B.Tech. Third Semester (Civil Engineering / Electronics Engineering / Electronics Telecommunication Engineering / Electronics Communication Engineering / Mechanical Engineering / Aeronautical Engineering) (C.B.C.S.) Winter 2022

Applied Mathematics-III

P. Pages : 2 **SPM/KW/22/2507/2513/2525/2553**

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Time : Three Hours Max. Marks : 70

Notes :
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4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Use of non programmable calculator is permitted.

1. a) Find Laplace Transform of $\dfrac{e^{-at}-e^{-bt}}{t}$ and hence evaluate $\displaystyle\int_0^\infty \left\{\frac{e^{-at}-e^{-bt}}{t}\right\} dt$. **6**

b) Find: $L^{-1}\left\{\log\left(\dfrac{s+a}{s+b}\right)\right\}$ **4**

c) Express $f(t)=\begin{cases} e^{-t}, & 0<t<2 \\ 0, & t>2 \end{cases}$ in terms of unit step function and hence find its Laplace Transform. **4**

OR

2. a) Using Convolution theorem find $L^{-1}\left\{\dfrac{1}{(s-2)(s+2)^2}\right\}$. **5**

b) Find $L\{f(t)\}$, if $f(t)=\begin{cases} t, & 0<t<1 \\ 0, & 1<t<2 \end{cases}$, where $f(t+2)=f(t)$. **3**

c) Solve $\dfrac{d^2x}{dt^2}+9x=\cos 2t$, given $x(0)=1$, $x\left(\pi/2\right)=-1$. **6**

3. a) Find Fourier Series to represent the function $f(x)=|x|$ for $-\pi<x<\pi$ and hence derive that $\dfrac{\pi^2}{8}=\dfrac{1}{1^2}+\dfrac{1}{3^2}+\dfrac{1}{5^2}+\ldots\ldots$ **7**

b) Find Fourier transform of $e^{-|x|}$ and hence show that $\displaystyle\int_0^\infty \frac{x\sin mx}{1+x^2}dx=\frac{\pi}{2}e^{-m}$, $m>0$ **7**

OR

4. a) Obtain half range cosine series for $f(x)=x^2$ in $0\le x\le\pi$. **7**

b) Solve the integral equation $\displaystyle\int_0^\infty f(x)\cos\lambda x\,dx=e^{-\lambda}$, $\lambda>0$. **7**

5. a) Show that $e^x(\cos y + i\sin y)$ is an analytic function. Find its derivative. **7**

b) Evaluate $\oint_C \frac{z-1}{(z+1)^2(z-2)}dz$ where C is $|z-i| = 2$ by Cauchy Integral formula. **7**

OR

6. a) If $u = y^3 - 3x^2y$, then show that u is harmonic and find v and the corresponding analytic function $f(z) = u + iv$. **7**

b) Find Laurent's series expansion of $f(z) = \frac{1}{(z-1)(z-2)}$ in the region. **7**

i) $1 < |z| < 2$ ii) $0 < |z-1| < 1$

iii) $|z| > 2$

7. a) Solve $(y+z)p - (x+z)q = x - y$ **4**

b) Solve $(D^2 + 2D'D + D'^2)z = \sin(x+2y)$ where $D = \frac{\partial}{\partial x}, D' = \frac{\partial}{\partial y}$. **5**

c) Solve by the method of separation of variables $3\frac{\partial u}{\partial x} - 2\frac{\partial u}{\partial y} = 0$ given that **5**

$u(x,0) = 4e^{-x}$

OR

8. a) Solve $x(y^2 - z^2)p + y(z^2 - x^2)q = z(x^2 - y^2)$ **4**

b) Solve $\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial x \partial y} - 2\frac{\partial^2 z}{\partial y^2} = (y-1)e^x$ **5**

c) Solve using Laplace transform method. **5**

$\frac{\partial U}{\partial t} + x\frac{\partial U}{\partial x} = x, x > 0, t > 0, U(x,0) = 0, U(0,t) = 0$

9. a) Check whether following set of vectors are linearly dependent, if dependent find the relation between them $X_1 = [1\ \ 2\ \ -1\ \ 3]$, $X_2 = [2\ \ -1\ \ 3\ \ 2]$, $X_3 = [-1\ \ 8\ \ -9\ \ 5]$. **4**

b) Find the modal matrix B corresponding to matrix $A = \begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}$ and verify that $B^{-1}AB$ is diagonal form. **5**

c) Use Sylvester's theorem to show that $3\tan A = (\tan 3)A$, where $A = \begin{bmatrix} -1 & 4 \\ 2 & 1 \end{bmatrix}$ **5**

OR

10. a) Find singular value decomposition if the matrix $A = \begin{bmatrix} 3 & 4 \\ 0 & 5 \end{bmatrix}$. **7**

b) Find the largest eigen value and corresponding eigen vector by iterative method **7**

$A = \begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$.

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B.Tech. Third Semester (Civil Engineering) (C.B.C.S.) Winter 2022

Fluid Mechanics

P. Pages : 2 **SPM/KW/22/2508**

Time : Three Hours Max. Marks : 70

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7. Due credit will be given to neatness and adequate dimensions.
8. Assume suitable data whenever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.
10. Use of non programmable calculator is permitted.

1. a) Differentiate the following: **7**
- i) Newtonian and non-Newtonian fluid.
- ii) Dynamic viscosity & kinematic viscosity

b) What is capillarity? Derive expression for height of capillary rise. **7**

OR

2. a) State "pascals law".

b) Find surface tension in a soap bubble of 20mm diameter. **7**

3. a) Convert pressure head of 10m of water into- **7**
- i) Pressure head of carbon tetrachloride of specific gravity 1.6.
- ii) Pressure head of oil of specific gravity
- iii) Pressure head of mercury

b) A vertical square plate of size $1\text{m} \times 1\text{m}$ is immersed in water such that it's side is parallel to water surface and lies 0.5m below it. Calculate the magnitude of total pressure and centre of pressure. **7**

OR

4. a) Explain the three states of equilibrium for a body partially immersed in liquid. **7**

b) A rectangular plate of size $2\text{m} \times 5\text{m}$ is immersed vertically in water such that it's longer side is parallel to water surface of lies 1.5m below it. Calculate the magnitude of total pressure and centre of pressure. **7**

5. a) Explain **any two.** **7**
- i) Steady flow and unsteady flow.
- ii) Laminar flow and Turbulent flow.
- iii) Stream function and velocity potential.

b) A two dimensional flow is described by the velocity components $u = 5x^3$ and $v = -15x^2 y$ Determine the stream function, velocity and acceleration at point $p(x - 1\text{m and } y - 2\text{m})$. **7**

OR

6. a) Write the assumptions made while deriving Bernoulli's equation also state and prove Bernoulli's equation. **7**

b) A pipe 350m long has a slope 1:100 and tapers from 1m dia at the higher end to 0.5m at the lower end. Quantity of water flowing is 90 lit/sec. If the pressure at higher end is $70\text{kN}/\text{m}^2$ find the pressure at the lower end. **7**

7. a) A venturimeter with 150mm inlet diameter of 100mm throat is used for measuring flow of oil (S = 0.9) Differential gauge shows a reading of 30cm. Assuming cd=0.98. Calculate the discharge flowing through the venturimeter. **7**

b) An orifice of diameter 40mm is provided in a vertical cylindrical tank of radius 550mm & length 2000mm. Find the discharge through the orifice take cd=0.64. **7**

OR

8. a) Coefficient of discharge of venturimeter is always greater than orificemeter why. **7**

b) Determine the discharge through a rectangular notch of length 2.1m with the head over the notch as 0.5m. Determine the discharge through the notch considering velocity of approach cd=0.64. **7**

9. a) Define and give significance of Reynolds number and Froude number explain both. **7**

b) Differentiate between laminar and turbulent flow. **7**

OR

10. a) What are the various methods of dimensional analysis to obtain a functional relationship between various parameters influencing a physical phenomenon? Explain any one. **7**

b) What size of pipe should be installed to carry $5.5 \times 10^{-3}\ \text{m}^3/\text{s}$. for medium on (kinematic viscosity $6 \times 10^{-6}\ \text{m}^2$) under laminar flow conditions. **7**

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B.Tech. Third Semester (Civil Engineering) (C.B.C.S.) Winter 2022

Solid Mechanics

P. Pages : 2 **SPM/KW/22/2509**

Time : Three Hours Max. Marks : 70

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5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Due credit will be given to neatness and adequate dimensions.
8. Assume suitable data whenever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.
10. Use of non programmable calculator is permitted.

1. a) Draw stress strain curve for mild steel under tension & explain the salient point. **6**

b) A composite section made up of copper rod 200 mm dia enclosed in steel tube of 150 mm internal diameter & 12 mm thick length of assembly is 600 mm and fostered at both ends if temperature of rod is raised to 60ºC find stresses developed in each material **8**

$E_C = 1.05 \times 10^5\ N/mm^2$, $E_S = 2 \times 10^5\ N/mm^2$

$\alpha_S = 12 \times 10^{-6}/{}^\circ C$ and $\alpha_C = 17.5 \times 10^{-6}/{}^\circ C$

OR

2. a) A bar as shown in fig. 1 subjected to tensile force. Determine the total change in length take $E = 2.1 \times 10^5\ N/mm^2$ **7**

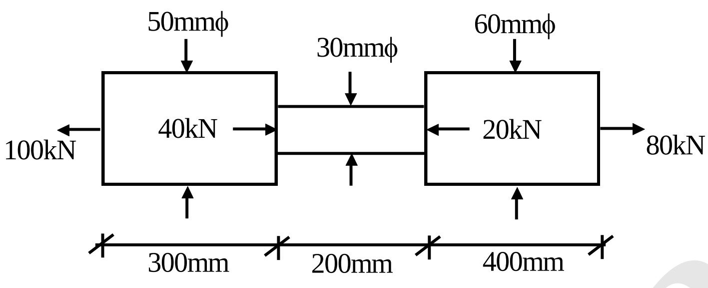


Fig. 1

b) Define Poisson's ratio and state the relation between three elastic constants E, G and K. **7**

3. a) Write properties of shear force diagram. **4**

b) Write properties of bending moment diagram. **3**

c) Derive relationship between load shear force and bending moment. **7**

OR

4. Draw SFD and BMD for loaded beam shown in fig. 2 and also find point of contraflexure if any. **14**

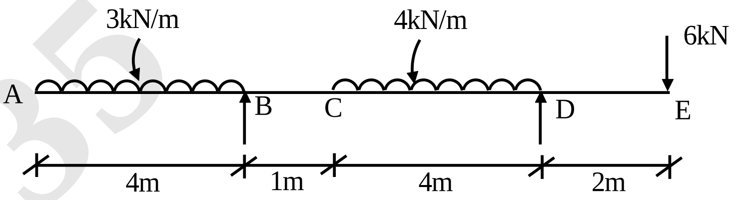


Fig. 2

5. a) Derive the bending formula and give the tree assumption in theory of simple bending. **7**

b) A simply supported beam of length 4m carrying a UDL of 20 kN/m over it entire span the beam of I section with top flange 60 mm x 10 mm web 10 mm x 100 mm and bottom flange 120 mm x 10 mm calculate bending stresses and draw distribution diagram. **7**

OR

6. A simply supported beam carries UDL of 35 kN/m over entire span 20 m. The cross section of beam is 'T' section having dimension as shown in fig. 3 calculate maximum shear stress for the section of beam. **14**

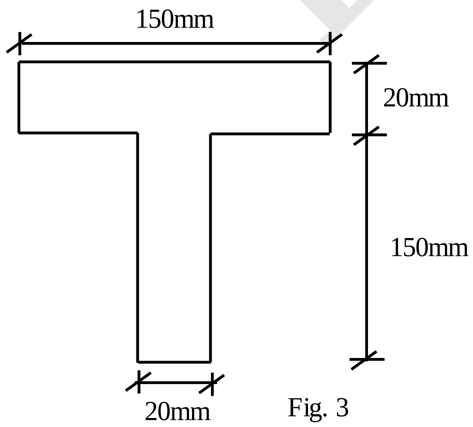
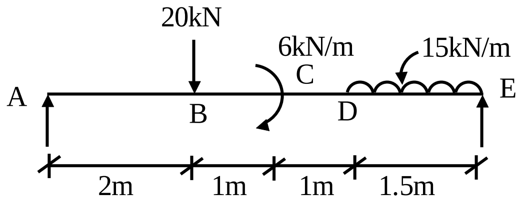


Fig. 3

7. Calculate the deflection under each point load for the beam as shown in fig. 4 in terms of EI. **14**



OR

8. a) Find the deflection of simply supported beam carrying a point load at centre. **9**

b) Derive differential equation of flex way beam. **5**

9. A solid circular shaft is to transmit 350 kN at 150 rpm, if shear stress is not to exceed 80 N/mm^2. Find the diameter of shaft what % of saving in weight would be obtained if this shaft is replaced by hollow one whose internal diameter is 0.6 times of external diameter? The length, material and maximum shear stress being same. **14**

OR

10. Derive the torsion equation and stating assumption in pure torsion. **14**

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B.Tech. Third Semester (Civil Engineering) (C.B.C.S.) Winter 2022

Geotechnical Engineering

P. Pages : 2 **SPM/KW/22/2510**

Time : Three Hours Max. Marks : 70

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Notes :
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7. Assume suitable data whenever necessary.

1. a) Write short notes on formation of soil. **7**

b) Derive Relation between γ (Bulk unit weight), G (Specific Gravity), e (void Ratio) and S (Degree of saturation from basic principle). **7**

OR

2. a) Define water content of soil. Enlist various methods of water content determination and discuss any one in detail. **7**

b) The Atterberg limits of a clay soil are: liquid limit 52%, plastic limit 30%, and shrinkage limit 18%. If the specimen of this soil shrinks from a volume of 39.5 cm3 at the liquid limit to a volume of 24.2cm3 at the shrinkage limit, calculate the true specific gravity? **7**

3. a) What are the factors affecting permeability of soil. **7**

b) Find the average of horizontal and vertical permeabilities of a soil mass made up of three horizontal layers. The first and second layers have the same thickness of 0.5m each. The third layer is 1.2m thick. The coefficient of permeabilities of the first, second and the third layers are respectively $1x10^{-3}$ cm/sec, $2x10^{-2}$ cm/sec and $5x10^{-4}$ cm/sec. **7**

OR

4. a) Explain the phenomenon of quick sand condition and derive the expression for critical hydraulic gradient. **7**

b) The data given below relate to falling head permeability test performed on soil:- Stand pipe diameter 12.5mm; Permeameter sample area $500mm^2$; Permeameter sample height 60 mm; Initial head in the stand pipe 1000 mm; Final head in the stand pipe 200 mm and Time for decreasing water head 250 sec. Calculate the permeability of soil. **7**

5. a) What are the factors affecting compaction. **7**

b) Following data is for a standard compaction test on soil using a mould of volume 1000 cm^3. **7**

Water content (%)	8.5	12.5	13.75	15.5	18.2	20.2
Wt. of compacted sample (N)	18.5	20	20.5	20.8	20.4	19.8

Determine optimum moisture content and maximum dry density values.

OR

6.	a)	How shear strengths tests are classified on the basis of consolidation and drainage condition of the soil. Discuss any one test in brief.	**7**
	b)	A soil has angle of internal friction 30º and cohesion 50 kN/m^2. Draw Mohr's circle of failure if the soil is tested in shear box at normal stress of 50 kN/m^2. Calculate magnitude and direction of principal stresses. Also, calculate the shear stress at failure	**7**
7.	a)	Explain various modes of shear failure in soil with suitable sketch.	**7**
	b)	Determine depth at which a circular footing of 2m diameter to be laid, if it has to carry a safe load of 1600 kN. The soil is having following properties C = 10 kN/m^2, $\Phi = 30^o, \gamma = 18\ kNm^3$, Take $Nc = 37.2,\ Nq = 22.5,\ N_\gamma = 19.7$. Assume f.o.s. = 2.	**7**

OR

8.	a)	Explain Effect of water table on bearing capacity of soil.	**7**
	b)	Explain the phenomenon of negative skin friction.	**7**
9.	a)	Describe the interior of the earth with a neat sketch.	**7**
	b)	Describe the various physiographic division of India.	**7**

OR

10.		Describe the various geological works of wind with respect to erosion transportation and deposition along with diagrams.	**14**

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B.Tech. Third Semester (Civil Engineering) (C.B.C.S.) Winter 2022

Building Construction & Elementary Building Drawing

P. Pages : 2 **SPM/KW/22/2511**

Time : Three Hours Max. Marks : 70

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9. Illustrate your answers whenever necessary with the help of neat sketches.
10. Use of non programmable calculator is permitted.

1. a) What is foundation? State the essential requirements of good foundation. **7**

b) What are the causes of failure of foundation? What measures are to be taken to prevent such failures? **7**

OR

2. a) Differentiate between load bearing and framed structure. **7**

b) What is bearing capacity of soil? Describe the various methods generally adopted to improve the bearing capacity of soils. **7**

3. a) Define "Bond" in brick masonry work. Explain in detail English Bond with neat sketch. **7**

b) Write a short note on : **7**

i) Stretcher bond

ii) Header bond

iii) Closer bricks

iv) Coping

OR

4. a) Explain with neat sketches different forms of rubble masonry? **7**

b) What are the function of lintels and arches? Discuss the commonly used types of lintels and Arches. **7**

5.	a)	What are different methods of damp proofing? Explain in brief.	**7**
	b)	Enumerate the causes and effects of dampness into the structure. Briefly explain how to prevent the dampness.	**7**

OR

6.	a)	Enumerate good requirements of floors.	**7**
	b)	What are the advantages and disadvantages of pitched and flat roofs?	**7**
7.	a)	What are different types of stairs. Explain any one in detail.	**7**
	b)	What are different types of doors? Explain any one.	**7**

OR

8.	a)	Classify, with the help of sketches, various types of windows based on their method of operation.	**7**
	b)	Discuss the factors to be considered regarding doors and windows. i) Purpose ii) Location and iii) Size	**7**
9.	a)	Distinguish between plastering and pointing. What are the precautions to be taken before plastering the new surface?	**7**
	b)	What are different types of scaffolding used? Explain any one in detail.	**7**

OR

10.		Explain in detail : i) Underpinning. ii) Defects in painting. iii) Types of pointing.	**14**

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B.Tech. Third Semester (Civil Engineering) (C.B.C.S.) Winter 2022

Effective Technical Communication

P. Pages : 3 **SPM/KW/22/2512**

Time : Max. Marks :

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1. a) Correct **any three** of the following sentences. **3**

i) The Doctor gave me many good advices.

ii) I am loving long walks.

iii) I am studying for three hours regularly.

iv) I regularly go for walk at the evening.

v) Are you good in drawing?

b) Do as directed **any three** of the following. **3**

i) Rama said "I am tired now".
(change the narration)

ii) Pravin does the duty very well
(change the voice)

iii) The aeroplane flies faster than birds
(change in to Negative sentence)

iv) They were too late to catch the train.
(remove too- to use so--- that)

v) She is very poor.
(Add a question tag)

c) Use the following idoms in your own sentences **any three.** **3**

1) A cold fish.

2) Keep your chin up

3) Hold your horses.

4) Back to square one

5) Blessing in disguise

2. a) Do as directed **any three.** **3**

1) Make new words with given prefixes and write their meanings.
   1 / sub 2 / inter

2) Give one word for the following:
   1 / one who copies from other writers.

3) Give two examples of words formed out of clipping.

4) Explain the jargon – spam.

5) Make two words using the suffix ‘ism’.

b) 1) Write two words as examples of ‘blending’ in English. **3**

2) Give two examples of jargons related to “Information Technology”.

3) Write two words borrowed from other countries and culture.

4) Give one word for “Man who eats human flesh”

5) Write synonym of the word ‘Explain’.

c) Explain the different types of Job Interviews. **3**

3. a) Answer **any one** of the following questions. **5**

1) Applications are invited for the post of software developers for a reputed company dealing in electronics goods. Qualified computer engineers with a minimum of 3 yrs. of experience may apply. Send applications with resume to HR manager, plot no. 24/15, Airport road, Shiva Nagar, Bangalore.

2) Place an order of 600 drafters and 400 engineering calculators to be delivered within 15 days from the date of order, holding the rights to reject the goods if delivered late or received in damaged conditions.

b) Read the passage and answer the questions that follows: **4**

Character is destiny. Character is that on which the destiny of a nation is built. One cannot have a great nation with men of small character. We must have young men and women who look upon others as the living images of themselves as our shastras have so often declared. But whether in public life of student life, we cannot reach great heights, if we are lacking in character. We cannot climb the mountain when the ground at our feet is crumbling. When the very basis of our structure is shaky how can we reach the heights we have set before ourselves? We must all have humility. Here is a country which we are all interested in building up for whatever service we take up, we should not care for what we receive. We should know how much we can put into that service, that should be the principle which should animate our young men and women. Ours is a great country, we have had for centuries a great history. The whole of the east reflects our cultures.

Questions and Answers.

1) What is the passage about?

2) What kind of young men and women must have?

3) How can we reach the great heights we have set before ourselves?

4) We can not reach great heights. (Add question tag)

4. a) 1) Assume that you are the chairman of a committee appointed by the president of the employees union of your company to look into the complaints against the functioning of the canteen on the premises and suggest measures for improvement. Write a report containing your analysis and recommendations. **4**

OR

2) Prepare a user manual of a 'Mobile' under the following headings:

a) cover page	b) diagram
c) functions	d) operation
e) precautions	f) Guarantee

b) 1) ACC cement company Jamul, wants to expand and improve the existing parking facilities for the four wheeler and two wheeler vehicles of its staff. As the personal manager of the company, draft the proposal to be sent to the secretary and board of directors of your company for expanding and improving the parking facilities. The proposal should include the following points: Area Available, optimum utilization of the area, security arrangements, provision of stand and roofs, issues related to ID cards and rent etc. **4**

OR

2) Write a note on the various components of which a research paper is made up of.

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