

# CBCS SCHEME

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17MAT31

## Third Semester B.E. Degree Examination, Jan./Feb. 2021 Engineering Mathematics – III

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Obtain the Fourier series of  $f(x) = x(2\pi - x)$  in  $0 \leq x \leq 2\pi$ . (08 Marks)
- b. Obtain the Fourier series for the function  $f(x) = \begin{cases} 1 + 4\frac{x}{3} & \text{in } -\frac{3}{2} < x \leq 0 \\ 1 - 4\frac{x}{3} & \text{in } 0 \leq x < \frac{3}{2} \end{cases}$  (06 Marks)
- c. Expand  $f(x) = 2x - 1$  as a Cosine half range Fourier series in  $0 < x < 1$ . (06 Marks)

### OR

- 2 a. Obtain the constant term and the coefficients of the first Cosine and Sine terms in the Fourier expansion of 'y' from the table

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

- b. Obtain the Fourier series of  $f(x) = |x|$  in  $-\pi \leq x \leq \pi$ . (06 Marks)
- c. Show that the sine half range series for the function  $f(x) = lx - x^2$  in  $0 < x < l$  is

$$\frac{8l^2}{\pi^3} \sum_0^{\infty} \frac{1}{(2n+1)^3} \sin\left(\frac{2n+1}{l}\pi x\right).$$
 (06 Marks)

### Module-2

- 3 a. If  $f(x) = \begin{cases} 1 & \text{for } |x| \leq a \\ 0 & \text{for } |x| > a \end{cases}$ , find the infinite Fourier transform of  $f(x)$  and hence evaluate  $\int_0^{\infty} \frac{\sin x}{x} dx$ . (08 Marks)
- b. Find the Fourier Cosine transform of  $e^{-x}$ . (06 Marks)
- c. Solve by using Z-transforms:  $y_{n+2} - 4y_n = 0$ , given  $y_0 = 0$  and  $y_1 = 2$ . (06 Marks)

### OR

- 4 a. Find the Fourier Sine transform of  $\frac{e^{-ax}}{x}$ ,  $a > 0$ . (08 Marks)
- b. Find the Z-transform of  $\sin(3n + 5)$ . (06 Marks)
- c. Find the inverse Z-transform of  $\frac{2z^2 + 3z}{(z+2)(z-4)}$ . (06 Marks)

**Module-3**

- 5 a. Find the coefficient of correlation for the data

x	1	3	4	2	5	8	9	10	13	15
y	8	6	10	8	12	16	16	10	32	32

(08 Marks)

- b. Fit a straight line to the following data

Year	1961	1971	1981	1991	2001
Production ( in tons)	8	10	12	10	16

(06 Marks)

- c. Compute the real root of
- $x \log_{10} x - 1.2 = 0$
- by Regula - Falsi method. Carry out three iterations in (2, 3).

(06 Marks)

**OR**

- 6 a. Obtain the lines of Regression for the following values of x and y

x	1	2	3	4	5
y	2	5	3	8	7

(08 Marks)

- b. Fit an exponential curve of the form
- $y = ae^{bx}$
- for the following data

No. of petals	5	6	7	8	9	10
No. of flowers	133	55	23	7	2	2

(06 Marks)

- c. Find a real root of
- $x \sin x + \cos x = 0$
- near
- $x = \pi$
- . Correct to four decimal places, using Newton - Raphson method.

(06 Marks)

**Module-4**

- 7 a. Given
- $\sin 45^\circ = 0.7071$
- ,
- $\sin 50^\circ = 0.7660$
- ,
- $\sin 55^\circ = 0.8192$
- ,
- $\sin 60^\circ = 0.8660$
- , find
- $\sin 57^\circ$
- using an appropriate interpolation formula.

(08 Marks)

- b. Use Newton's divided difference formula to find
- $f(4)$
- given the data

x	0	2	3	6
f(x)	-4	2	14	158

(06 Marks)

- c. Using Simpsons
- $1/3^{\text{rd}}$
- rule, evaluate
- $\int_0^{\pi/2} \sqrt{\cos \theta} d\theta$
- by dividing
- $[0, \pi/2]$
- in to 6 equal parts.

(06 Marks)

**OR**

- 8 a. From the following table find the number of students who have obtained less than 45 marks

Marks	30-40	40-50	50-60	60-70	70-80
No. of Students	31	42	51	35	31

(08 Marks)

- b. Using Lagrange's interpolation formula fit a polynomial of the form
- $x = f(y)$

x	2	10	17
y	1	3	4

(06 Marks)

- c. Evaluate
- $\int_0^1 \frac{x}{1+x^2} dx$
- by Weddle's rule taking seven ordinates.

(06 Marks)

Module-5

- 9 a. Verify Green's theorem in a plane for  $\oint_C (3x^2 - 8y^2)dx + (4y - 6xy)dy$ , where 'C' is the boundary of the region enclosed by  $y = \sqrt{x}$  and  $y = x^2$ . (08 Marks)
- b. Verify Stoke's theorem for  $\vec{F} = (x^2 + y^2)\mathbf{i} - 2xy\mathbf{j}$  taken round the rectangle bounded by the lines  $x = \pm a$ ,  $y = 0$  and  $y = b$ . (06 Marks)
- c. Derive Euler's equation  $\frac{\partial t}{\partial y} - \frac{d}{dx} \left[ \frac{\partial t}{\partial y'} \right] = 0$ . (06 Marks)

OR

- 10 a. Use Gauss divergence theorem to evaluate  $\iint_S \vec{F} \cdot \hat{n} ds$  over the entire surface of the region above xy plane bounded by the cone  $z^2 = x^2 + y^2$  the plane  $z = 4$  where  $\vec{F} = 4xz\mathbf{i} + xyz^2\mathbf{j} + 3z\mathbf{k}$ . (08 Marks)
- b. Prove that geodesics of a plane are straight lines. (06 Marks)
- c. Find the extremal of the functional  $\int_0^{\pi/2} (y^2 - y'^2 - 2y \sin x) dx$  under the end conditions  $y(0) = y(\pi/2) = 0$ . (06 Marks)

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# CBCS SCHEME

17CV/CT32

USN

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## Third Semester B.E. Degree Examination, Jan./Feb. 2021 Strength of Materials

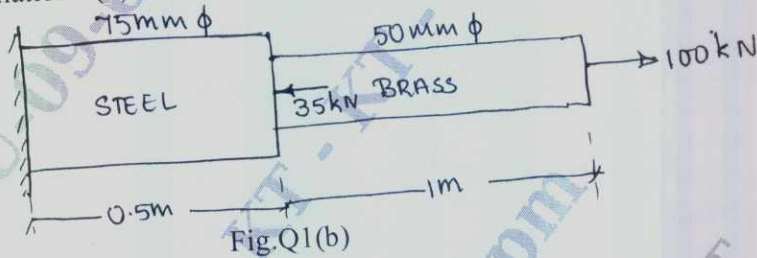
Max. Marks: 100

Time: 3 hrs.

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Define: (i) Young's modulus (ii) Bulk modulus (iii) Poisson's ratio. Derive a relationship between them. (10 Marks)
- b. Two solid cylindrical rods are connected and loaded as shown in Fig.Q1(b). Determine:  
(i) Total deformation (ii) Deformation at point B.  $E_s = 200 \text{ GPa}$ ,  $E_b = 100 \text{ GPa}$ .



(10 Marks)

OR

- 2 a. A compound bar made of steel plate 60 mm wide and 10 mm thick to which a copper plate 60 mm wide and 5 mm thick are rigidly connected to each other. The length of the bar is 0.7 m. If the temperature is raised by  $80^\circ\text{C}$ . Determine the stress in each metal and the change in length.  
 $E_s = 200 \text{ GPa}$ ,  $\alpha_s = 12 \times 10^{-6}/^\circ\text{C}$ ;  $E_{cu} = 100 \text{ GPa}$ ,  $\alpha_{cu} = 17 \times 10^{-6}/^\circ\text{C}$  (12 Marks)
- b. Derive an expression for extension of the bar due to its self weight only having area 'A' and length L suspended from its top. (04 Marks)
- c. Write a note on thermal stresses. (04 Marks)

### Module-2

- 3 a. At a certain point in a strained material the stress condition shown in Fig.Q3(a) exists. Find:  
(i) The normal and shear stress on the inclined plane AB  
(ii) Principal stresses and principal planes  
(iii) Maximum shear stresses and their planes

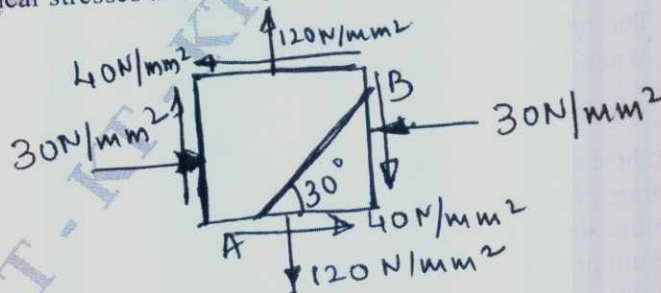


Fig.Q3(a)

(12 Marks)

- b. Derive an expressions for volumetric strain in case of a thin cylindrical shell of diameter 'd' subjected to internal pressure 'p'. (05 Marks)
- c. Define: (i) Principal stresses (ii) Principal planes (03 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. 2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8=50, will be treated as malpractice.

OR

- 4 a. A cylindrical shell is 3m long 1m internal diameter and is subjected to an internal pressure of  $1 \text{ N/mm}^2$ . If thickness of the shell is 12mm, find the circumferential stress and longitudinal stress. Also find maximum shear stress and the changes in the dimensions of the shell. Take  $E = 200 \text{ kN/mm}^2$  and  $\mu = 0.3$ . (10 Marks)
- b. A thick metallic cylindrical shell of 150 mm, internal diameter is required to withstand an internal pressure of 8 MPa. Find the necessary thickness of cylinder, if permissible stress of the section is 20 MPa. (10 Marks)

Module-3

- 5 a. Derive relation between shear force, bending moment and load. (06 Marks)
- b. Calculate SF and BM at salient points and draw SFD and BMD for the beam shown in Fig.Q5(b).

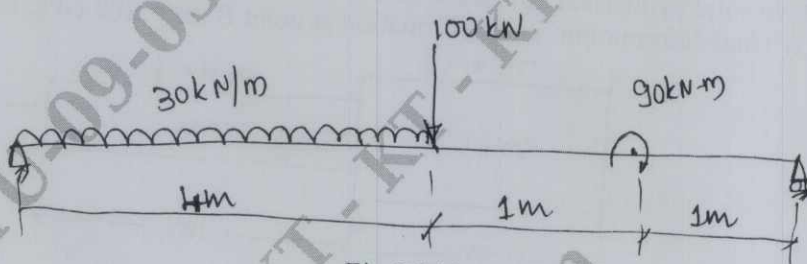


Fig.Q5(b)

(14 Marks)

OR

- 6 a. Define: (i) Bending moment (ii) Shear force (04 Marks)
- b. Draw SFD and BMD for beam shown in Fig.Q6(b).

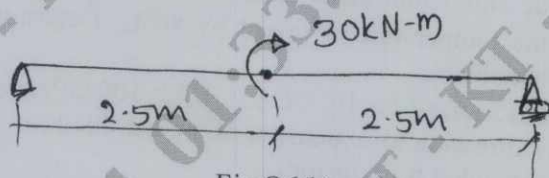


Fig.Q6(b)

- c. Draw SFD and BMD for simply supported beam of length  $L$  with point load 'P' placed at a distance 'a' from right support and 'b' from left support. (06 Marks)

(10 Marks)

Module-4

- 7 a. Define: (i) Torsional strength (ii) Torsional stiffness (iii) Torsional rigidity (06 Marks)
- b. A shaft transmits 300 KW power at 120 rpm. Determine:  
 (i) The necessary diameter of solid circular shaft.  
 (ii) The necessary outer diameter of hollow circular section such that the inner diameter being  $2/3$  of the outer diameter. Take allowable shear stress as  $70 \text{ N/mm}^2$ . (14 Marks)

OR

- 8 Write short notes on any four:  
 a. Maximum principal stress theory  
 b. Maximum shear stress theory  
 c. Maximum principal strain theory  
 d. Maximum strain energy theory  
 e. Maximum shear strain energy theory

(20 Marks)

**Module-5**

- 9 a. Show that for a rectangular cross section maximum shear stress is 1.5 times average shear stress. (06 Marks)
- b. A simply supported beam of span 6 m has a cross section as shown in Fig.Q9(b). It carries 2 point loads each of 30 kN at a distance of 2m from each support. Calculate the bending stress and shear stress for maximum values of bending moment and shear force respectively. Draw neat diagram of bending stress and shear stress distribution across the cross section.

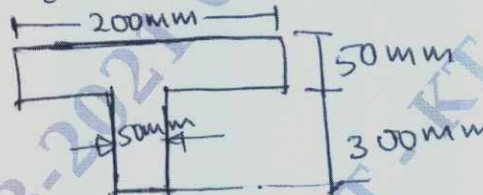


Fig.Q9(b)

(14 Marks)

OR

- 10 a. Derive an expression for Euler's buckling load for long column with one end fixed and other end free. (08 Marks)
- b. The cross section of a column is a hollow rectangular section with its external dimensions 200 mm  $\times$  150 mm. The internal dimension are 150  $\times$  100 mm. The column is 5m long and fixed at both ends. If  $E = 120$  GPa, calculate the critical load using Euler's formula. Compare the above load with the value obtained from Rankine's formula. The permissible compressive stress is 500 N/mm<sup>2</sup>. The Rankine's constant is 1/6000. (12 Marks)

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# CBCS SCHEME

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17CV33

## Third Semester B.E. Degree Examination, Jan./Feb. 2021 Fluid Mechanics

Time: 3 hrs.

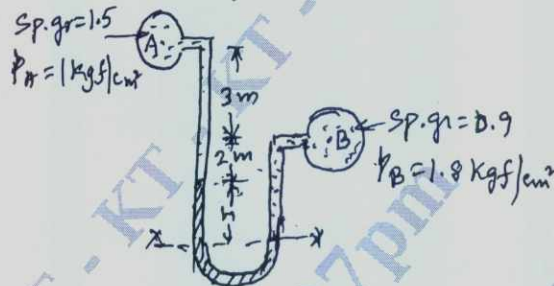
Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Define the following fluid properties. Also mention their units.  
i) Specific Gravity ii) Viscosity iii) Mass Density iv) Specific Volume. (06 Marks)
- b. Define capillarity and derive expressions for capillary rise and capillary fall. (06 Marks)
- c. A differential manometer is connected at the two points A and B of two pipes as shown in Fig.Q.1(c). The pipe A contains a liquid of specific gravity of 1.5, while pipe B contains a liquid of specific gravity of 0.9. The pressures at A and B are  $1 \text{ kgf/cm}^2$  and  $1.8 \text{ kgf/cm}^2$  respectively. Find the difference in mercury level in the differential manometer. (08 Marks)

Fig.Q.1(c)



OR

- 2 a. With neat sketch, explain Bourdon tube pressure gauge. (06 Marks)
- b. State and prove hydrostatic law of pressure. (06 Marks)
- c. The dynamic viscosity of an oil used for lubrication between a shaft and sleeve is  $0.6 \text{ N}\cdot\text{sec/m}^2$ . The shaft is of diameter 0.4m and rotates at 190rpm. Calculate the power lost in the bearing for a sleeve length of 90mm. The thickness of the oil film is 1.5mm. (08 Marks)

### Module-2

- 3 a. Define total pressure and centre of pressure. Also derive expressions for total pressure and centre of pressure for a plane surface submerged vertically in a liquid. (08 Marks)
- b. Distinguish between:  
i) Laminar Flow and turbulent flow  
ii) Uniform flow and non uniform flow  
iii) Steady flow and unsteady flow. (06 Marks)
- c. Determine the total pressure and centre of pressure on an isosceles triangular plate of base 4m and altitude 4m when it is immersed vertically in an oil of specific gravity 0.9. The base of the plate coincides with the free surface of oil. (06 Marks)

OR

- 4 a. Derive the three dimensional continuity equation in the Cartesian coordinates. (06 Marks)
- b. The velocity vector in a fluid flow is given as  $V = 4x^3i - 10x^2yj + 2tk$ . Find the velocity and acceleration of a fluid particle at (2, 1, 3) at time  $t = 1$ . (08 Marks)
- c. Determine the total pressure on a circular plate of diameter 1.5m which is placed vertically in water in such a way that the centre of the plate is 3m below the free surface of water. Find the position of centre of pressure also. (06 Marks)

**Module-3**

- 5 a. Define free vortex flow and forced vortex flow. Also mention two examples for each. (04 Marks)
- b. Derive Euler's equation of motion along a stream line and obtain Bernoulli's equation from Euler's equation. Also mention the assumptions made in derivation. (10 Marks)
- c. A 30cm × 15cm venturimeter is inserted on a vertical pipe carrying water, flowing in upward direction. A differential mercury manometer connected to the inlet and throat gives a reading of 20cm. Find the discharge. Take  $C_d = 0.98$ . (06 Marks)

**OR**

- 6 a. Derive an expression for discharge through a venturimeter. (06 Marks)
- b. List the various instruments that works on the Bernoulli's principle. Also explain how pilot tube is used to measure velocity of flow. (06 Marks)
- c. A 300mm diameter pipe carries water under a head of 20m with a velocity of 3.5m/s. If the axis of the pipe turns through  $45^\circ$ , find the magnitude and direction of the resultant force on the bend. (08 Marks)

**Module-4**

- 7 a. Give a detailed note on classification of orifices mouth pieces. (06 Marks)
- b. Derive an expression for discharge through a Borda's mouth piece running free. (06 Marks)
- c. Water flows over a rectangular weir 1m wide at a depth of 150mm and afterwards passes through a triangular right angled weir. Taking  $C_d$  for the rectangular weir and triangular weir as 0.62 and 0.59 respectively. Find the depth over triangular weir. (08 Marks)

**OR**

- 8 a. Give a detailed note on classification of weirs. Derive an expression for discharge through a triangular notch. (10 Marks)
- b. Define hydraulic coefficients. Also mention the general values of hydraulic coefficients. (06 Marks)
- c. A jet of water, issuing from a sharp edged vertical orifice under a constant head of 10cm at a certain point, has the horizontal and vertical coordinates measured from the vena-contracta as 20cm and 10.5cm respectively. Find the value of  $C_v$  and also value of  $C_c$  if  $C_d = 0.6$ . (04 Marks)

**Module-5**

- 9 a. Give a brief note on loss of energy in pipes. Also derive Darcy's Weisbach equation for loss of energy due to friction. (10 Marks)
- b. Give a brief note on water hammer in pipes. (04 Marks)
- c. Three pipes of lengths 800m, 500m and 400m and diameters 500mm, 400mm and 300mm respectively are connected in series. These pipes are to be replaced by a single pipe of length 1700m. Find the diameter of the single pipe. (06 Marks)

**OR**

- 10 a. Derive an expression for the loss of head due to sudden enlargement of pipe section. (08 Marks)
- b. The water is flowing with a velocity of 1.5m/s in a pipe of length 2500m and of diameter 500mm. At the end of the pipe, a valve is provided. Find the rise in pressure if the valve is closed in 25 seconds. Take the value of  $C = 1460\text{m/s}$ . (06 Marks)
- c. An oil of specific gravity 0.7 is flowing through a pipe of diameter 300mm at the rate of 500l/s. Find the head lost due to friction and power required to maintain the flow for a length of 1000m. Take  $\nu = 0.29$  stokes. (06 Marks)

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# CBCS SCHEME

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17CV34

## Third Semester B.E. Degree Examination, Jan./Feb. 2021 Basic Surveying

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Explain classification of Surveying in detail. (10 Marks)  
b. Explain principles of Surveying in detail. (06 Marks)  
c. Distinguish between Plane and Geodetic survey. (04 Marks)

OR

- 2 a. Discuss accessories required for horizontal measurements in detail. (10 Marks)  
b. To measure a base line, a steel tape 30m long standardized at 15°C with a pull of 100N was used. Find the correction per tape length if the temperature at the time of measurement was 20°C and the pull exerted was 160 N. If the length of 250m is measured on a slope of 1 in 4, find the horizontal length. Take  $E = 2.1 \times 10^5 \text{ N/mm}^2$ ;  $\alpha = 11.2 \times 10^{-6}/^\circ\text{C}$  and cross-sectional area of tape = 0.08 cm<sup>2</sup>. (10 Marks)

### Module-2

- 3 a. Define Local attraction? How it defected? Explain. (06 Marks)  
b. Distinguish between Prismatic compass and Surveyor's compass. (04 Marks)  
c. Determine the bearings of sides of regular pentagon of sides 5m, if the bearing of the first line AB is 80°. (10 Marks)

OR

- 4 a. Explain the temporary adjustment of transit theodolite in detail. (10 Marks)  
b. Discuss the methods of Repetition and reiteration for measuring horizontal angle in detail with neat sketch. (10 Marks)

### Module-3

- 5 a. What is meant by balancing of Traverse? Explain the Bowditch method of adjusting the traverse. (10 Marks)  
b. In a closed traverse ABCDE, the length and bearings of EA has been omitted. Compute the length and bearing of the line EA.

Line	Length (m)	Bearing
AB	204	87° 30'
BC	226	20° 20'
CD	187	280° 0'
DE	192	210° 3'
EA	?	?

(10 Marks)

OR

- 6 a. Derive the distance and elevation formulae for stadia tachometry, when the staff is held vertical and the line of sight being inclined upwards and downwards with neat sketch.

(10 Marks)

- b. A tacheometer, fitted with an anallactic lens and having the multiplying constant 100, was setup at station C to determine the gradient between two points A and B and the following observations were taken, keeping the staff vertical.

Staff at	Vertical angle	Stadia readings
A	+4° 20' 0"	1.300, 1.610, 1.920
B	+0° 10' 40"	1.100, 1.410, 1.720

(10 Marks)

**Module-4**

- 7 a. The following readings were observed successively with a levelling instrument. The instrument was shifted after 5<sup>th</sup> and 11<sup>th</sup> readings.  
0.585, 1.010, 1.735, 3.295, 3.775, 0.350, 1.300, 1.795, 2.575, 3.375, 3.895, 1.735, 0.635 and 1.605m.  
Draw up a page of level book and determine the RL of various points if RL of first point is 136.440m. Use Rise and Fall method. (10 Marks)
- b. Enumerate the errors in leveling in detail. (10 Marks)

OR

- 8 a. Derive an equation to determine the difference in elevation of the instrument station and top of a Chimney using Double plane method. (10 Marks)
- b. The following observations were made on a hill top to ascertain its elevation. The height of the target F was 5m. The instrument stations were 100m apart and were in line with F.

Instrument Station	Staff reading on BM	Vertical angle	Remarks
01	2.550	18° 6'	RL of BM
02	1.670	28° 42'	= 345.580 m

(10 Marks)

**Module-5**

- 9 a. A railway embankment of formation width 10m is to be built with side slope of 1 vertical to 2 horizontal. The ground is horizontal in the direction transverse to the centre line. Length of embankment is 150m. The centre height of embankment at 25m intervals are as given below:  
1.8, 3.3, 3.6, 4.2, 2.9, 2.6, 2.2m  
Calculate the volume of earth filling. (10 Marks)
- b. Explain the method of computation of volume by the  
(i) Trapezoidal rule (ii) Prismoidal rule (10 Marks)

OR

- 10 a. Explain characteristics of contours with neat sketches. (10 Marks)
- b. Discuss the uses of contour maps for various Civil engineering works with sketches. (10 Marks)

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# CBCS SCHEME

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17CV36

Third Semester B.E. Degree Examination, Jan./Feb. 2021

## Building Materials and Construction

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. List the requirements of good building stones. (04 Marks)  
b. Briefly explain the manufacturing process of clay bricks. (08 Marks)  
c. Explain briefly (i) Cement Concrete blocks (ii) Stabilized Mud blocks. (08 Marks)

OR

- 2 a. With a neat sketch explain the cross-section of an exogenous tress. (06 Marks)  
b. What do you mean by bulking of fine aggregate? Explain the importance of bulking of fine aggregates in the construction industry. (08 Marks)  
c. Explain the importance of size, shape and texture of coarse aggregates. (06 Marks)

### Module-2

- 3 a. List the essential requirements of a good foundation. (04 Marks)  
b. Explain the following :  
(i) English bond (ii) Flemish bond (iii) Cavity walls (iv) Partition walls. (08 Marks)  
c. Explain briefly the requirements of good stone masonry. (08 Marks)

OR

- 4 a. What do you mean by safe bearing capacity of soil? Briefly explain various methods adopted to improve SBC. (08 Marks)  
b. Explain briefly classification of stone masonry. (06 Marks)  
c. With the help of neat sketch explain 1½ (one-half) brick thick wall constructed by using English bond. (06 Marks)

### Module-3

- 5 a. Define Lintel. How are they classified according to the materials of construction? (04 Marks)  
b. Draw a neat sketch of a segmental arch and explain various technical terms used in arch work. (08 Marks)  
c. Explain briefly the factors influencing the selection of flooring materials. (08 Marks)

OR

- 6 a. Explain briefly the advantages of arch over lintel. (04 Marks)  
b. Explain the following :  
(i) Lintel (ii) Canopy (iii) Chejja (iv) Balcony (08 Marks)  
c. With the help of neat sketch explain the parts of King Post truss. (08 Marks)

### Module-4

- 7 a. Plan a dog-legged stair between two floors of 3.15m height with roof thickness of 15 cms. The size of staircase room is 2.5m × 5m. Draw the plan of the stair. (10 Marks)  
b. Explain the following with neat sketches:  
(i) Bay window (ii) Dormer window. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 8 a. With a neat sketch, label the different parts of a stair. Explain the terms involved. (10 Marks)  
b. Write short notes on : (10 Marks)  
(i) Scaffolding (ii) Under pinning

**Module-5**

- 9 a. What do you mean by plastering? Explain the purpose of providing plastering. (05 Marks)  
b. Explain the causes and effects of dampness in a building. (07 Marks)  
c. Explain briefly the various constituents of a good paint. (08 Marks)

OR

- 10 a. Explain briefly the various defects in plastering. (08 Marks)  
b. What do you mean by damp proof course? List the necessity of damp proof course in building. (04 Marks)  
c. Describe the procedure of painting on new wood work. (08 Marks)

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# CBCS SCHEME

USN

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17CPH39/49

## Third/Fourth Semester B.E. Degree Examination, Jan./Feb. 2021 Constitution of India and Professional Ethics and Human Rights

(COMMON TO ALL BRANCHES)

Time: 2 hrs.]

[Max. Marks: 30

### INSTRUCTIONS TO THE CANDIDATES

1. Answer all the thirty questions, each question carries **ONE** mark.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

1. When the Indian Constitution given effect  
a) 26.10.1949                      b) 26.12.1949  
c) 26.01.1950                      d) 26.01.1949
2. Which of the following word was added in the Preamble of the Constitution by 42<sup>nd</sup> Amendment Act 1976  
a) Socialist                              b) Sovereign  
c) Federal                                d) Republic
3. The President power to suspend death sentence temporarily is called  
a) Respite                                b) Reprieve  
c) Remission                            d) Constitution
4. The Preamble of the Constitution has been amended so far  
a) 4 times                                b) 3 times  
c) Twice                                 d) Once
5. Which one of the following is not one of the 3 organs of the state/union?  
a) Executive                              b) Press  
c) Judiciary                               d) Legislation
6. Which one of the following states constitution has been removed by the Parliament?  
a) West Bengal                           b) Nagaland  
c) Sikkim                                d) J & K

7. Which one of the landmark judgment passed by the Supreme Court in respect of Preamble of the Constitution
  - a) Beru Bari
  - b) Keshavananda Bharathi
  - c) Menaka Gandhi
  - d) Sonia Gandhi
8. Who is the Neutral person in the affairs of the party politics?
  - a) C.M.
  - b) Home Minister
  - c) Finance Minister
  - d) Speaker
9. Indian Constitution guarantees reservation of seats to SC and ST in
  - a) Loksabha and Assembly only
  - b) Loksabha only
  - c) Loksabha and Rajyasabha
  - d) Rajyasabha
10. India is referred to as \_\_\_\_\_ under the Indian Constitution
  - a) Country
  - b) Hindustan
  - c) India
  - d) Bharat
11. Who will preside over the joint session of both the houses of the parliament
  - a) President
  - b) Prime Minister
  - c) Speaker
  - d) Law Minister
12. What is the minimum age for becoming M.P. in Rajyasabha and Loksabha
  - a) 18 & 25 years
  - b) 25 & 18 years
  - c) 35 & 25 years
  - d) 30 & 25 years
13. The citizens can enforce their Fundamental Rights before SC under Article
  - a) Art 31
  - b) Art 32
  - c) Art 33
  - d) Art 34
14. Who quoted "Child of Today is Citizen of Tomorrow"?
  - a) L. Tilak
  - b) Jawaharlal Nehru
  - c) B.R. Ambedkar
  - d) Gandhiji
15. Who quoted "Freedom is my birth right"
  - a) L. Tilak
  - b) Jawaharlal Nehru
  - c) Sardar Patel
  - d) Gandhiji
16. No person shall be punished for same offence more than once
  - a) Jeopardy
  - b) Double Jeopardy
  - c) Ex-post facto law
  - d) Testimonial compulsion
17. When the Office of The President falls vacant the same must be filled up within
  - a) 4 months
  - b) 6 months
  - c) 12 months
  - d) 18 months
18. Which important Human Rights is protected under Article 21
  - a) Right to Equality
  - b) Right to Life and Personal Liberty
  - c) Right to Freedom of Speech
  - d) Right to Religion

19. The Rajya Sabha is  
a) Is a Permanent House  
c) Has a life of 5 years  
b) Has a life of 6 years  
d) Has a life of 7 years
20. The Quorum or minimum number of members required to hold the meetings of either houses of the Parliament is  
a) One-tenth  
c) One-third  
b) One-fifth  
d) One-fourth
21. Article 19 provides  
a) 6 freedoms  
c) 8 freedoms  
b) 7 freedoms  
d) 5 freedoms
22. One of the salient features of our Constitution is  
a) It is fully rigid  
c) It is partly rigid and partly flexible  
b) It is fully flexible  
d) None of these
23. Who is the present Speaker of Lok Sabha  
a) Sumithra Mahajan  
c) Om Birla  
b) K.S.Hegde  
d) Venkiah Naidu
24. The Chief Election Commission holds office for a period of  
a) 3 yrs  
c) 5 yrs  
b) 6 yrs  
d) 6 yrs or till he attains the age of 65 years
25. The procedure for amending the Constitution is detailed under  
a) Art 360  
c) Art 352  
b) Art 368  
d) Art 301
26. Writ of Mandamus can be issued on the ground of  
a) Non-performance of public duties  
c) Unlawful occupation of public offence  
b) Unlawful Detention  
d) None of these
27. Engineering Ethics is  
a) A macro ethics  
c) A preventive ethics  
b) Business Ethics  
d) A code of scientific rules based on ethics
28. The use of Intellectual Property of others without permission is referred as  
a) Cooking  
c) Plagiarism  
b) Stealing  
d) Trimming
29. Who appoints the Lieutenant General to Delhi  
a) Prime Minister  
c) President  
b) Home Minister  
d) Vice-President
30. The final interpreter to the Indian Constitution is  
a) Speaker of Lok Sabha  
c) President  
b) Parliament  
d) SC

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# CBCS SCHEME

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17MATDIP31

**Third Semester B.E. Degree Examination, Jan./Feb. 2021**

## Additional Mathematics - I

Time: 3 hrs.

Max. Marks: 100

**Note: Answer any FIVE full questions, choosing ONE full question from each module.**

### Module-1

- 1
- a. Find the modulus and amplitude of  $\frac{(1+i)^2}{3+i}$ . (06 Marks)
  - b. If  $x + \frac{1}{x} = 2 \cos \alpha$ , then prove that  $x^n + \frac{1}{x^n} = 2 \cos n \alpha$ . (07 Marks)
  - c. Find the fourth roots of  $1 - \sqrt[3]{3}$  and represent them on an argand plane. (07 Marks)

OR

- 2
- a. If the vectors  $2\hat{i} + \lambda\hat{j} + \hat{k}$  and  $4\hat{i} - 2\hat{j} - 2\hat{k}$  are perpendicular to each other than find the value of  $\lambda$ . (06 Marks)
  - b. Find the sine of the angle between the vectors  $\vec{a} = \hat{i} + \hat{j} + \hat{k}$  and  $\vec{b} = 2\hat{i} - 3\hat{j} + 2\hat{k}$ . (07 Marks)
  - c. Find  $\lambda$  such that the vectors  $2\hat{i} - \hat{j} + \hat{k}$ ,  $\hat{i} + 2\hat{j} - 3\hat{k}$  and  $3\hat{i} + \lambda\hat{j} + 5\hat{k}$  are coplanar. (07 Marks)

### Module-2

- 3
- a. Find the  $n^{\text{th}}$  derivative of  $\cos x \cos 2x \cos 3x$ . (06 Marks)
  - b. With usual notations prove that  $\tan \phi = r \frac{d\theta}{dr}$ . (07 Marks)
  - c. Prove that  $\sqrt{1 + \sin 2x} = 1 + x - \frac{x^2}{2} - \frac{x^3}{3} + \frac{x^4}{24} + \dots$  By using Maclaurin's expansion. (07 Marks)

OR

- 4
- a. If  $u = \tan^{-1} \left( \frac{x^3 + y^3}{x - y} \right)$ , prove that  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \sin 2u$ . (06 Marks)
  - b. If  $u = f \left( \frac{x}{y}, \frac{y}{z}, \frac{z}{x} \right)$ , prove that  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = 0$ . (07 Marks)
  - c. If  $u = e^x \cos y$ ,  $v = e^x \sin y$ , find  $J = \frac{\partial(u, v)}{\partial(x, y)}$ . (07 Marks)

### Module-3

- 5
- a. Evaluate  $\int_0^{\pi} x \cos^6 x \, dx$ . (06 Marks)
  - b. Evaluate  $\int_0^1 \int_0^1 \frac{dx dy}{\sqrt{(1-x^2)(1-y^2)}}$ . (07 Marks)
  - c. Evaluate  $\int_0^1 \int_0^2 \int_1^2 x^2 y z \, dx \, dy \, dz$ . (07 Marks)



OR

- 6 a. Evaluate  $\int \sin^6 x \, dx$ . (06 Marks)
- b. Evaluate  $\iint_R (x^2 + y^2) \, dx \, dy$ , where R is the triangle bounded by the lines  $y = 0$ ,  $y = x$  and  $x = 1$ . (07 Marks)
- c. Evaluate  $\int_0^1 \int_0^1 \int_0^1 e^{x+y+z} \, dx \, dy \, dz$ . (07 Marks)

**Module-4**

- 7 a. A particle moves along a curve whose position vector is given by  $\vec{r} = \left(t - \frac{t^3}{3}\right)\hat{i} + t^2\hat{j} + \left(t + \frac{t^3}{3}\right)\hat{k}$ . Find the velocity and acceleration at  $t = 3$ . (06 Marks)
- b. Find the unit normal vector to the surface  $xy + x + zx = 3$  at  $(1, 1, 1)$ . (07 Marks)
- c. Find  $\text{div } \vec{F}$  and  $\text{curl } \vec{F}$ , where  $\vec{F} = \nabla(x^3 + y^3 + z^3 - 3xyz)$ . (07 Marks)

OR

- 8 a. A particle moves so that its position vector is given by  $\vec{r} = \cos wt \hat{i} + \sin wt \hat{j}$ , where  $w$  is a constant. Show that the velocity  $\vec{V}$  is perpendicular to  $\vec{r}$ . (06 Marks)
- b. If  $\vec{F} = (x + y + 1)\hat{i} + \hat{j} - (x + y)\hat{k}$ , show that  $\vec{F} \text{ curl } \vec{F} = 0$ . (07 Marks)
- c. Show that  $\vec{f} = (\sin y + z)\hat{i} + (x \cos y - z)\hat{j} + (x - y)\hat{k}$  is irrotational. Also find  $\phi$  such that  $\vec{f} = \nabla\phi$ . (07 Marks)

**Module-5**

- 9 a. Solve  $\frac{dy}{dx} = 1 + \frac{y}{x} + \left(\frac{y}{x}\right)^2$ . (06 Marks)
- b. Solve  $\frac{dy}{dx} + y \cot x = \sin x$ . (07 Marks)
- c. Solve  $(x^2 + y)dx + (y^3 + x)dy = 0$ . (07 Marks)

OR

- 10 a. Solve  $\frac{dy}{dx} + \frac{y}{x} = y^2x$ . (06 Marks)
- b. Solve  $(y \cos x + \sin y + y) \, dx + (\sin x + x \cos y + x) \, dy = 0$ . (07 Marks)
- c. Solve  $y^2 + x^2 \frac{dy}{dx} = xy \frac{dy}{dx}$ . (07 Marks)

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