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Rajarambapu Institute of Technology, Rajaramnagar

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End Semester Examination

F.Y.M.Tech. Structural Engineering Sem- I

Q.P. Code
E217

Course Code: CES 1015 **Course Name: Advanced Solid Mechanics**

Day & Date: Wed., 01/03/2023

Time : 2:30 to 5:30 Max Marks: 100

Instructions: **1) All questions are compulsory.**
2) Figures to the right indicate maximum marks.
3) Assume suitable data if not given.
4) Use of non-programmable calculator is allowed.

Q.1 **Solve.**

a. If the state of stress at a point in a body is given as follows, determine the components of the body force in order to satisfy the equations of equilibrium. **CO1 06**

$\sigma x = 20x^3+y^2$, $\sigma y = 30x^3+100$, $\sigma z = 10(y^2+z^2)$;
$\tau xy = z$, $\tau yz = x^3$, $\tau zx = y^3$;

b. The state of stress at a particular point for a given reference xyz, is given by the stress tensor τ_{ij}. If a new set of axes x'y'z' is formed by rotating xyz through 60° about z-axis, find the new stress tensor τ_{ns}. **CO1 10**

$$\tau_{ij} = \begin{bmatrix} 200 & 100 & 0 \\ 100 & 0 & 0 \\ 0 & 0 & 500 \end{bmatrix} \text{KPa}$$

OR

b. The state of a stress at a point is given by σx = 1000 kPa, σy = -600 kPa, σz = 400 kPa; τxy = 800 kPa, τyz= 0, τzx = 0. Consider another set of co-ordinate axes x'y'z', in which z' coincides with z and x is rotated by 30° anticlockwise from the x-axis. Determine the stress components in the new coordinate system. **CO1 10**

Q.2. **Solve.**

a. The strain components at a point in a continuum with respect to x,y,z coordinate system are given as follows: **CO1 08**

$\varepsilon_x = 0.02$, $\varepsilon_y = 0.03$, $\varepsilon_z = 0$,
$\gamma_{xy} = 0.01$, $\gamma_{yz} = -0.04$, $\gamma_{zx} = 0$
Determine the strain components in a different coordinate systemx',y',z' which was obtained through rotating x,y,z system about y axis by an angle of 45°.

b. At a point in a body, the displacement field is linear and is given by the following expressions. Find all the strains. **CO1 08**

$u = 0.06x + 0.05y + 0.01z$
$v = 0.01y - 0.03x$
$w = 0.02x + 0.01z$

OR

c. At a point in a continuum, the deformations are given by **CO1 08**

$u = 3x^2z$
$v = 4y^3z$
$w = -x^3 - y^4$
Determine the strain components at a point whose coordinates are (1,3,2).

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Q.3 **Solve.**

a. Write equations for strain giving general form of Hooke's law. **CO1 04**

b. Investigate the stress distribution at $0< x < l$ for $y = \pm h$ where l is the span of the beam and $2h$ is depth of beam, and F is the load for the following Airy's stress function. **CO1 14**

$$\emptyset = B\left(y^3 + \frac{3yh^2}{4}\right) + \frac{F}{8}y^2$$

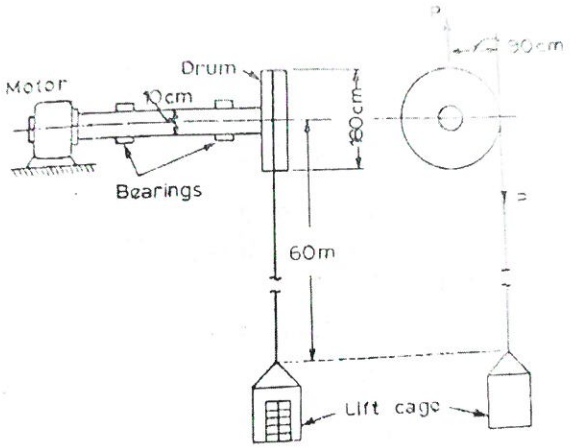
OR

b. Airy's stress function $\emptyset$ for problem consists of a polynomial. One of these terms is $\theta = xy^3$ over $0 \leq x \leq L$, $-C \leq y \leq +C$. Find what problem the above term represents. **CO1 14**

Q.4 **Solve.**

a. Write basic assumptions made while deriving torsional equation. **CO2 04**

b. A group of people enters a lift cage; it moves down elastically by 5mm. If the length of cables from the lift cage to the pulleys is 60 m, and the length of motor shaft (solid circular section) is, 1.5 m, find the total weight of people. The ropes are wound round a drum of 1800 mm diameter and the motor does not move at all. So the motor shaft of 100 mm diameter may be assumed to be fixed at the motor end and elastically rotates at the drum end. Area of cables – 300 sq.mm. E = 200 GPa. Poissons ratio = 0.25. **CO2 14**



Q.5 **Solve.**

a. Discuss the yield criterion for a material. **CO1 04**

OR

b. Discuss the Tresca's yield criterion. **CO1 04**

c. The state of stress at a point is given by $\sigma_x = 70MPa$, $\sigma_y = 120MPa$, $\tau_{xy} = 35MPa$. If the yield strength for the material is $125MPa$, determined in a uniaxial tensile test, whether yielding will occur according to Tresca's and von-Mises yield conditions or not. **CO1 12**

Q.6 **Solve any two.**

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a. Derive equations for bending moment at a) incipient yielding b) elasto-plastic yielding and c) fully plastic yielding considering the idealized stress strain curve. **CO3 08**

b. A simply supported beam of rectangular cross section 100mm wide and 120mm deep is 2.5m long. It carries a concentrated load at the center of span. The yield strength of the beam material is 250N/mm^2. Assume linear stress stress-strain behavior of the material. Determine the magnitude of the concentrated load if, **CO3 08**
i. the outermost fibers of the beam just start yielding,
ii. the outer shell upto 30mm depth yields,
iii. whole of the beam yields.

c. A simply supported beam of length L, carries a concentrated load W at midspan. If the stress-strain curve for the beam is given by $\sigma = H\varepsilon^n$, determine the deflection of the beam under the load. **CO3 08**

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K.E.Society's

Rajarambapu Institute of Technology, Rajaramnagar

(An Autonomous Institute, affiliated to SUK)

End Semester Examination (JAN/FEB 2023)

FYMTech. Civil Structural Engg. Sem- I

Q.P.Code
E233

Course Code: CES1035 **Course Name**: Advanced Structural Analysis

Day & Date: Friday, 03 /03/ 2023

Time : 2.30 pm to 5.30 pm Max Marks: 100

Instructions: 1) All questions are compulsory

2) Figures to the right indicate maximum marks

3) Assume suitable data if not given

4) Use of non-programmable calculator is allowed

Q.1	a	Define and state significance of ILD	04	CO1
	b	Construct influence line diagram for radial shear, normal thrust and bending moment at a section 6m from left hand support of the two hinged parabolic arch of span 20 m and central rise 5 m.	13	CO1
Q.2	a	Comment on- analysis of determinate & indeterminate beams curved in plan	03	CO2
	b	An uniform circular in cross section bent ABC horizontal in plan, $\angle B=90^0$ is fixed at A and free at end C. It carries downward concentrated load 25 kN at its free end. Determine the deflection of free end C. Take AB = 3m, BC = 2m, GJ = 0.8 EI	13	CO2
Q.3	a	Enumerate the situations in which Geometric nonlinearity must be included in the structural analysis	03	CO3
	b	A beam column of circular section 100mm diameter is 2m long, hinged at both ends. It supports an axial compression of 5kN, together with three lateral loads of 2kN each spaced at intervals of 500mm.Determine the maximum deflection and maximum stress developed in the column. Assume E = 200 kN/mm^2	13	CO3
OR				
Q.3		A beam- column simply supported at the ends is subjected to an axial compressive force P at both the ends and a lateral beam load is uniformly distributed over the entire length of intensity w per unit length. Develop the equation for the elastic curve; also find maximum deflection, and bending moment. Assume the beam-column is prismatic	16	CO3
Q.4	a	Explain with example Boundary value and Initial value problem	04	CO5
	b	An axially loaded column has characteristics $E = 10 \times 10^9\ Pa,\ I = 1.25 \times 10^{-5}\ m^4\ and\ L = 3m$ using three interior points determine eigen values and corresponding buckling loads in the column. The differential equation of column is $$\frac{d^2y}{dx^2} + p^2y = 0 \qquad where\ \frac{P}{EI} = p^2$$	12	CO5

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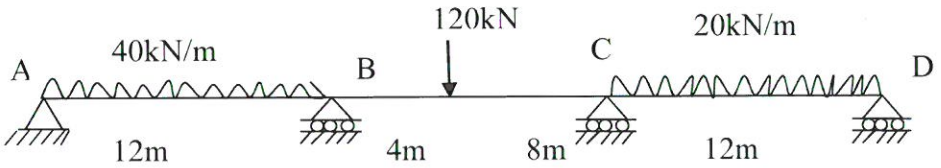
OR

b Determine the values of y at the pivotal points of the interval (0,1). If y satisfies the boundary value problem $y^{iv} + 81y = 81x^2, y(0) = y(1) = y''(0) = y''(1) = 0$. Take n = 3 — 12

Q.5 a With suitable example show that [K] [F] = [I] — 05 CO4

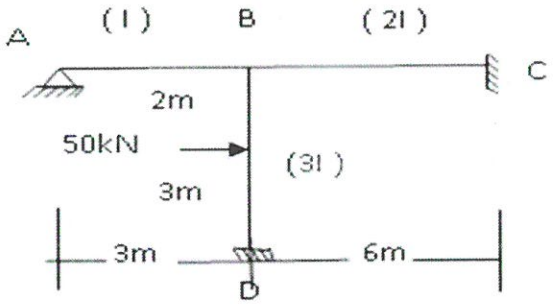
b Analyze the continuous beam loaded and supported as shown in figure., during loading support B and C settles with 15mm and 5mm respectively. Use flexibility matrix method. Also draw BMD. — 13 CO4

Take EI = constant = 180 x10 ^{11}Nmm^2



Q.6 a Derive the element stiffness matrix for beam element by using direct stiffness method — 04 CO4

b Analyze the portal frame ABC is loaded and supported as shown in figure., by using stiffness matrix method. Construct BMD — 13 CO4



OR

Q.6 a Explain Transformation of matrix and state its significance — 03 CO4

b A continuous beam ABC fixed at A and simply supported at B and C, such that AB = BC = 6m. Beam is loaded with udl of intensity 15kN/m over span AB and point load 45kN at 2m from support B on span BC. During loading support B sinks by 25mm. Analyze the beam and draw BMD. — 14 CO4

Take EI = 3800 kN-m^2

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Rajarambapu Institute of Technology, Rajaramnagar
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End Semester Examination (JAN/FEB 2023)
F.Y.M. Tech. Civil Structural Engg. Sem- I
Course Code: CES1055
Course Name: Structural dynamics and Earthquake Engineering

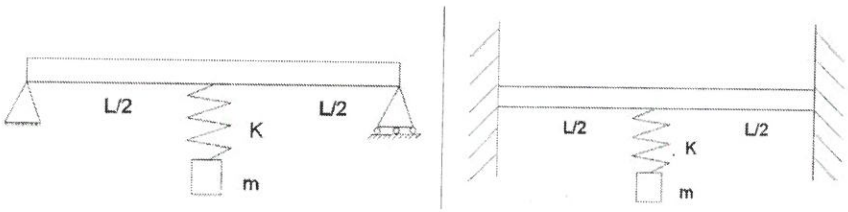
Q. P. Code
E246

Day & Date: – Monday, 06/03/2023
Time: ...2:30 to 5:30 pm,
Max Marks: 100

Instructions: 1) All questions are compulsory
2) Figures to the right indicate maximum marks
3) Assume suitable data if not given
4) Use of non-programmable calculator is allowed

Q.1 Solve the following questions

(a) Calculate the equivalent stiffness of the systems shown in given figure When L= 3.6 m, E=22000 Mpa, I= 1.2 x 10^{-4} m^4, K= 40 kN/m, m= 10 kN. — 08 Marks — **CO1**



(b) Explain the degree of freedom system along with the examples. — 04 Marks — **CO1**

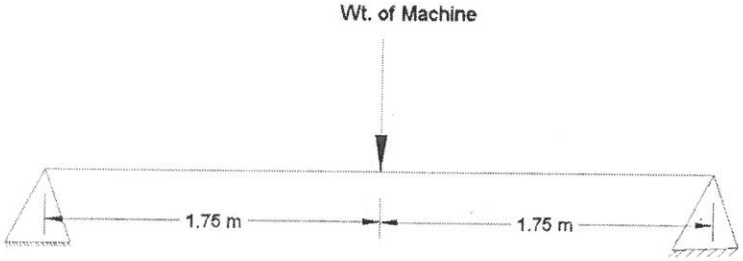
(c) Explain the components of basic dynamic system — 05 Marks — **CO1**

OR

(c) Explain the concept of equivalent stiffness — 05 Marks — **CO1**

Q.2 Solve any two

(a) A machine of weight 80kN is mounted centrally on a simply supported beam, produces a harmonic force of magnitude F= 140kN at a frequency of 60 rad/s. Neglect the weight of beam and assume 15% of critical damping. Determine the amplitude of motion of machine and the force transmitted to support. Given E = 2 x 10^5 N/mm^2 and I = 30 x 10^6 mm^4 — 08 Marks — **CO1**



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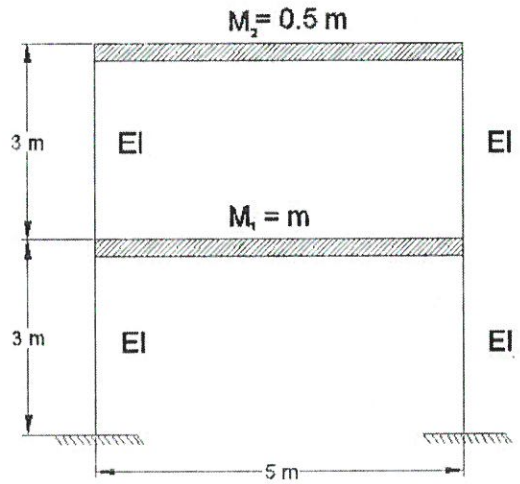
(b) For single degree of freedom system mass is 10 kg, stiffness 6.25 — 08 Marks — **CO1**

kN/m. damping coefficient 20Ns/m. Initial displacement at t=0 and initial velocity is 150 m/s. obtain the equation of motion and find the displacement at t=2s.

(c) The stiffness and damping characteristics of a dynamic system are to be determined by free vibration test. In this test, a mass of 18 kg is set into free vibration by displacing to 25 mm through hydraulic jack and then suddenly released at the end of 20 complete cycle. The elapsed time is 3 sec and amplitude is 5mm. determine the damping and stiffness of system — 08 Marks — **CO1**

Q.3 **Solve the following question** — 18 Marks — **CO1**

(a) Compute the natural frequencies and mode for the shear building shown in figure. Given EI= 5 X 10^6 Nm^2, m = 500 x 10^3 Ns^2/m, Storey height = 3m, Span = 5m.



Q.4 **Solve the following question**

(a) Explain seismic waves with schematic diagram — 08 Marks — **CO2**

(b) 6 Feb 2023 an earthquake struck southern and central turkey and western Syria. Explain how to determine the intensity of an earthquake in different regions using modified mercalli intensity scale. — 08 Marks — **CO2**

OR

(b) Explain with neat sketch the working of seismograph and how to determine the epicenter of an earthquake. — 08 Marks — **CO2**

Q.5 Solve the following question

(a) Explain how do earthquake affect structural members of an reinforced concrete building — 10 Marks — **CO2**

(b) Describe how to make building ductile for good seismic resistance — 07Marks — **CO2**

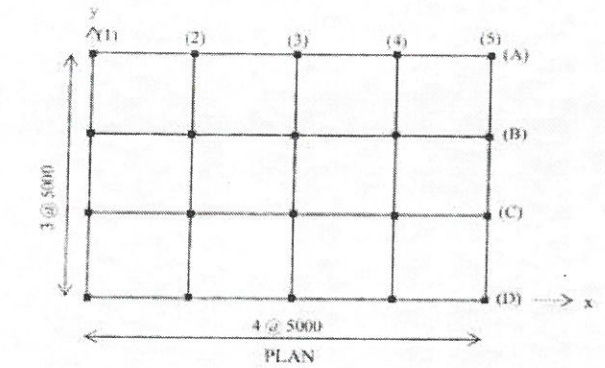
OR

(b) Describe how flexibility of structure affect their earthquake response — 07Marks — **CO2**

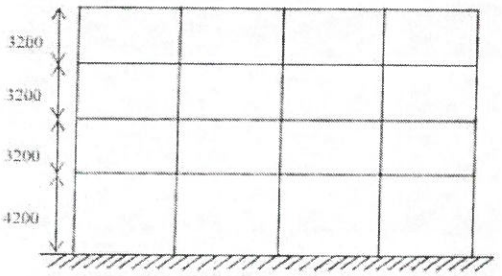
Q.6 Solve the following question

(a) For a office RCC (special moment resisting frame) building the seismic weights on the floor are W1=W2=W3=4200kN and W4= 3000kN. The storey heights are ground floor = 4.2 m, first storey = 3.2 m, second storey =3.2 m, third storey =3.2 m. the building is founded on medium stiff soil and situvated in shialong (seismic zone 5). Determine the design seismic load on the structure and draw base sheat diagrm.
(Assume suitable data if necessary)

12 Marks **CO3**



PLAN



ELEVATION

(b) Explain how architecture features affect the building during an earthquake

04 Marks **CO3**

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End Semester Examination (JAN/FEB 2023)

FYMTech. Civil Structural Engg. Sem- I

Q.P.Code
E257

Course Code: CES1155 **Course Name**: PE-I Advanced Concrete Technology

Day & Date: Wed., 08/3/2023

Time : 2.30 to 5.30 pm,

Max Marks: 100

Instructions: 1) All questions are compulsory

2) Figures to the right indicate maximum marks

3) Assume suitable data if not given

4) Use of non-programmable calculator and IS 10262-2019 (without annexure) is allowed

Q.1

(a)	Distinguish between mineral and or chemical admixtures.	6 Marks	CO1
(b)	Compare the effect of accelerators and retarders on between properties of concrete.	5 Marks	CO1
	OR		
	Compare the applications of waterproofing admixtures and plasticizers in concrete construction.	5 Marks	CO1
(c)	Explain any three types of concrete chemical admixtures to improve properties of concrete.	5 Marks	CO1

Q.2

(a)	Explain factors influencing the strength and density of light weight concrete.	5 Marks	CO4
(b)	Describe the role of air entrainment for mass concrete with respect to strength and durability of concrete.	6 Marks	CO4
	OR		
	Explain the significant difference between design mix proportioning of conventional and high strength concrete.	6 Marks	CO4
(c)	Compare the important properties of normal concrete with those of polymer concrete.	6 Marks	CO4

Q.3

(a)	Explain tremie, prepacked concrete and bucket placing method of underwater concreting.	7 Marks	CO2
(b)	Explain precautions required during production, placing and curing of hot weather concrete.	5 Marks	CO2
	OR		
	Explain precautions required during production, placing and curing of cold weather concrete.	5 Marks	CO2

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	(c)	Explain precautions required during concrete pumping.	5 Marks	CO2
Q.4				
	(a)	Explain the recommendations for superior fire resistance concrete.	6 Marks	CO3
	(b)	Explain factors influencing corrosion of steel in reinforced cement concrete.	5 Marks	CO3
	(c)	Describe precautions to avoid alkali-silica reaction in concrete.	6 Marks	CO3
		OR		
		Describe the precautions to avoid freeze-thaw damage in concrete?	6 Marks	CO3
Q.5				
	(a)	Design mass concrete mix according to following data : Stipulations for proportioning : a) Grade designation : M20 b) Type of cement : OPC 43 grade conforming to IS 269 c) Type of mineral admixture : Fly ash conforming to IS 3812 (Part1) d) Maximum nominal size of aggregate : 150 mm e) Minimum cement content and maximum water-cement ratio to be adopted and/or Exposure conditions as per Table 3 and Table 5 of IS 456: : Moderate (for plain concrete) f) Workability : 50 mm (slump) g) Degree of supervision : Good h) Type of aggregate : Rounded aggregate j) Maximum cement (OPC) content : 450 kg/m3 k) Chemical admixture : Not required as rounded aggregate of 150 mm msa is being used Test data for materials : a) Cement used : OPC 43 grade conforming to IS 269 b) Specific gravity of cement : 3.15 c) Fly ash : Conforming to IS 3812 (Part 1) d) Specific gravity of fly ash : 2.2 e) Specific gravity of 1) Coarse aggregate(at SSD condition) : 2.74 2) Fine aggregate(at SSD condition) : 2.65 f) Water absorption 1) Coarse aggregate : 0.5 percent 2) Fine aggregate : 1.0 percent g) Free (surface) moisture 1) Coarse aggregate : Nil (absorbed moisture also nil) 2) Fine aggregate : Nil (absorbed moisture also nil) h) Sieve analysis	16 Marks	CO4

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Coarse aggregate:

Sieve Sizes mm	Percentage Passing				
	Fraction I (150-80 mm)	Fraction II (80 - 40 mm)	Fraction III (40 - 20 mm)	Fraction IV (20 - 10 mm)	Fraction V (10 – 4.75 mm)
(1)	(2)	(3)	(4)	(5)	(6)
150	100	100	100	100	100
80	Nil	92	100	100	100
40	Nil	5	90	100	100
20	-	Nil	4	97	100
10	-	-	Nil	10	78
4.75	-	-	-	2	10

Fine aggregate : Conforming to grading Zone II of Table 9 of IS 383

Assume suitable data, if necessary and mention it.

Q.6

(a)	Explain importance and limitations of ultrasonic pulse velocity test in hardened concrete testing	6 Marks	CO5
(b)	Describe factors affecting the measurement of pulse velocity in hardened concrete testing.	5 Marks	CO5
	OR		
	Describe and limitations of rebound hammer test in hardened concrete testing	5 Marks	CO5
(c)	Explain advantages and limitations of core cutting test in hardened concrete testing	6 Marks	CO5

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K.E.Society's
Rajarambapu Institute of Technology, Rajaramnagar
(An Autonomous Institute, affiliated to SUK)
End Semester Examination March 2023
First Year M.Tech. Civil Structural Engg. Sem- I

Design of Bridges (PE-II) CES – 1195

QP code
E269

Day & Date – Friday, 10/03/2023
Time – 2.30 to 5.30 pm.

Max Marks- 100

Instructions

1. *All Questions are compulsory.*
2. *Figures to the right indicate maximums marks.*
3. *Use of non-programmable calculator, IS- 456, IRC-21, SP-16 are allowed.*
4. *Assume any additional data if not given.*

Q 1 a	Explain the concept of dispersion length and width	07	CO1
b	Explain salient features of live load and impact load in IRC loading. Draw a sketch and show details of load distribution as per IRC standards.	09	CO1
Q 2 a	Design a culvert across a stream using following data. Draw sketch and show details. Span of bridge – 3.80 m, Width of road 7.5 m, IRC class AA loading wheeled vehicle, Thickness of wearing coat- 100 mm, material- Concrete M- 25 & Steel Fe 415, Max. allowable shear stress- 0.62 N/mm^2	17	CO2
	OR		
a	Design a box culvert using following data. Draw sketch Inside dimensions – 4 x 4 m Width of road- 7 m Material- Concrete M- 25 & Steel Fe 415 Culvert is subjected to water pressure from inside, earth pressure from outside. The B.M. at support is 650 kNm, at mid span is 640 kNm .The max. Shear force is 180 kN.	17	CO2

Q 3 a	Design the longitudinal girder for a T beam .The total moment on girder is 350 kNm and S.F. is 150 kN. Total width of road – 7.5 m Clear span of one slab 10 m Density of RCC- 25 kN/m^3 Density of wearing coat- 22 kN/m^3 Thickness of wearing coat- 100 mm Loading- IRC Class AA- Wheeled vehicle Width of support (Bearing)- 400 mm No lateral pressure from outside Material- Concrete M- 25 & Steel Fe 415 Use m1= 0.038, m2 = 0.031 for D.L. and m1= 0.08, m2 = 0.06 for L.L. Impact factor= 22% , Continuity factor = 0.8, Tc= 0.38 MPa	17	CO2
Q 4 a	Design top slab of a fly over bridge with following data Total width of road – 7.5 m Clear span of slab 4 m Density of RCC- 25 kN/m^3 Density of wearing coat- 22 kN/m^3 Thickness of wearing coat- 100 mm Loading- IRC Class AA- Wheeled vehicle Width of support (Bearing)- 400 mm Material- Concrete M- 40 & Steel Fe 415	17	CO2
Q 5 a	Verify the stability of abutment from the following data Density of soil- 18 kN/m^2 Coefficient of friction – 0.6 Angle of repose of the soil - 30^0 IRC class 70 R loading Material M 25 and Fe 415 Total top width including bearing - 1.6 m Bearing – 1 m Thickness of deck – 400 mm Total height - 6 m Side slope- 1m horizontal in 5 m vertical Span of bridge- 15 m Deck consist of 3 longitudinal girders 0.6 x 1.5 m and deck slab of 400 mm Angle of friction between soil and concrete - 18^0	17	CO3
	OR		
a	Verify the adequacy of the dimensions of the concrete pier for the following data. Draw fig. Top width of pier- 1.8 m Height of pier up to springing level – 12 m	17	CO3

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C/C of bearing – 1300 mm
side slope 1 in 10
HFL 1000 mm below springing level
Span of bridge – 16 m
Reaction due to live load of one span – 700 kN
Road - Two lane road with 1m wide footpath on either side
D.L from Superstructure: (Consists of three longitudinal girders of 1.4 m depth with deck slab of 200 mm depth. Rib width of girders = 300mm.)= 1700 KN
Material of pier: M 25, Fe 415.
Max. mean velocity of current (v) – 3.0 m/sec
Live load – IRC Class AA
K' factor for semicircular section in plan – 0.66
Water pressure = $5.2Kv^2$

Q 6 a	Explain with sketch Joints in bridges	06	CO2
b	Design a suitable bearing using following data.	10	CO2

Vertical load (Sustained) – 225 kN
Vertical Load (Dynamic) – 50 kN
Horizontal force – 70 kN
Modulus of rigidity of elastomer – 1 N/mm^2
Friction Coefficient – 0.33

Enroll No	

K.E. Society's

Rajarambapu Institute of Technology, Rajaramnagar

(An Autonomous Institute, affiliated to SUK)

End Semester Examination

S.Y.M.Tech. All Branch . Sem-III

Q.P. Code
E320

Course Code: MOE2011 **Course Name**: OE: Artificial Intelligence-Machine Learning

Day & Date: Sat., 11/03/2023

Time : 10:30 to 1:30 pm, Max Marks: 100

Instructions: 1) All questions are compulsory

2) Figures to the right indicate maximum marks

3) Assume suitable data if not given

			Marks	CO
Que.1	**Attempt any two**			
	A)	Elaborate with suitable application what is AI and ML.	8	CO1
	B)	Describe supervised learning with example.	8	CO1
	C)	Justify the role of reinforcement learning in AI and ML.	8	CO2
Que.2	**Attempt any two**			
	A)	What are the different learning datasets in machine learning describe any one dataset in detail?	8	CO2
	B)	Describe how principal component analysis (PCA) is better than another dataset.	8	CO3
	C)	Sometimes a dataset can contain missing features, explain the different methods used to manage the missing feature.	8	CO2
Que.3	**Attempt any two**			
	A)	What are the different types of regression? Describe logistic regression in detail.	8	CO1
	B)	Develop bidirectional linear regression model for a linear equation with adding some noise.	8	CO3
	C)	Describe Stochastic gradient descent classifier (SGDC) with suitable application.	8	CO2
Que.4	**Attempt any two**			
	A)	Describe how Bayes theorem is powerful and easy-to-train classifiers.	8	CO3
	B)	Justify the sentence "SVM can work for linear and non-linear scenarios, allowing high performance in many different contexts"	8	CO4
	C)	Write note on Support Vector Regression.	8	CO2

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Que.5 Attempt any two

A)	Describe how accuracy of predicative model is improved using decision trees.	9	CO4
B)	Describe evaluation methods based on completeness and adjusted rand index in machine learning.	9	CO5
C)	Write note on ensemble learning using random forests.	9	CO4

Que.6 Attempt any two

A)	Explain basic concepts of clustering and the structure of k-means.	9	CO4
B)	Describe Model-based collaborative filtering in machine learning.	9	CO5
C)	Explain the following Hierarchical strategies • Agglomerative clustering • Divisive clustering	9	CO1