Printed Pages – 6

320351(14)

B. E. (Third Semester) Examination, April-May 2020

NOV-DEC 2020

(New Scheme)

(Civil, Agriculture Engg. Branch)

MATHEMATICS-III

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Part (a) is compulsory. Attempt any two parts from (b), (c) and (d) of each question. All question carry equal marks.

Unit-I

1. (a) In the Fourier series expansion of $f(x) = |\sin x|$ in

    $(-\pi, \pi)$, the value of a_0 = ...   2

(b) Obtain a half range cosine series for :

$$f(x) = \begin{cases} kx, & 0 \le x \le l/2 \\ k(l-x), & l/2 \le x \le l \end{cases}$$

Deduce the sum of the series :

$$\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots \dots \infty$$ 7

(c) Expand $f(x) = x \sin x$ as a Fourier series in

$(0, 2\pi)$.   7

(d) Obtain the constant term and the coefficients of the first sine and cosine terms in the Fourier expansion of y as given in the following table :   7

x	0	1	2	3	4	5
y	9	18	24	28	26	20

Unit-II

2. (a) Find the Laplace transform of $e^{2t} \cos^2 t$.   2

(b) Find the Laplace transform of half wave rectified sine wave defined as :

$$f(t) = \begin{cases} \sin wt, & 0 < t < \pi/w \\ 0, & \pi/w < t < 2\pi/w \end{cases}$$

and $f(t + 2\pi/w) = f(t)$.   7

(c) Find

$$L^{-1} \left\{ \frac{s^2}{(s^2 + a^2)(s^2 + b^2)} \right\}$$ by using convolution

theorem.   7

(d) Solve the equation by transform method :

$$\frac{d^2 y}{dt^2} + 2\frac{dy}{dt} + 5y = e^{-t} \sin t$$

where $y(0) = 0$ and $y'(0) = 1$.   7

Unit-III

3. (a) Solve :   2

$$\frac{\partial^3 z}{\partial x^3} - 4\frac{\partial^3 z}{\partial x^2 \partial y} + 4\frac{\partial^3 z}{\partial x \partial y^2} = 0$$

(b) Solve :   7

$$\left(x^2 - y^2 - z^2\right)p + 2xy\, q = 2\, xz$$

(c) Solve :

$$(D + D' - 1)(D + 2D' - 3)z = 4 + 3x + 6y \qquad 7$$

(d) Solve the following equation by the method of separation of variables :

$$4\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 3u$$

given

$$u = 3e^{-y} - e^{-5y} \text{ when } x = 0. \qquad 7$$

Unit-IV

4. (a) Find the value of

$$\int_C \frac{z + 4}{z^2 + 2z + 5} \, dz,$$

if C is the circle $|z + 1| = 1$. \qquad 2

(b) Prove that the function $f(z)$ defined by :

$$f(z) = \frac{x^3(1 + i) - y^3(1 - i)}{x^2 + y^2} \quad (z \neq 0),$$

$f(0) = 0$ is continuous and the C-R equations are

satisfied at the origin yet $f'(0)$ does not exist. \qquad 7

(c) Find the Taylor's and Laurent's series expansion of the function

$$\frac{z^2 - 1}{(z + 2)(z + 3)}$$

about $z = 0$ in the regions :

(i) $|z| < 2$

(ii) $|z| > 3$ \qquad 7

(d) Find the residue of :

$$f(z) = \frac{1}{(z^2 + 4)^2}$$

at its poles and hence evaluate $\oint_C f(z) \, dz$

where C is the circle $|z - i| = 2$. \qquad 7

Unit - V

5. (a) If $f(x)$ has probability density $Cx^2, 0 < x < 1$, determine the C and find the probability that

$1/3 < x < \frac{1}{2}$. \qquad 2

(b) The frequency function of a continuous random variable is given by :

$$f(x) = y_0 x(2 - x), \ 0 \le x \le 2$$

Find the value of y_0, mean and variance of x. 7

(c) If 10 percent of rivets produced by a machine are defective, find the probability that out of 5 rivets chosen at random :

(i) none will be defective,

(ii) one will be defective and

(iii) atleast two will be defective 7

(d) The frequency of accidents per shift in a factory is as shown in the following table :

Accident per shift	0	1	2	3	4
Frequency	180	92	24	3	1

Calculate the mean number of accidents per shift the corresponding Poisson distribution and compare with actual observations. 7

B020312(020)

B. Tech. (Third Semester) Examination, Nov.-Dec. 2020

(New Scheme)

(Civil Engg. Branch)

INTRODUCTION TO FLUID MECHANICS

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : *Attempt all questions. Part (a) of each question is compulsory. Attempt any two parts from (b), (c) and (d) of each questions.*
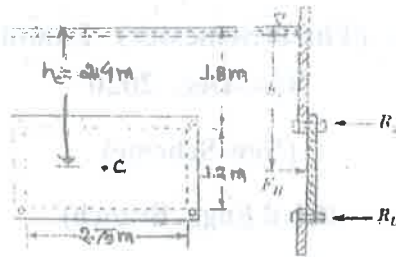
Unit-I

1. (a) Enunciate Newton's law of viscosity and distinguish between Newtonian and non-Newtonian fluids. 4

   (b) The vertical side of a reservoir has a rectangular opening 2.75 m long × 1.2 m high. It is closed by

a plate using 4 bolts placed at the corner of the opening. What would be the tension in the bolts if water stands to a height of 1.8 m above the top edge of the opening? 8
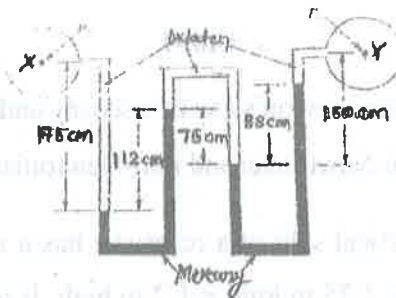

(c) On what factors does the pressure variation in the vertical direction depends? Derive the expression for pressure variation. 8

(d) Two U-tube manometers are connected in series as shown in figure. Determine difference of pressure between X and Y. 8

Unit-II

2. (a) What should be the acceleration in steady uniform flow? 4

(b) A fluid flows along a flat surface parallel to the x-direction. The velocity u varies linearly with y, the distance from the flat surface, that is $u = Ay$. 8

   (i) Find the stream function of the flow

   (ii) Determine whether or not the flow is irrotational

(c) Is the flownet analysis applicable to rotational flow? If not, why? 8

(d) Show that the stream lines and equipotential lines from a net of mutually perpendicular lines. 8

Unit-III

3. (a) Describe the nature of various forces included in the momentum equation. 4

(b) A venturimeter is to be filled in a 150 mm dia. Pipeline horizontally at a section where the pressure is 100 kN/m². If the maximum flow of water in the

pipe is 150 litres/sec, find the diameter of the throat so that the pressure at the throat does not fall below 75 kN/m² (vacuum). Assume that 3% of the differential head is lost between the inlet and throat. 8

(c) "Bernoulli's equation is a special case of the generalized energy equation." Comment on the validity of this statement. 8

(d) What condition leads to cavitation? Is cavitation possible in a free surface flow? 8

Unit-IV

4. (a) What are the different causes of loss of energy in pipe flow? 4

(b) What do you understand by best hydraulic channel cross section? In how many ways can you express it? 8

(c) Derive the expression and sketch the velocity and shear stress distribution across the flow in a circular pipe (for fully developed laminar flow). 8

(d) Determine the dimensions of an economical

trapezoidal section of an open channel with side slope 2 H : 1 V laid at a slope of 1 in 1600 to carry a discharge of 36 m³/s. Assume Chezy's coefficient C = 50. 8

Unit-V

5. (a) Why should the coefficient of velocity be less for mouthpiece as compared to orifices? 4

(b) What are the various methods for measuring the flow in open channel? Discuss the limitations of each. 8

(c) Differentiate between a sharp-crested and a broad crested weir. 8

(d) What are the advantages of a triangular weir over a rectangular one? Which one is better suited for a wide range of discharge variation? 8

B020313(020)

B. Tech. (Third Semester) Examination, Nov.-Dec. 2020

(Civil Engg. Branch)

INTRODUCTION to SOLID MECHANICS

(ESE)

Time Allowed : Three hours

Maximum Marks : 100

Note : *Attempt all questions. Part (a) of each question is compulsory and carries 04 marks. Attempt any **two** parts from (b), (c) and (d) carry 08 marks.*

1. (a) Prove that :- *"Linear strain (e) of diagonal due to shear = Half the shear strain* (ϕ) *"*   4

(b) A member $ABCD$ is subjected to point loads of P_1, P_2, P_3 and P_4 as shown in figure 1 below. Calculate the force P_2 necessary for equilibrium if $P_1 = 10\,kN$, $P_3 = 40\,kN$ and $P_4 = 16\,kN$. Taking modulus of elasticity as $2 \cdot 05 \times 10^5\,N/mm^2$, determine the total elongation of the member.   8
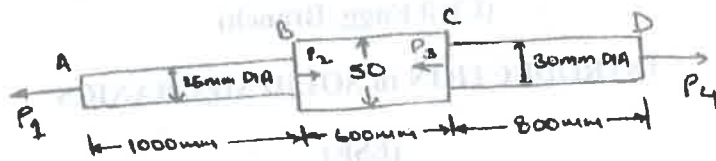

Fig.-1

(c) Derive an equation relating three elastic constant from first principal.   8

(d) A compound bar is made by fastening one flat bar of steel between two similar bars of aluminium alloy. The dimensions of each bar are 40 mm wide × 8 mm. So that the cross-section of the composite bar measures 40 mm × 24 mm. If E for steel $= 2 \cdot 04 \times 10^5\,N/mm^2$ and E for alloy $= 0 \cdot 612 \times 10^5\,N/mm^2$, find the apparent value of

E loaded in tension. If the respective elastic limits are 230 N/mm² and 50 N/mm², find the elastic of the compound bar.   8

2. (a) Explain :   4

   (i) Principal stresses

   (ii) Principal planes

   (b) Derive an equation for p_n, p_t and p_r induced on an inclined plane due to state of biaxial stress.   8

   (c) A piece of material is subjected to tensile of p_1 and p_2 at right angles to each other $(p_1 > p_2)$. Find the plane across which the resultant stress is most inclined to the normal. Find the value of this inclination and the resultant stress when $p_1 = 60\,N/mm^2$ and $p_2 = 40\,N/mm^2$ (both tensile).   8

   (d) At a point in a material, the stresses on two mutually perpendicular planes are 50 N/mm² (tensile) and 30 N/mm² (tensile). The shear stress across these planes is 12 N/mm². Using Mohr circle, find the magnitude and direction of the resultant stress on a

plane making an angle of 35° with the plane of the first stress. Find also, the normal and tangential stresses on this plane.   8

3. (a) Define :   4

    (i) Shear Force

    (ii) Bending Moment

    (b) Derive the expression for pure bending theory.   8

    $$\frac{M}{I} = \frac{f}{y} = \frac{E}{R}$$

    (c) The beam is loaded as shown in figure 2. Draw the shear force and bending moment diagram, indicating the values at important locations.   8
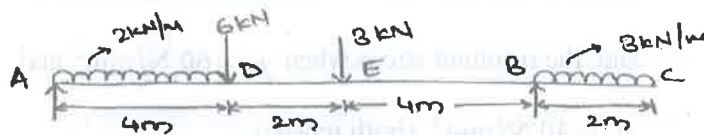

    Fig.-2

    (d) A 500 mm × 500 mm timber is strengthened by the addition of 500 mm × 8 mm steel plates secured to its top and bottom surfaces. The composite beam is simply supported at its ends and

carries a uniformly distributed load of 100 kN/m run over an effective span of 6 m. Find the maximum bending stresses in steel and timber at the mid-span. Take E for steel $= 2 \times 10^5$ N/mm^2 and E for timber $= 0.1 \times 10^5$ N/mm^2.   8

4. (a) What are the modes of failure of a column?   4

    (b) Derive the equation for Euler load when both the ends of a column are hinged.   8

    (c) A masonry pier of 2 m × 3 m supports a vertical load of 50 kN as shown in figure 3. Find (a) Stresses developed at each corner of the pier (b) What additional load should be placed at the center of the pier, so that there is no tesnion anywhere in the pier section? (c) What are the stresses at the corner with the additional load in the centre?   8
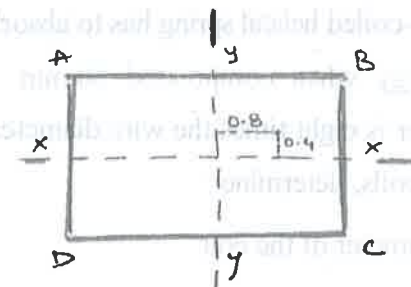

    Fig.-3

(d) A dam 6 m high and 1·5 m wide at the top has vertical water face. Find the base width of the dam if no tension is to develop. Take unit weight of masonry as 20 kN/m³ and $c = 1$. Investigate the stability of the dam if coefficient of friction is 0·6 and maximum allowable compressive stress is 1800 kN/m².   8

5. (a) Explain :   4

    (i) Resilience of spring

    (ii) Torsional Rigidity

(b) Prove that : *"The intensity of shear stress at any point in the cross section of a shaf subjected to pure torsion is proportional to its distance from the centre"*.   8

(c) A close-coiled helical spring has to absorb 60 N-m of energy when compressed 60 mm. The coil diameter is eight times the wire diameter. If there are 10 coils, determine :

    (i) Diameter of the coil

    (ii) Diameter of the wire

    (iii) Maximum shear stress

Take $N = 0·86 \times$ N/mm²   8

(d) As shaft transmits 300 kW power at 120 r.p.m. Determine (a) the necessary diameter of solid circular shaft (b) the necessary diameter of hollow circular section, the inside diameter being 2/3 of the external diameter. The allowable shear stress is 70 N/mm². Taking the density of material is 77 kN/m² ; calculate the % saving in the material if hollow shaft is used.   8

B020314(020)

B. Tech. (Third Semester) Examination, Nov.-Dec. 2020

(New Scheme)

(Civil Engg. Branch)

PLANE SURVEYING

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : ~~40~~ 35

Note : Part (a) is compulsory in all the questions.

Attempt any two parts from (b), (c) and (d).

1. (a) What is Leveling and why it is important in survey work?   4

(b) Explain in detail the permanent adjustment of a Dumpy level.   8

(c) Write short notes on : (any **two**)   8

   (i) Reciprocal leveling

   (ii) Fly leveling

   (iii) Profiles leveling

(d) Discuss the effect of curvature and refraction applied to leveling and deduce expression for each of them along with the combined correction.   8

Unit-II

2. (a) What is the differences between vertical cliff and over hanging cliff, draw contours for that?   4

(b) What are the different methods of locating contours? 8

(c) What is interpolation of contours? Explain any one method of contour interpolation.   8

(d) Draw neat sketch and explain working of any **two** minor instruments :   8

   (i) Hand level

   (ii) Box sextant

   (iii) Pantograph

Unit-III

3. (a) How a theodolite can be used as a dumpy level?   4

(b) Write a detailed note on permanent adjustment of theodolite.   8

(c) Explain various sources of errors in Theodolite.   8

(d) Write short notes on : (any **two**)   8

   (i) Face right and face left observations

   (ii) Swinging the telescope

   (iii) Transiting the telescope

Unit-IV

4. (a) What is plane table survey? How it is different from other methods of survey?   4

(b) What is three points problem? Explain by neat sketch by applying of plane table work.   8

(c) Explain merits and demerits of various methods of orientation of plane table work.   8

(d) Name the common methods of balancing the traverse. How is closing error in a traverse balanced?　　8

Unit-V

5. (a) Write the relationship between radius and degree of curve.　　4

(b) Explain the elements of simple circular curve. Give their relationship.　　8

(c) What are the elements of compound curve? Explain with neat sketch.　　8

(d) Derive intrinsic equation of ideal transition curve.　　8

B020315(020)

B. Tech. (Third Semester) Examination, Nov.-Dec. 2020

(New Scheme)

(Civil Engg. Branch)

BUILDING MATERIALS

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

*Note : Attempt all questions. Parts (a) of each question is compulsory and carries 4 marks; attempt any **two** parts from (b), (c) and (d) carrying 08 marks.*

Unit-I

1. (a) (I) To produce low heat cements, it is necessary to reduce the compound :   2 2

(i) C3S

(ii) C2S

(iii) C3A

(iv) C4AF

(II) If p is the standard consistency of cement, the amount of water used in conducting initial setting time test on cement is :   2

(i) 0.65 p

(ii) 0.85 p

(iii) 0.6 p

(iv) 0.78 p

(b) Explain the hydration process of cement with schematic diagram.

(c) Write a note on classification of aggregates. Differentiate between Coarse Aggregate Vs Fine Aggregate.

(d) Write short notes on :

(i) Classification of Pozzolanas

(ii) Field test for cement

(iii) Ennore sand

Unit-II

2. (a) (I) The approximate ratio of strength of 15 cm × 30 cm concrete cylinder to that of 15 cm cube of the same concrete is :   2

(i) 1.25

(ii) 0.85

(iii) 1.00

(iv) 0.50

(II) Consider the following strengths of concrete :

1. Cube strength

2. Cylinder strength

3. Split-tensile strength

4. Modulus of rupture

The correct sequence in increasing order of these strengths is :   2

(i) 3, 4, 2, 1

(ii) 3, 4, 1, 2

(iii) 4, 3, 2, 1

(iv) 4, 3, 1, 2

(b) Define workability and factor affecting it. Explain slump test in detail.

(c) What are the factor affecting strength and durability of concrete?

(d) Explain following terms :

(i) Modulus of elasticity of concrete

(ii) Bleeding

(iii) Segregation

(iv) Water cement ratio

Unit-III

3. (a) (I) According to I.S. code the weight of the timber is to be reckoned at a moisture content of : 2

(i) 0%

(ii) 4%

(iii) 8%

(iv) 12%

(II) Hard boards are example of : 2

(i) Plywood

(ii) Particle board

(iii) Fiber board

(iv) Chip board

(b) Write short notes on form work and also explain its objective.

(c) Discuss the need of developing cost effective materials. Give the names and their applications of agricultural and industrial wastes as cost effective material.

(d) Write short notes on :

(i) Veneers

(ii) Plywood

(iii) Fiber board

(iv) Particle board

Unit-IV

4. (a) (I) Varnish is a homogeneous solution of resin in : 2

(i) Alcohol

(ii) Kerosene oil

(iii) Naptha

(iv) Spar varnish

(II) Putty is made up of : 2

(i) white lead and turpentime

(ii) red lead and linseed oil

(iii) powered chalk and raw linseed oil

(iv) zinc oxide and boiled linseed oil

(b) Enumerate the composition of oil paint and their functions.

(c) Write short notes on :

(i) White washing

(ii) Varnishing

(iii) Distempering

(iv) Aluminium paint

(d) Write the classification of bitumen and its uses.

Unit-V

5. (a) (I) Percentage of minimum elongation in high strength deformed steel bar Fe-500 : 2

(i) 14·5%

(ii) 8%

(iii) 6%

(iv) 20%

(II) The crudest form of iron : 2

(i) Mild steel

(ii) Wrought steel

(iii) Pig iron

(iv) Cast iron

(b) Write composition of steel and explain different type of rolled structural steel section.

(c) What are refractories? Describe its classification.

(d) Write short notes on :

(i) Uses of PVC

(ii) Advantage of Aluminium

(iii) Uses of Glass

(iv) Type of tiles

B067315(067)

B. Tech. (Third Semester) Examination, Nov.-Dec. 2020

ENGINEERING MATERIAL

Time Allowed : Three hours

Maximum Marks : ~~80~~ 100

Minimum Pass Marks : ~~28~~ 35

Note : Attempt all questions. Part (a) of each
question carries 2 marks and is compulsory.
*Attempt any **two** parts from (b), (c) and (d).*

1. (a) Define Yield strength.   24

   (b) Explain Homogenous and Heterogeneous nucleation.
       How metal solidifies in a ingot?   78

(c) Explain the effect of grain size on properties of metal. 7 8

(d) What is the purpose of tensile test performed for a metal? Write principle of determination of tensile test of a metal. 7 8

2. (a) What is elastic and plastic deformation? 2 4

(b) What do you understand by deformation of metals? Explain the deformation by slip? 7 8

(c) Differentiate between hot working and cold working. 7 8

(d) Explain Recovery, Recrystallization and grain growth. 7 8

3. (a) What is solid solution? 2 4

(b) Describe Hume Rothery Rules. 7 8

(c) Classify phase diagram and explain the term : phase, system, component, alloys, liquid and solid. 7 8

(d) Explain Fe-C equilibrium diagram desribing various phases present on it. 7 8

4. (a) Define heat treatment process. 2 4

(b) What are the various objectives of heat treatment process? 7 8

(c) What do you understand by Annealing? What are the types of annealing? 7 8

(d) Explain following Hardening process : 7 8

   (i) Flame Hardening

   (ii) Cyaniding

5. (a) Define Ferrous and Non-Ferrous metal. 2 4

(b) What is cast iron? Give composition, properties and application of Gray cast iron and white cast iron. 7 8

(c) What are the properties and applications of copper and aluminium? 7 8

(d) Write short notes on Piezoelectric Materials, Electro-strictive Materials. 7 8