department of Civil Engineering, BIET Jhansi

B.Tech.

Class Test – 1 (Odd Semester 2021 – 2022)

KCE – 301 (Engineering Mechanics)

Total Marks: 15



Time: 1 Hour

Note: Attempt all questions. All questions are carrying equal marks.

1. What is a force system? What is its point of concurrency?
CO1
2. A string of length ' l ' is fastened to two points **A** and **B** at the same level at a distance ' a ' apart. A ring CO1 of weight W can slide on the string and a horizontal force ' P ' is applied to it such that it is in equilibrium vertically below **B**. Show that $P = \frac{Wa}{l}$ and that the tension in the string is $\frac{W(l^2 + a^2)}{2l}$.
3. What is the Newton's law of gravitation?
4. Explain the principle of transmissibility of forces.
CO5
CO1
5. The resultant of two forces **P** and **Q** is at right angles to **P**. Show that the angle between the forces is CO1 $\cos^{-1}(-P/Q)$.

First mid-semester Test 2021-22

Fluid Mechanics

Time-1 Hour

Max. Marks 15

Note: Attempt all questions. Each question carries equal marks.
Assume any missing data suitably.

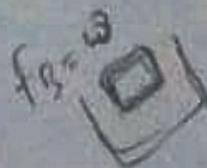
(1) Attempt any TWO parts of the following (4x2=8)

- State and explain the meta-center and meta-centric-height and mention some of its practical applications. What is the principle of floatation? Describe the equilibrium conditions of a floating body.
- A piece of wood (specific gravity = 0.6) of 10 cm square in cross-section and 2.5 m long floats in water. How much lead (specific gravity = 12) need to be fastened at the lower end of stick so that it floats upright with 0.5 m length out of water?
- Explain Newton's law of viscosity. Define Newtonian and non-Newtonian fluids with examples. If the velocity distribution over a solid surface is given by $u = 30 y - 200 y^2$. what would be the shear stress at the flat surface and at an elevation of 50 mm from it. Take $\mu = 0.048 \text{ kg/m s}$.

(2) Attempt any TWO parts of the following (3-1/2x2=7)

- Explain steady flow, unsteady flow; uniform flow, non-uniform flow; 1-D, 2-D and 3-D flows; rotational flow, irrotational flow and Laminar flow and turbulent flow.
 - Define stream lines. Show that for steady uniform flow stream lines, streak lines and path lines are identical.
- Derive and explain the continuity equation in 3-D Cartesian coordinates for steady flow of incompressible fluids.
- Calculate the unknown velocity component so that they satisfy the continuity equation:
 - $u = 2x^2, v = xyz \text{ and } w = ?$
 - $u = 2x^2 + 2xy, v = ?, w = z^3 - 4xz - 2yz$.

$y = 30 - 200y^2$



$S.G = 0.6$
 10 cm^2
 $1, 2.5 \text{ m}$

Department of Civil Engineering, BIET Jhansi
B.Tech. 2nd Year (Civil Engineering)
Class Test – 2 (Odd Semester 2021 – 2022)
KCE – 302 (Surveying and Geomatics)

Time: 1 Hour

Note: Attempt all questions.

Total Marks: 15

- 1.** A circular curve has a 180 m radius and 65° deflection angle. What is its degree (a) by arc definition and (b) by chord definition? Also calculate (a) length of curve, (b) tangent length, (iii) length of long chord (iv) apex distance and (v) mid-ordinate. 04 CO2
- 2.** Derive the equation of offsets from the long chord method in setting out a simple circular curve. 03 CO2
- 3.** Comparison of Transition Curves. 03 CO2
- 4.** Two points A and B having elevations of 640 m and 250 m, respectively, above datum, appear on a vertical photograph obtained with a camera of focal length of 250 mm and flying altitude of 2700 m above datum. Their correlated photographic coordinates are as follows: 2.5 CO4

Point	Photographic coordinate
	x (cm)
	y (cm)
a	+3.65
b	-2.25
	+2.54
	+5.59

- 5.** The images x and y of the base and top, respectively of a factory chimney 150 m high are observed in a truly vertical aerial photograph of scale 1 = 10000. Determine the position of x given that y is 70.0 mm from the principal point of the photograph. Take the focal length of the camera to be 125 mm and assume the chimney to be at datum level. 2.5 CO4

(Following Roll No. to be filled by candidate)

Roll No.

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B TECH
FIRST SEMESTER EXAMINATION 2020-2021
KEC101T
EMERGING DOMAINS IN ELECTRONICS ENGINEERING

Time: 2 Hours

Max. Marks: 100

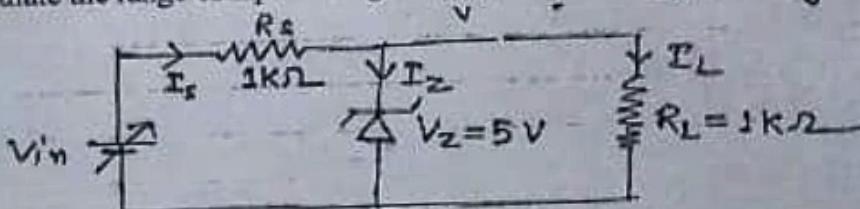
Note:

- Attempt all questions.
- All questions are equal marks.
- All symbols have usual meaning.

Attempt any two of the following questions:

[2×10][CO1]

- a. A silicon p-n junction diode under reverse bias has depletion region of width $10 \mu\text{m}$ the relative permittivity of Si = 11.7 and the permittivity of free space $\epsilon_0 = 8.85 \times 10^{-12} \text{ F/m}$. Calculate the depletion capacitance of the diode in per square meters.
- b. What do you interpret by depletion layer? How it changes with application of biasing.
- c. Calculate the range of input voltage if $I_{2\min} = 2\text{mA}$ and $I_{2\max} = 20\text{mA}$



Attempt any two of the following questions:

[2×10][CO2]

- a. Explain your understanding of bipolar junction transistor based on your understanding of doping level, area and resistances of its various regions.
- b. Draw circuit arrangement for obtaining input and output characteristics of transistor in common emitter configuration. Sketch v-I characteristics and indicate different region of importance.
- c. What do you interpret by enhancement type MOSFET? Discuss its construction and characteristics.

Attempt any two of the following questions:

[2×10][CO3]

- a. Compare both gains of operational amplifier in operation of practical opamp circuit? What do you understand by CMRR?
- b. Write short note on (i) Microprocessor (ii) Bluetooth

Time: 1 Hour

Note: Attempt all questions.

1. Following are the bearings taken in a closed compass traverse.

Line	F. B.	B. B.
AB	S 37°30'E	N 37°30'W
BC	S 43°30'W	N 44°15'E
CD	N 73°00'W	S 72°15' E
DE	N 12°45' E	S 13°15'W
EA	N60°00'E	S59°00'W

Compute the interior angles and correct them for observational errors.

2. Explain the definitions (a) Telescope Normal (b) Line of Sight (c) Transit (d) Swinging the Telescope.
3. From a topographic map, the areas enclosed by contour lines for a proposed dam are given below. Find the volume of impounded water using Prismoidal formula.

Contours (m)	300	302	304	306	308
Area (m ²)	620	8400	60240	90510	100200

4. Following is a page of a level field book. Fill in the missing reading and calculate the reduced level of all the points. Apply the usual checks.

Station	B. S.	I. S.	F. S.	Rise	Fall	R. L.	Remark
1	3.250					274220	B. M.
2	1.755		?	0.750		2748.570	C. P.
3			1.950		0.195	2740.315	
4	?	3.040	1.920	0.030		2740.311	
5			2.340		1.500	2749.845	
6			?	1.000		2750.845	
7	1.850		2.185	0.343	250.00	C. P.	
8			1.575	0.275		2750.215	
9		0.743				2750.215	
10	?	1.900	1.895		1.650	2748.615	C. P.
11			1.350	0.750		2749.315	Last Point

Total Marks: 15

02
03
05
CO1
CO1
CO1

- 02
03
05
CO1
CO1
CO1

c. Derive expression for output voltage of the differentiator circuit using opamp

4. Attempt any two of the following questions:

[2x10][CO4]

- What do you interpret by SSI, MSI, LSI and VLSI circuits?
- Apply K map minimization considering one example of your choice.
- Discuss rules of Boolean algebra simplification.

5. Attempt any two of the following questions: [2x10][CO5]

- What do you interpret by electromagnetic spectrum?
- Discuss need of modulation and its advantages
- Write short note on (i) GPRS (ii) GSM (iii) CDMA

4. Attempt any **TWO** parts of the following: 2×10 CO
 a. Explain the following:
 (i) Reciprocating positive displacement pumps
 (ii) Cavitation causes and prevention in hydraulic machines
 b. The diameter of a centrifugal pump which is discharging 0.045 cumecs of water against a total head of 25 m is 0.40 m. The pump is running at 1500 rpm. Find the head, discharge and ratio of powers of a geometrically similar pump of diameter of 0.28 m when it is running at 3000 rpm.
 c. With the help of a neat sketch, show the main parts of a centrifugal pump.
 A centrifugal pump is to discharge $0.15\text{m}^3/\text{s}$ at a speed of 1450 rpm against a head of 25m. The impeller diameter is 250 mm, its width at outlet is 50 mm and manometric efficiency is 77%. Determine the vane angle at the outer periphery of the impeller.

5. Attempt any **FOUR** parts of the following: 4×5 CO
 a. Draw main characteristics curves for a Francis and Kaplan turbine. CO5
 b. Differentiate between impulse and reaction turbines. Also draw the neat sketch for Francis turbine. CO5
 c. With the help of a neat sketch, explain the layout of a hydroelectric power plant. CO5
 d. A turbine develops 7240 kW power under a head of 25 meters at 135 rpm. Calculate the specific speed of the turbine and state the type of the turbine. CO5
 e. A Kaplan turbine works under a head of 11 meters and runs at 95 rpm. The outlet vane angle at the extreme edge of the runner is 20° . The boss diameter is $1/3$ of the diameter of the runner. The flow ratio is 0.50. Determine the diameters of the runner and the boss. Assume the whirl at outlet to be zero.

- ✓ 1. A model turbine 30 cm in diameter give a maximum CO₅ efficiency of 84% at 900 rpm and at 0.70 gate opening under a head of 20m giving an output of 28kW. A similar turbine is required to produce 380 kW at 0.70 gate opening and under a head of 28m. Calculate its diameter and speed of rotation.

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B. TECH.
FOURTH SEMESTER THEORY EXAMINATION, 2021-22
KAS-403
MATHEMATICS-III

Time: 03 Hours

Max. Marks: 100

to:

- Attempt all questions. All questions carry equal marks.
- Assume missing data suitably.

1. Attempt any **TWO** parts of the following: 2×10 CO

a. Express the function in terms of unit step function:

$$f(t) = \begin{cases} t-1, & 1 < t < 2 \\ 3-t, & 2 < t < 3 \end{cases} \quad \text{CO1}$$

and find its Laplace transform.

b. Use Convolution Theorem to find

$$L^{-1} \left\{ \frac{s^2}{(s^2 + a^2)(s^2 + b^2)} \right\}, a \neq b \quad \text{CO1}$$

c. Solve using Laplace Transform:

$$\frac{d^2y}{dt^2} + 2 \frac{dy}{dt} + 2y = 5 \sin t, \quad y(0) = y'(0) = 0 \quad \text{CO1}$$

2. Attempt any **TWO** parts of the following: 2×10 CO

a. Express the function $f(t) = \begin{cases} 1, & \text{for } |x| < 1 \\ 0, & \text{for } |x| > 1 \end{cases}$ as fourier integral.

Hence evaluate $\int_0^\infty \frac{\sin \lambda \cos \lambda x}{\lambda} d\lambda$

CO2

b. Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}, x > 0, t > 0$ subject to condition

(10) (i) $u = 0$ when $x = 0, t > 0$ (ii) $u = \begin{cases} 1, & 0 < x < 1 \\ 0, & x \geq 1 \end{cases}$ when $t = 0$

and (iii) $u(x, t)$ is bounded.

c. Solve by Z-transform $y_{k+2} - 3y_{k+1} + 2y_k = 0; y_0 = 0, y_1 = 1$

CO2

3. Attempt any **FOUR** parts of the following: 4×5 CO

a. Show that $\{(p \vee q) \Rightarrow r\} \wedge (\neg p) \Rightarrow (q \Rightarrow r)$ is a tautology CO3 without using truth tables.

b. State and prove Lagrange's theorem. CO3

c. Obtain the principal disjunctive normal form of CO3 $P \vee (\neg P \wedge \neg Q \wedge R)$.

d. Prove that forth root of unity $1, -1, i, -i$ form an abelian CO3 multiplicative group.

e. Define permutation group and write the permutation CO3 $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 2 & 1 & 4 & 6 & 5 & 3 \end{pmatrix}$ as a product of disjoint cycles.

f. Determine whether the following argument is valid or not: CO3
 $p \Rightarrow \neg q$

$r \Rightarrow q$

r

$\therefore \neg p$

4. Attempt any **FOUR** parts of the following: 4×5 CO

a. For any two sets A and B prove that $(A \cap B)' = A' \cup B'$ CO4

b. Prove by mathematical induction CO4

$$1^3 + 2^3 + 3^3 + \dots + n^3 = \left[\frac{n(n+1)}{2} \right]^2$$

c. If R be a relation in set of integers defined by CO4
 $R = \{(x, y) : x \in \mathbb{Z}, y \in \mathbb{Z}, (x - y) \text{ is divisible by } 6\}$
then prove that R is an equivalence relation.

d. Prove that the function $f : R \rightarrow R$ defined as $f(x) = 2x + 3$ for all CO4
 $x \in R$ is bijective function.

1

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B. TECH.

FOURTH SEMESTER THEORY EXAMINATION, 2021 – 22

KCE – 401

MATERIALS, TESTING & CONSTRUCTION PRACTICES

Time: 03 Hours

Max. Marks: 100

Note:

- Attempt all questions. All questions carry equal marks.
- Illustrate the answers with suitable sketches.

1. Attempt any **FOUR** parts of the following: 4×5

- a. List and define the physical properties of building materials. CO1
- b. What are the characteristics of a good brick? Write also the ingredients of a good brick earth. CO1
clay Alumina magnesia
- c. Describe the common defects in bricks. CO1
- d. Name the various types of stones which are used for building works give the specifications for a good building stones. CO1
- e. State the qualities you will consider in selecting timber for construction purposes. CO1
- f. Discuss the general properties of bituminous materials. CO1

2. Attempt any **FOUR** parts of the following: 4×5

- a. With the help of percentage of elongation; how can you plot the stress – strain curve for mild steel? Explain all the points in the stress – strain curve for mild steel. CO2
- b. What is the difference between ferrous and non – ferrous metals? CO2
Give two examples of each type and state their properties and uses.
- c. Classify the glasses on the basis of their constituents. Also CO2 describe briefly the use of glass as a building material.
- d. What are the various ingredients of the plastics? Give their CO2 specific uses.
- e. Classify different type of varnish and briefly describe them. CO2

3. Attempt any **TWO** parts of the following: 2×10 CO
- A simply supported rectangular beam of 6 m span is subjected to an uniformly distributed load of 15 kN/m over its entire length. The cross section of the beam is 20 cm wide and 30 cm deep. Sketch the variation for bending stress in the beam cross-section.
 - Derive an expression shear stress in beam of symmetrical I section with usual notation. Also sketch stress distribution for beam.
 - A hollow shaft of diameter ratio 3/8 is required to transmit 600 kW at 110 r.p.m., the maximum torque being 20% greater than the mean. The shear stress is not to exceed 63 MN/m² and the twist in a length of 3 m not to exceed 1.4 degree. Calculate the maximum external diameter satisfying these conditions. Take $C = 84 \text{ GN/m}^2$.

4. Attempt any **TWO** parts of the following: 2×10 CO
- A beam AB of span 8 metres is simply supported at the ends. It carries a uniformly distributed load of 30 kN/m over its entire length and a concentrated load of 60 kN at 3 metres from the support A. Determine the maximum deflection in the beam and the location where the deflection occurs.
 - A cantilever 2 m long is loaded with a point load of 1.4 kN at free end and distributed load of 3.4 kN per metre run over 1.2 metre from the fixed end. If the section is rectangular 80 mm X 160 mm, calculate the deflection at the free end using moment area method. Take $E = 1 \times 10^7 \text{ kN/m}^2$.
 - Derive an equation for buckling load in a long column with both ends hinged using Euler's column theory.

- Attempt any **TWO** parts of the following: 2×10 CO
- Derive Lame's equation for stress in thick cylinder. How it is used in analyses of stress in thick cylinder?
 - In a thin cylinder, show that the hoop stress is twice the



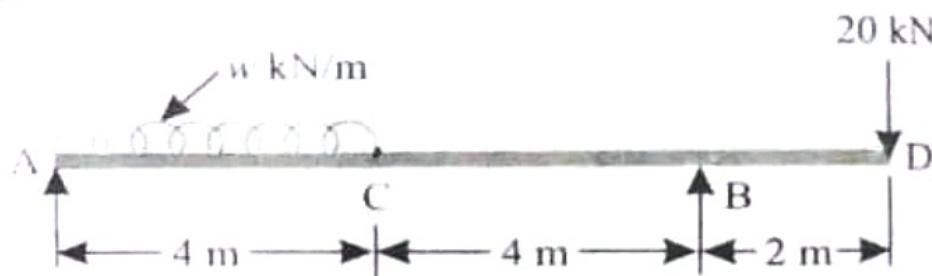
- f. Briefly describe the properties and uses of heat insulating CO2 material. 2×10
3. Attempt any **TWO** parts of the following: 2×10
- a. Write a note on the various components of a building and their basic requirements. CO3
- b. What are the different bonds used in brick masonry? Explain about English Bond 1 – brick, brick and 2 – brick thick wall masonry using a neat sketch. CO3
- c. Explain with neat sketches various types of R.C.C. floors and also state, where do we use these floors? CO3
4. Attempt any **TWO** parts of the following: 2×10
- a. What are the functional requirements for the design and construction of doors and windows? Briefly discuss with the neat sketches: CO4
- Battened and ledged doors
 - Battened, ledged and braced doors
- b. What are the factors to be considered in selecting a roof covering for a building? Also give the relative advantages of steel roof trusses over the timber sloping trusses. CO4
- c. Explain, with neat sketches, various ways of using steel and R.C.C. lintels. Also show the R.C.C. lintel with chhajja projection. CO4
5. Attempt any **TWO** parts of the following: 2×10
- a. Explain in details, various fire resisting materials with their relevant uses and specifications. CO5
- b. What is the difference between a lift and an escalator? What are the functional requirements of a lift in a building? CO5
- c. As a civil engineer, how will you prevent the cracks and leaks in the building? Also explain the process of repairing the cracks and leaks. CO5

- e. Explain the procedure for determining stresses in a general CO1 two dimensional stress system using Mohr's Circle.

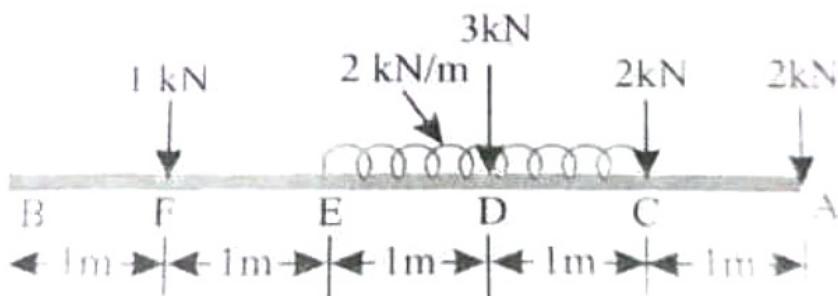
- f. A shaft is subjected to a maximum torque of 10 KNm and a CO1 maximum bending moment of 7.5 KNm at a particular section. If the allowable equivalent stress in simple tension is 160 MN/m² find the diameter of the shaft according to the strain energy theory. Take poisson's ratio = 0.24.

2. Attempt any **TWO** parts of the following: 2×10 CO

- a. For the beam loaded as shown in figure calculate the value CO2 of U.D.L. w so that B.M. at C is 50 KNm. Draw the shear force and bending moment diagram for this beam for the calculated value of w . Locate the point of contraflexure, if any.



- b. Draw the shear force and bending moment diagram for CO2 cantilever loaded as shown in figure.



- c. A simply supported beam AB of span l is subjected to a CO2 uniformly distributed load of w per unit length over the whole span. Develop expression for Shear force and bending moment. Sketch Shear force and bending moment diagram.

e. Find particular solution of recurrence relation CO4

$$a_r + 5a_{r-1} + 6a_{r-2} = 3r^2$$

f. If $f : A \rightarrow B$ and $g : B \rightarrow C$ be one-one onto functions then CO4
 (gof) is also one-one onto function. Show that
 $(gof)^{-1} = f^{-1}og^{-1}$

5. Attempt any **TWO** parts of the following: 2×10 CO

a. Let $A = \{1, 2, 3, 4\}$ and consider the relation CO5

$$R = \{(1,1), (1,2), (1,3), (2,2), (3,2), (3,3), (4,2), (4,3), (4,4)\}$$

Show that R is partial ordering and draw the Hasse diagram.

Also check whether it is lattice or not.



b. Simplify the Boolean function using K-map CO5

$$F(a,b,c,d) = a'b'c'd' + a'bc'd + a'b'cd + a'b'cd' + a'bcd$$

c. Simplify the Boolean function $pqr + pqr' + pq'r + p'qr$ and CO5
 draw the logic gate diagram of simplified expression



2. Attempt any **TWO** parts of the following: 2×10 CO
- a. A discharge of 16 cumecs flows with a depth of 2m in a CO2 rectangular channel 4m wide. At a downstream section the width is reduced to 3.5 m and the channel bed is raised by ΔZ . Analyse the water surface elements in the transition when $\Delta Z = 0.30\text{m}$. CO2
- b. A rectangular brick lined channel ($n=0.016$) of 4.0 m width CO2 is laid on a bottom slope of 0.0009. It carries a discharge of 15 cumecs and the flow is non-uniform. If the depth at a section A is 2.6 m, calculate the depth at a section B 500 m downstream of A by using only one step by any one suitable method. CO2
- c. (i) Derive the Differential equation of GVF in a rectangular channel having the variable width B. CO2
(ii) Sketch the GVF profiles on upstream and downstream of a sluice gate introduced in a CO2
(a) Steep Slope (b) Mild Slope
3. Attempt any **TWO** parts of the following: 2×10 CO
- a. Explain the velocity distribution profile in hydraulic jump CO4 with neat sketch.
- A hydraulic jump in a rectangular channel has the Froude number at the beginning of the jump $F_1 = \sqrt{15}$. Find the Froude Number F_2 at the end of the jump. CO4
- b. Derive the sequent depth ratio expression for a hydraulic jump forming in an exponential channel. Further from this expression, derive sequent depth ratio for rectangular channel. CO4
- c. Discuss in detail the use of jump as an energy dissipater. CO4
- The depth and velocity of flow in a rectangular channel are 1.2 m and 1.6 m/s respectively. If a gate at the d/s end of the channel is abruptly closed, what will be the height and absolute velocity of the resulting surge? CO4



longitudinal stress. Also find the maximum shear stress expression.

- c) An open coiled helical spring made of steel wire 6 mm diameter and 30 mm mean coil radius, with 65° inclination of the coils with the spring axis, is subjected to an axial torque T. If number of turns in the spring increases by 1/8 and the original number of turns is 12 calculate: CO5

- (i) Magnitude of axial torque T ;
- (ii) Change in axial length of spring.

Take $C_{\text{steel}} = 84 \text{ GN/m}^2$ and $E_{\text{steel}} = 210 \text{ GN/mm}^2$.



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B. TECH.**FOURTH SEMESTER THEORY EXAMINATION, 2021-22**

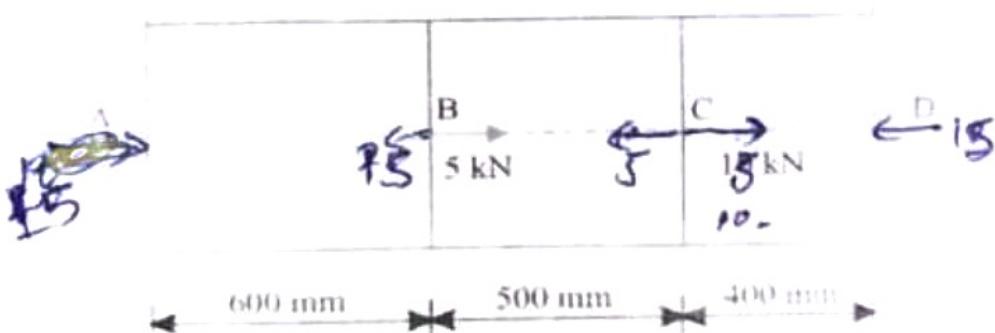
KCE-402

INTRODUCTION TO SOLID MECHANICS**Time: 03 Hours****Max. Marks: 100**

Note:

- Attempt all questions. All questions carry equal marks.

1. Attempt any **FOUR** parts of the following: 4×5 CO
- a. A straight uniform bar AD is clamped at both ends and CO1
loaded as shown in figure. Initially the bar is free. Determine
the stresses in all the three parts (AB, BC, CD) of the bar if
the cross-sectional area of bar is 1000mm^2 .



- b. Derive the relationship between Young's modulus and bulk modulus. CO1

- c. At a point in a bracket the stress on two mutually perpendicular planes are 400 MN/m^2 tensile and 300 MN/m^2 tensile. The shear stress across these planes is 200 MN/m^2 . Determine the magnitude and directions of principal stress and maximum shear stress.

- d. Explain the maximum shear stress theory. CO1

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B. TECH.**FOURTH SEMESTER THEORY EXAMINATION, 2021-22**

KCE-403

HYDRAULIC ENGINEERING AND MACHINES**Time: 03 Hours****Max. Marks: 100**

Note:

- Attempt all questions. All questions carry equal marks.
- Assume missing data suitably.

1. Attempt any **FOUR** parts of the following: 4×5 CO
 a. Differentiate with one example CO1
- (i) Prismatic and Non-prismatic channels 2.5
- (ii) Hydraulic mean depth and hydraulic mean radius

b Prove $y_c = \left[\frac{4y_1^4 y_2^4}{(y_1^2 + y_2^2)(y_1 + y_2)} \right]^{1/5}$, CO1

where y_1 & y_2 are alternate depths in a triangular channel.

- c. Find the condition for economic circular section having maximum velocity in the channel. Use Chezy's formula, CO1

- d. Determine the ratio of critical specific energy to critical depth for an exponential channel. → CO1

- e. A rectangular channel 4 m wide carries a flow of 66 cumecs, Find the critical depth and critical velocity of flow under the given condition. CO1

- f. Prove that for hydraulically most efficient trapezoidal channel section is one half of a regular hexagon. CO1