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# [3462]-101

## S.E. (Civil) (First Sem.) EXAMINATION, 2008

028

## ENGINEERING MATHEMATICS—III

### (2003 COURSE)

**Time : Three Hours** **Maximum Marks : 100**

***N.B.*** :— (*i*) Answers to the two Sections should be written in separate answer books.

(*ii*) In Section I, attempt Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**.

In Section II, attempt Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12**.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of non-programmable electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

## SECTION I

**1.** (*a*) Solve any *three* of the following differential equations : [12]

(*i*) $(D^2 + 3D + 2)\, y = \sin(e^x)$

(*ii*) $(D^4 - 1)\, y = \cosh x \sinh x$

(*iii*) $(D^3 + D)\, y = \cos x$

P.T.O.

(iv) $\left(D^2 + 9\right) y = \dfrac{1}{1 + \sin 3x}$ (Use method of variation of parameters)

(v) $x^2 \dfrac{d^2y}{dx^2} - x \dfrac{dy}{dx} + 4y = \cos(\log x) + x \sin(\log x)$

(b) Solve : [4]

$$\frac{dx}{dt} - 3x - 6y = t^2$$

$$\frac{dy}{dt} + \frac{dx}{dt} - 3y = e^t.$$

*Or*

**2.** (a) Solve any *three* of the following differential equations : [12]

(i) $\left(D^2 + 6D + 9\right) y = \dfrac{e^{-3x}}{x^3}$

(ii) $\dfrac{d^2y}{dx^2} + 4y = x \sin x$

(iii) $\dfrac{d^3y}{dx^3} - \dfrac{d^2y}{dx^2} = 3x + x\, e^x$

(iv) $\dfrac{d^2y}{dx^2} + 4y = \tan 2x$ (Use method of variation of parameters)

(v) $(1 + x)^2 \dfrac{d^2y}{dx^2} + (1 + x) \dfrac{dy}{dx} + y = 2 \sin \log (1 + x)$.

(b) Solve :

$$\frac{dx}{x\left(2y^4 - z^4\right)} = \frac{dy}{y\left(z^4 - 2x^4\right)} = \frac{dz}{z\left(x^4 - y^4\right)}.$$ [4]

3. (*a*) The deflection of a strut with one end built in ($x = 0$) and other supported and subjected to end thrust P, satisfies the equation :

$$\frac{d^2y}{dx^2} + a^2y = \frac{a^2p^2}{\underline{P}}(l - x).$$

Given that :

$$\frac{dy}{dx} = y = 0$$

when $x = 0$ and $y = 0$, when $x = l$, prove that :

$$y = \frac{R}{\underline{P}}\left[\frac{\sin ax}{a} - l\cos ax + l - x\right],$$

where $al = \tan al$. [8]

(*b*) A string is stretched tightly between $x = 0$, $x = l$ and both ends are given displacement $y = a \sin pt$ perpendicular to the string. If the string satisfies the differential equation $\frac{\partial^2y}{\partial x^2} = \frac{1}{c^2}\frac{\partial^2y}{\partial t^2}$, prove that the oscillations of the string are given by :

$$y = a \sec\frac{pl}{2c}\cos\left(\frac{px}{c} - \frac{pl}{2c}\right)\sin pt.$$ [8]

*Or*

4. (*a*) The differential equation of whirling shaft, where W is the weight of the shaft and $w$ is its whirling speed is given by :

$$EI\frac{d^4y}{dx^4} - \frac{W w^2}{g}y = W.$$

Taking the shaft of length $2l$, with the origin at the centre and short bearing at both ends, show that the medium deflection of the shaft is given by :

$$\frac{g}{2w^2}[\sec al + \text{sech } al - 2].$$ [8]

(*b*) Solve :

$$\frac{\partial u}{\partial t} = K \frac{\partial^2 u}{\partial x^2},$$

for the conduction of heat along a rod without radiation subject to the following conditions :

(*i*) $u$ is not infinite as $t \to \infty$.

(*ii*) $\frac{\partial u}{\partial x} = 0$ for $x = 0$, $x = l$ (ends are insulated)

(*iii*) $u = lx - x^2$, for $t = 0$ between $x = 0$ to $x = l$. [8]

**5.** (*a*) Solve the following system of equations by Gauss-Seidel method :

$$10x_1 + x_2 + x_3 = 12$$

$$2x_1 + 10x_2 + x_3 = 13$$

$$2x_1 + 2x_2 + 10x_3 = 14.$$ [6]

(*b*) Use Gauss elimination with partial pivoting to solve the following system of linear equations :

$$8x_2 + 2x_3 = -7$$

$$3x_1 + 5x_2 + 2x_3 = 8$$

$$6x_1 + 2x_2 + 8x_3 = 26.$$ [6]

(*c*) Use Runge-Kutta method of fourth order to solve :

$$\frac{dy}{dx} = \frac{1}{x + y}, \; x_0 = 0, \; y_0 = 1.$$ [6]

*Or*

**6.** (*a*) Using Adam's Bashforth method find $y(0.4)$, given that :

$$\frac{dy}{dx} = 1 + xy, \; y(0) = 2, \; y(0.1) = 2.1103,$$

$$y(0.2) = 2.243, \; y(0.3) = 2.4011$$ [6]

(*b*) Solution of the equation :

$$5x \frac{dy}{dx} + y^2 - 2 = 0$$

is tabulated as :

| $x$ | $y$ |
|---|---|
| 4 | 1.0 |
| 4.1 | 1.0049 |
| 4.2 | 1.0097 |
| 4.3 | 1.0143 |

Use Milen's predictor-corrector method to find $y$ at $x = 4.4$ and $x = 4.5$. [6]

(c) Solve the following system by Cholesky's method :

$$4x_1 + 2x_2 + 14x_3 = 14$$

$$2x_1 + 17x_2 - 5x_3 = -101$$

$$14x_1 - 5x_2 + 83x_3 = 155.$$ [6]

## SECTION II

7. (a) Calculate the first four moments about the mean of the given distribution. Also find $\beta_1$ and $\beta_2$. [6]

| $x_i$ | $f_i$ |
|---|---|
| 2 | 4 |
| 2.5 | 36 |
| 3.0 | 60 |
| 3.5 | 90 |
| 4.0 | 70 |
| 4.5 | 40 |
| 5.0 | 10 |

(b) Obtain regression lines for the following data : [5]

| $x$ | $y$ |
|---|---|
| 6 | 9 |
| 2 | 11 |
| 10 | 5 |
| 4 | 8 |
| 8 | 7 |

(c) A bag contains 3 red and 5 black balls and second bag contains 6 red and 4 black balls. A ball is drawn from each bag. Find the probability that one is red and other is black. [5]

*Or*

8. (a) From a group of 10 students, marks obtained by each paper of Mathematics and Applied Mechanics are given as :

| Marks in Maths | Marks in Appl. Mech. |
|---|---|
| 23 | 25 |
| 28 | 22 |
| 42 | 38 |
| 17 | 21 |
| 26 | 27 |
| 35 | 39 |
| 29 | 24 |
| 37 | 32 |
| 16 | 18 |
| 46 | 44 |

Calculate Karl Pearson's coefficient of correlation. [6]

(b) The first four moments of distribution about the value 5, are 2, 20, 40 and 50. From the given information obtain the first four central moments standard deviation and coefficient of skewness and kurtosis. [5]

(c) In a certain examination test, 2000 students appeared in a subject of Statistics average marks obtained were 50% with standard deviation 5%. How many students do you expect to obtain more than 60% of marks, supposing that marks are distributed normally ? [5]

**9.** (a) Find the directional derivative of $\phi = e^{2x} \cos yz$ at (0, 0, 0) in the direction of tangent to the curve $x = a \sin t$, $y = a \cos t$, $z = at$ at $t = \pi/4$. [5]

(b) A particle describes the cardioid $r = a\ (1 + \cos \theta)$ under the attraction of a force directed towards the pole. Find the law of force. [5]

(c) Prove any *two* of the following with usual notations : [6]

(i) $$\nabla \left( \frac{\bar{a} \cdot \bar{r}}{r^n} \right) = \frac{\bar{a}}{r^n} - \frac{n\,(\bar{a} \cdot \bar{r})\,\bar{r}}{r^{n+2}},$$

$\bar{a}$ is constant vector.

(ii) $$\nabla^2 \left[ \nabla \cdot \frac{\bar{r}}{r^2} \right] = \frac{2}{r^4}$$

(iii) $\nabla \times (\bar{a} \times \bar{r}) = 2\bar{a}$, $\bar{a}$ is a constant vector.

*Or*

**10.** (a) Show that :

$$\bar{F} = \left(6xy + z^3\right) \hat{i} + \left(3x^2 - z\right) \hat{j} + \left(3xz^2 - y\right) \hat{k}$$

is irrotational. Find scalar function $\phi$ such that $\bar{F} = \nabla\phi$. [5]

(*b*) Find the tangential and normal components of acceleration of a particle moving along the curve

$$x = a(t + \sin t),\ y = a\ (1 - \cos t).$$ [5]

(*c*) With usual notations prove any *two* of the following : [6]

(*i*) $$\nabla^2 \left[ \frac{\bar{a} \cdot \bar{b}}{r} \right] = 0,$$

$\bar{a}, \bar{b}$ are constant vectors.

(*ii*) $$\nabla \times \left[ \frac{\bar{a} \times \bar{r}}{r^n} \right] = \frac{(2 - n)}{r^n} \bar{a} + \frac{n (\bar{a} - \bar{r}) \bar{r}}{r^{n+2}}.$$

(*iii*) If $\phi$ and $\psi$ satisfies Laplace equation then prove that the vector

$$\phi \nabla \psi - \psi \nabla \phi$$

is solenoidal.

**11.** (*a*) Verify divergence theorem for

$$\bar{F} = 2x^2 y\hat{i} - y^2\hat{j} + 4xz^2\hat{k}$$

taken over region in the first octant bounded by $y^2 + z^2 = 9$ and $x = 2$. [7]

(*b*) Evaluate :

$$\int_C \bar{F} \cdot d\bar{r}$$

along the line (0, 0, 0) to (1, 2, 3); where

$$\bar{F} = \left(3x^2 - 6yz\right) \hat{i} + (2y + 3xz)\ \hat{j} + \left(1 - 4xyz^2\right) \hat{k}.$$ [6]

(c) If the velocity of an incompressible fluid at $(x, y, z)$ is given by :

$$\bar{q} = \frac{3xz}{r^5}\,\hat{i} + \frac{3yz}{r^5}\,\hat{j} + \frac{3z^2 - r^2}{r^5}\,\hat{k}$$

where $r = \sqrt{x^2 + y^2 + z^2}$, then determine the streamlines of motion. [5]

*Or*

**12.** (a) Verify Stokes' theorem for

$$\bar{F} = (y - z + 2)\,\hat{i} + (yz + 4)\,\hat{j} - xz\,\hat{k}$$

over the surface of a cube $x = 0$, $y = 0$, $z = 0$, $x = 2$, $z = 2$ above the *xoy* plane open at the bottom. [7]

(b) Evaluate :

$$\iint_S \left(x^3\,\hat{i} + y^3\,\hat{j} + z^3\,\hat{k}\right) . d\bar{S},$$

where S is the surface of the sphere $x^2 + y^2 + z^2 = 16$. [6]

(c) Find the work done in moving a particle once round the ellipse

$$\frac{x^2}{25} + \frac{y^2}{16} = 1,\ z = 0$$

under the field of force given by

$$\bar{F} = (2x - y - z)\,\hat{i} + \left(x + y - z^2\right)\,\hat{j} + (3x - 2y + 4z)\,\hat{k}.$$

Is the field conservative ? [5]

Total No. of Questions—12] [Total No. of Printed Pages—4+1

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## S.E. (Civil) (First Sem.) EXAMINATION, 2008

## BUILDING MATERIALS AND CONSTRUCTION

## (2003 COURSE)

**Time : Three Hours** **Maximum Marks : 100**

***N.B.*** :— (*i*) Answers to the two Sections should be written in separate answer books.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data if necessary.

(*v*) *All* questions are compulsory.

## SECTION I

**1.** (*a*) State the methods of improving bearing capacity of soil. Explain sand pile method in detail. [6]

(*b*) Explain plinth, a building component with neat sketch. [4]

(*c*) Write down the circumstances where strap footing is used. Give neat sketch of strap footing. [6]

*Or*

**2.** (*a*) Describe with sketch the following : [6]

(*i*) Bearing pile.

(*ii*) Friction pile.

(*iii*) Underreamed pile.

P.T.O.

(*b*) Explain the step by step procedure of setting out building in the field. [6]

(*c*) Describe differential settlement with sketch. [4]

**3.** (*a*) Write down the characteristics of the stones which should be observed in case of educational building. [6]

(*b*) Differentiate between brick masonry and stone masonry. [4]

(*c*) Explain the following terms with sketches : [6]

(*i*) Header stone.

(*ii*) Mitred closer.

(*iii*) Queen closer.

(*iv*) Cornice.

*Or*

**4.** (*a*) Describe the following terms with sketches : [6]

(*i*) Corbel

(*ii*) Lap

(*iii*) Coping

(*iv*) Throating.

(*b*) Write down any *four* instruments used in dressing of stones. Also write down the specific use of each. [4]

(*c*) Write down the points to be observed in supervision Brick Masonry. [6]

5. (*a*) Draw neat and labelled sketch of panelled door. Give sizes of any *four* components. [6]

(*b*) Give a detailed sketch of lintel with weather-shed. Write down its functions. [6]

(*c*) What is pointing ? Explain defects in plastering. [6]

*Or*

6. (*a*) Explain the detailed procedure of installation of centering for Arches. [6]

(*b*) State different materials used for wall cladding finishes. Write down the objects of paints. [6]

(*c*) State different types of fixtures and fastenings used for doors and windows. Explain any *two* hinges in detail with sketches. [6]

## SECTION II

7. (*a*) Enlist the various flooring tiles available in the market. Write advantages and disadvantages of any *two*. [6]

(*b*) Explain step by step procedure of fixing of A.C. sheet with sketches. [6]

(*c*) State the functional requirements of flooring materials. Give I.S. codes for any *two* tiles. [4]

*Or*

8. (*a*) Explain the following terms with sketches : [6]

(*i*) Skirting

(*ii*) Dado

(*iii*) Ridge

(*iv*) Purlin.

(*b*) Describe Lean to Roof in detail with neat and labelled sketch. [6]

(*c*) Explain water absorption test for tiles in detail. [4]

**9.** (*a*) Design a suitable staircase for a residential building using the following data : [6]

(*i*) Size of stair hall — 4.60 m × 2.40 m

(*ii*) Floor to floor height — 3.20 m

(*iii*) Wall thickness — 230 mm

(*iv*) Thickness of slab — 110 mm

Assume suitable data if necessary.

Draw detailed plan only.

(*b*) State the different means of vertical circulations. Explain Escalators in detail. [6]

(*c*) State the various connections used in steel construction. Describe any *one* in detail. [4]

*Or*

**10.** (*a*) Explain the design procedure for dog-legged stair in detail. [6]

(*b*) Explain Escalators with sketch. [4]

(c) Compare between Rivet connections and welded connections. Write down advantages and disadvantages of Bolted connections. [6]

**11.** (a) What is timber ? Explain the defects in timber with sketches. [6]

(b) Discuss safety measures in demolition of building in congested area. [6]

(c) What is underpinning ? Explain cantilever needle beam method of underpinning. [6]

*Or*

**12.** (a) State any *six* building materials. Write down their advantages and disadvantages. [6]

(b) State the types of shoring. Describe raking shores. [6]

(c) Which safety measures will you suggest in case of high rise building construction ? [6]

Total No. of Questions—12] [Total No. of Printed Pages—8+2

# [3462]-103

## S.E. (Civil) (First Sem.) EXAMINATION, 2008

## STRENGTH OF MATERIALS

## (2003 COURSE)

**Time : Three Hours** **Maximum Marks : 100**

*N.B.* :— (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I, Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary and clearly state them.

(*vii*) Assessment will be based on complete solutions but not on final answer.

(*viii*) Use of cell phone is prohibited in the examination hall.

## SECTION I

**1.** (*a*) A steel rod having cross-sectional area of 300 $mm^2$ and length of 15 m is suspended vertically from one end. It supports a tensile load of 20 kN at the lower end. If the unit mass of steel is 7850 $kg/m^3$ and E = 200 GPa, find the total elongation of the rod. [8]

P.T.O.

(*b*) Determine the values of the stress in portion AB and CB of the steel bar shown in Fig. 1 (*b*), when the temperature of bar is –45°C, knowing that a close fit exists at both the rigid supports when the temperature is +24°C.

Take E = 200 GPa and $\alpha = 11.7 \times 10^{-6}$/°C for steel. [8]

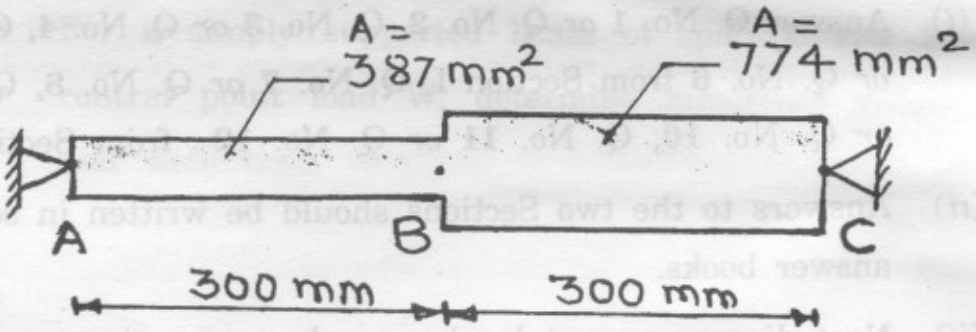



Fig. 1 (*b*)

*Or*

**2.** (*a*) State and explain generalized Hooke's law and find an expression for change in volume. [8]

(*b*) The two vertical attached to the light rigid bar shown in Fig. 2 (*b*) are identical except for length. Before the load 'W' was attached, the bar was horizontal and the rods stress free. Determine the force in each rod if W = 6600 N. [8]

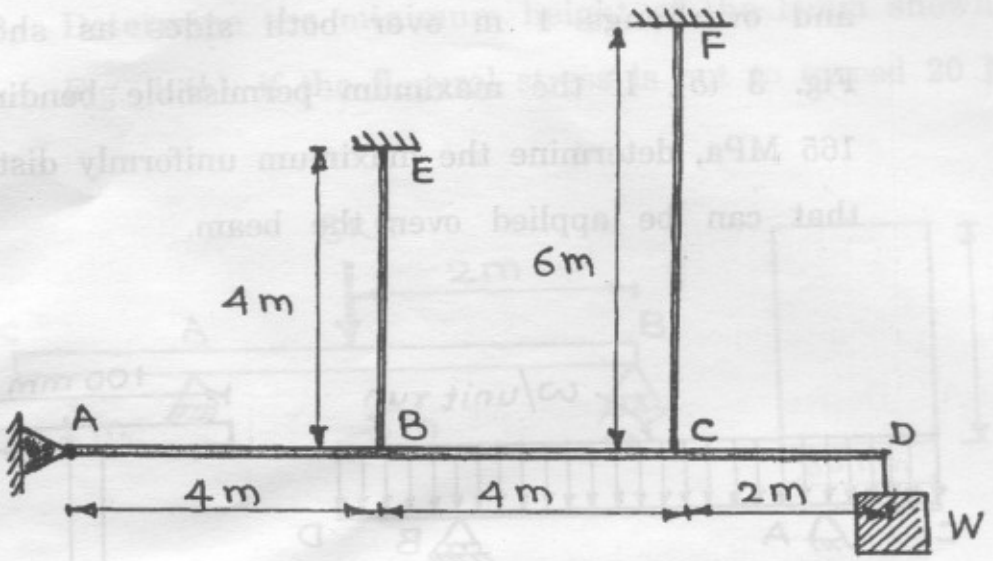



Fig. 2 (*b*)

**3.** (*a*) For the beam loaded as shown in the Fig. 3 (*a*), draw the shear force and bending moment diagram, showing all the salient points. [8]

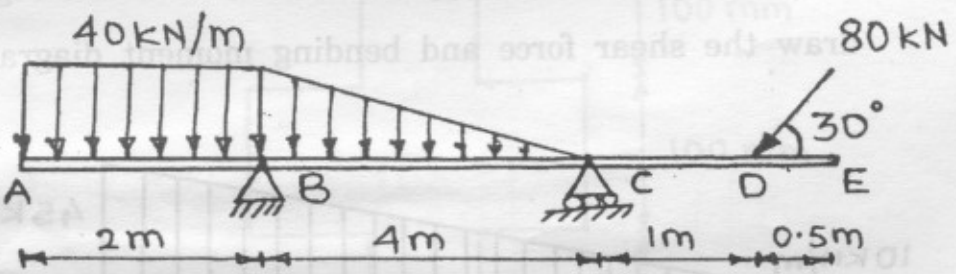



Fig. 3 (*a*)

(*b*) A 100 mm × 100 mm T beam has thickness 10 mm and length 5 m. It is simply supported over the span of 3 m

and overhangs 1 m over both sides as shown in the Fig. 3 (*b*). If the maximum permissible bending stress is 165 MPa, determine the maximum uniformly distributed load that can be applied over the beam. [8]

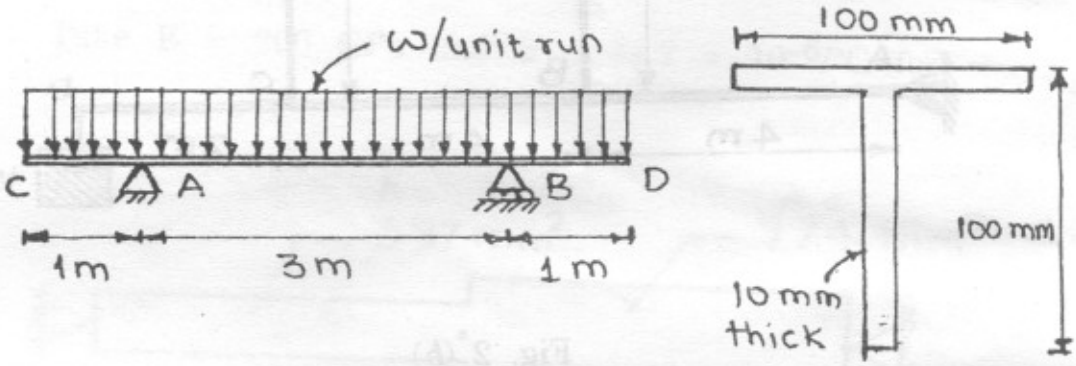



Fig. 3 (*b*)

*Or*

**4.** (*a*) Derive the expression for shear force and bending moment for the beam loaded and supported as shown in the Fig. 4 (*a*). Also, draw the shear force and bending moment diagram. [8]

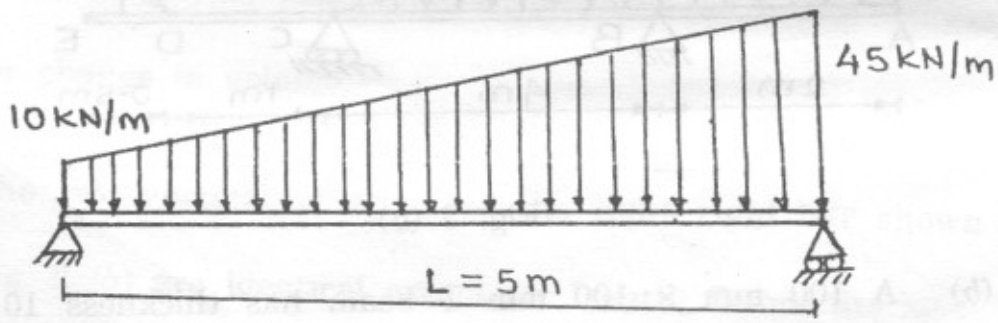



Fig. 4 (*a*)

(*b*) Determine the minimum height of the beam shown in the Fig. 4 (*b*), if the flexural stress is not to exceed 20 MPa. [8]

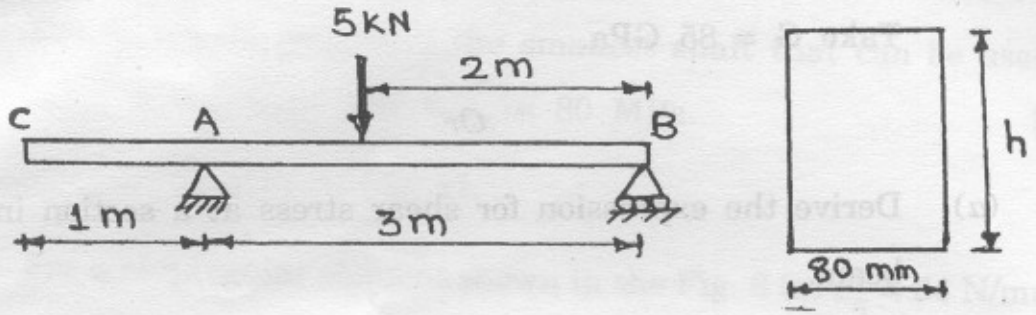



Fig. 4 (*b*)

**5.** (*a*) Draw the shear stress distribution for the cross-section as shown in the Fig. 5 (*a*), if it is subjected to maximum shear force of 225 kN. [9]

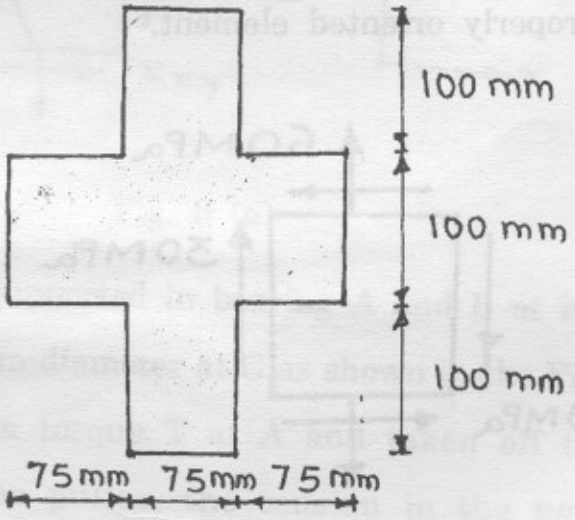



Fig. 5 (*a*)

(*b*) A hollow steel shaft 1.5 m long is to transmit a torque of 80 kN-m. Determine the diameter of shaft if the angle of twist should not exceed 1° and the allowable shear stress is 90 MPa.

Take G = 85 GPa. [9]

*Or*

**6.** (*a*) Derive the expression for shear stress at a section in a loaded beam. [9]

(*b*) Show that a hollow circular shaft whose inner diameter is half the outer diameter has a torsional strength equal to 15/16 of that of a solid shaft of the same outside diameter. [9]

## SECTION II

**7.** (*a*) For the state of stress shown in the Fig. 7 (*a*), determine the principal stresses and the maximum shear stress. Show all results on properly oriented element. [8]

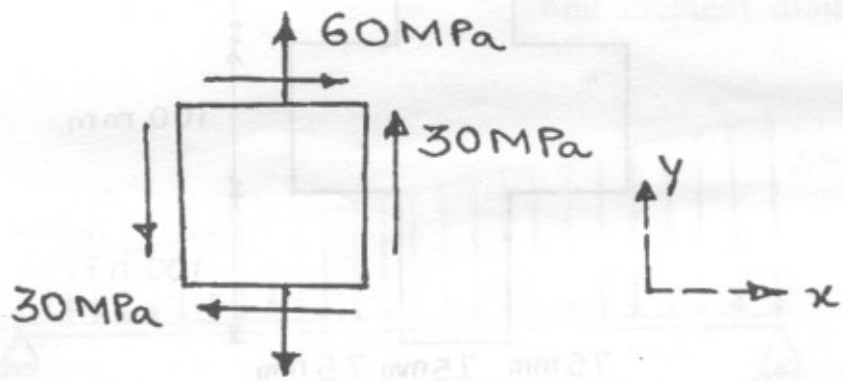



Fig. 7 (*a*)

(*b*) A solid circular shaft is used to transmit simultaneously a torque of 3000 N.m and a maximum bending moment of 2400 N.m. Determine the radius of the smallest shaft that can be used if $\sigma_{max}$ = 120 MPa and $\tau_{max}$ = 80 MPa. [10]

*Or*

**8.** (*a*) For a rectangular element shown in the Fig. 8 (*a*) $\sigma_x = 84$ N/mm$^2$, $\sigma_y = 28$ N/mm$^2$, $\tau_{xy} = 21$ N/mm$^2$. Calculate the normal stress and the shear stress on the plane defined by angle $\phi = 30°$. [8]

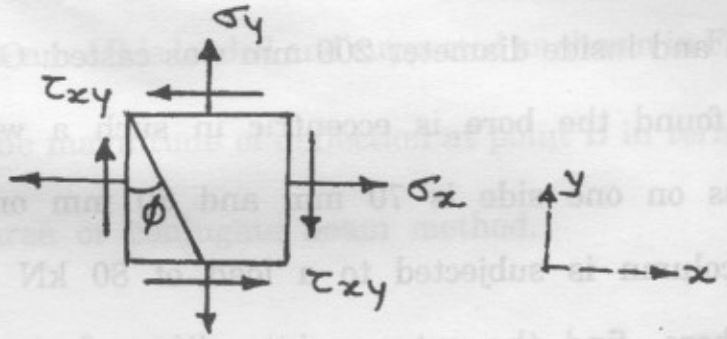



Fig. 8 (*a*)

(*b*) A steel shaft supported in bearing A and B at its ends carries a pulley 600 mm diameter at C as shown in the Fig. 8 (*b*). Power is applied by a torque T at A and taken off through a belt overturning the pulley, the tension in the two sides being 1250 N on the tight side and 250 N on the slack side. Find the required diameter *d* for the shaft if the working stresses are $\sigma = 85$ N/mm$^2$ and $\tau = 42.5$ N/mm$^2$. [10]

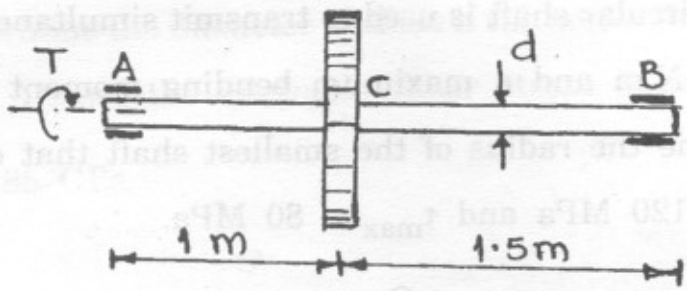



Fig. 8 (*b*)

**9.** (*a*) Derive an expression for Euler's critical load for a column having both ends hinged. [8]

(*b*) A short hollow cylindrical cast iron column of outside diameter 300 mm and inside diameter 200 mm was casted. On inspection, it was found the bore is eccentric in such a way that the thickness on one side is 70 mm and 30 mm on the other. If the column is subjected to a load of 80 kN at the axis of the bore, find the extreme intensities of stresses in the column base. [8]

*Or*

**10.** (*a*) A 50 mm by 100 mm timber is used as a column with fixed ends. Determine the minimum length at which Euler's formula can be used if E = 10 GPa and the proportional limit is 30 MPa. What central load can be carried with a factor of safety of 2, if the length is 2.5 m ? [8]

(*b*) A hollow circular column of 200 mm external diameter and 160 mm internal diameter is 4 m long with both ends fixed. If the column carries load of 150 kN at an eccentricity of 25 mm, find the extreme stresses in the column base. [8]

**11.** (*a*) A simply supported beam of span L is loaded with udl of wN/m on entire span. Determine moment M to be applied at the end, so that deflection at center is equal to zero. [8]

(*b*) Beam AB is loaded and supported as shown in Fig. 11 (*b*). Determine the magnitude of deflection at point B in terms of EI by moment area or conjugate beam method. [8]

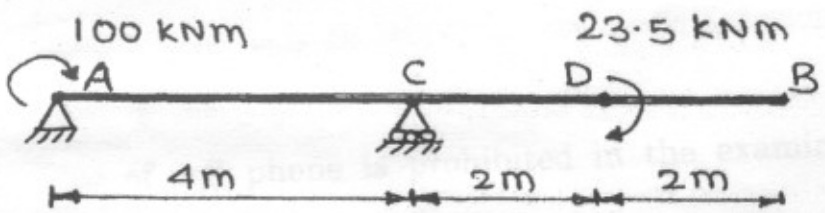



Fig. 11 (*b*)

*Or*

**12.** (*a*) For the beam loaded and supported as shown in Fig. 12 (*a*), determine the deflection at B by moment area or conjugate beam method. [8]

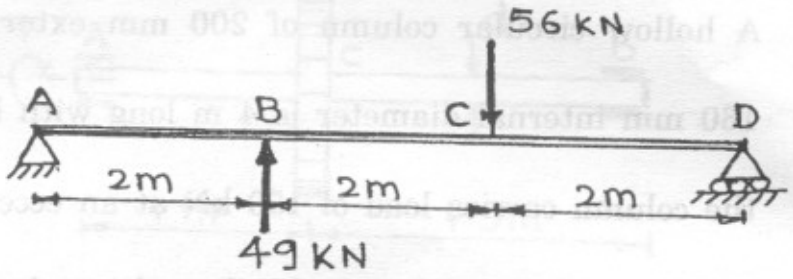



Fig. 12 (*a*)

(*b*) For a simply supported beam of span L and loaded with central point load W, determine maximum values of slope and deflection. [8]

Total No. of Questions—6] [Total No. of Printed Pages—4

**[3462]-104**

**S.E. (Civil) (First Sem.) EXAMINATION, 2008**

**ENGINEERING GEOLOGY**

**(2003 COURSE)**

**Time : Three Hours** **Maximum Marks : 100**

*N.B.* :— (*i*) *All* questions are compulsory.

(*ii*) Answers to the two Sections should be written in separate answer books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

**SECTION I**

1. (*a*) Describe in detail, modified Hatch's scheme of classification of Igneous rocks. [12]

(*b*) Write a detailed note on 'Depth zones of metamorphism'. [4]

*Or*

(*a*) Write detailed notes on :

(*i*) Classification of sedimentary rocks based on grain size. [5]

(*ii*) Textures and structures of metamorphic rocks. [5]

(*b*) Write short notes on (any *two*) :

(*i*) Welding and cementation. [3]

(*ii*) Clastic texture. [3]

(*iii*) Effect of contact metamorphism on limestone. [3]

P.T.O.

2. (*a*) How are rocks folded ? What are the different parts of fold and types of fold ? How does a fold pass into a fault ? [12]

(*b*) Write a note on 'Reverse Fault'. [4]

*Or*

Write short notes on :

(*i*) Unconformity and overlap. [4]

(*ii*) Conchordant and dischordant igneous intrusions. [4]

(*iii*) Dip and strike. [3]

(*iv*) Origin of fault. [2]

(*v*) Horst and Graben. [3]

3. (*a*) Describe different varieties and their distribution of Deccan Trap basalt. [10]

(*b*) Write short notes on (any *two*) :

(*i*) Internal structure of the earth. [4]

(*ii*) Vindhyan building stone. [4]

(*iii*) Changing the earth. [4]

(*iv*) Products of volcanoes. [4]

*Or*

(*a*) What do you mean by River Rejuvenation ? Explain in brief the landforms of river rejuvenation. [5]

(*b*) Describe the classification of mountains. [4]

(*c*) Describe with the help of a neat figure, Geomorphology of a recent coast. [3]

(*d*) Write short notes on :

(*i*) Seismic waves. [3]

(*ii*) Focus and epicentre. [3]

## SECTION II

**4.** Write notes on the following :

(*a*) Water bearing capacity of rocks. [6]

(*b*) Landslides, various causes of landslides and preventive measures against landslides. [10]

*Or*

(*a*) Write a note on Tunnelling through soft rocks. [6]

(*b*) Describe with suitable examples various geological conditions leading to tail channel erosion. [10]

**5.** Write notes on :

(*a*) Indian building stones. [6]

(*b*) Observations and precautions during drilling. [6]

(*c*) Artesian wells. [4]

*Or*

Write a detailed account of preliminary geological exploration at dam site. [16]

**6.** Write notes on the following :

(*a*) Use of GIS and remote sensing in Engineering Geology. [5]

(*b*) Tunnelling through Deccan trap basalts. [5]

(*c*) Geological studies to be carried out in reservoir area. [5]

(*d*) Perched water table. [3]

*Or*

Write notes on :

(*a*) Contact springs, Hot springs, Geysers. [9]

(*b*) Groundwater consideration in tunnelling. [5]

(*c*) Stable and unstable regions of earthquake. [4]

Total No. of Questions—12] [Total No. of Printed Pages—4

# [3462]-105

## S.E. (Civil) (First Semester) EXAMINATION, 2008

## ENGINEERING ECONOMICS AND MANAGEMENT

## (2003 COURSE)

**Time : Three Hours** **Maximum Marks : 100**

***N.B.*** :— (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

### SECTION I

**1.** (*a*) Define the following terms : [6]

(*i*) Wealth

(*ii*) Goods

(*iii*) Wants

(*iv*) Cost

(*v*) Price

(*vi*) Value.

(*b*) Explain the following terms with suitable example : [6]

(*i*) Law of substitution;

(*ii*) Elasticity of demand.

(*c*) What are demand and supply curves ? Describe the elasticity of supply. [2+2=4]

*Or*

**2.** (*a*) Explain with suitable example, the law of diminishing marginal utility. [6]

(*b*) Define Engineering Economics and explain the importance of it in Civil Engineering. [2+4=6]

P.T.O.

(c) Discuss the following in brief : [2+2=4]

(i) Equilibrium price;

(ii) Equilibrium amount.

**3.** (a) State and explain the Law of Returns. [6]

(b) What do you mean by productivity ? How will you improve productivity ? [2+4=6]

(c) Discuss in brief : [2+2=4]

(i) Perfect competition;

(ii) Monopolistic competition.

*Or*

**4.** (a) Discuss in brief "Life Cycle of Product". [6]

(b) What are the different factors of production ? Explain any *two* of them in detail. [2+4=6]

(c) Explain the following : [2+2=4]

(i) Gross National Product

(ii) Gross Domestic Product.

**5.** (a) Describe the role of S.E.B.I. [6]

(b) Define capital. Explain the term 'Capital Generation' ? [1+5=6]

(c) Differentiate between the following : [3+3=6]

(i) Fixed capital and working capital

(ii) Inflation and deflation.

*Or*

**6.** (a) Explain the following : [3+3=6]

(i) Build Own Transfer (BOT)

(ii) Public Deposits.

(*b*) Explain the different types of taxes related to Machinery and Materials. [4]

(*c*) Write short notes on any *two* of the following : [4+4=8]

(*i*) R.B.I.

(*ii*) Foreign Exchange

(*iii*) Break-even analysis.

## SECTION II

**7.** (*a*) What is Management. Give its importance. [5]

(*b*) Write a note on contribution of F.W. Taylor to management. [5]

(*c*) Enlist different types of organisation and suggest a suitable type of organisation for a construction industry. [5]

(*d*) Write a short note on Joint Stock Company. [3]

*Or*

**8.** (*a*) Write a note on functions of Management. [5]

(*b*) Differentiate between a public limited company and a private limited company. [4]

(*c*) Explain Deming's P.D.C.A. cycle. [5]

(*d*) Explain "Functional organisation with respect to its merits and demerits". [4]

**9.** (*a*) What are methods of selection of an employee in a industry ? [4]

(*b*) Explain the concept of a "Decision Tree'. [4]

(*c*) List different leadership styles. Explain any *one* in brief. [4]

(*d*) Explain in short cost-benefit analysis. [4]

*Or*

**10.** (*a*) Define Motivation. Enlist methods of motivating employees. Explain *one* in brief. [5]

(*b*) Differentiate between programmed and non-programmed decisions. [4]

(*c*) Explain importance of training. [3]

(*d*) List factors affecting Man-power planning. [4]

**11.** (*a*) What are industrial disputes ? List their causes. [3]

(*b*) Write a note on T.Q.M. [3]

(*c*) Explain in brief need of MIS in a construction industry. [3]

(*d*) What do you understand by work study ? [3]

(*e*) Give functions of Trade Unions. [4]

*Or*

**12.** (*a*) Write a note on Theory 'X' and Theory 'Y'. [4]

(*b*) Write is collective bargaining. Give its *three* advantages. [4]

(*c*) Explain in brief quality circle. [4]

(*d*) Write a note on time and motion study. [4]

Total No. of Questions—12] [Total No. of Printed Pages—4+1

# [3462]-106

## S.E. (Civil) (Second Semester) EXAMINATION, 2008

## FLUID MECHANICS—I

## (2003 COURSE)

**Time : Three Hours** **Maximum Marks : 100**

***N.B.*** :— (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of electronic non-programmable calculator is allowed.

(*vi*) Assume suitable data, if necessary.

## SECTION I

**1.** (*a*) A liquid has a specific gravity of 0.98. Find its mass density, weight density, specific volume and kinematic viscosity if its dynamic viscosity is 1.47 $Ns/m^2$. [6]

(*b*) State and explain Newton's law of Viscosity. Also derive the equation for the same. [6]

(*c*) By applying Froude's model law find the scale ratios for : [6]

(*i*) Discharge;

(*ii*) Velocity;

(*iii*) Force.

P.T.O.

*Or*

2. (*a*) At a certain point in a fluid the shear stress is 0.216 $N/m^2$ and the velocity gradient is 0.267 $s^{-1}$. If the mass density of the fluid is 1268 $kg/m^3$, find its kinematic viscosity. [6]

(*b*) Write short notes on : [6]

(*i*) Capillarity;

(*ii*) Scale effects.

(*c*) Using method of dimensional analysis, obtain an expression for the discharge Q over a rectangular weir. The discharge Q depends on the head H over the weir, acceleration due to gravity '*g*' length of weir crest 'L', height of weir crest over the channel bottom 'P' and the kinematic viscosity 'ν' of the liquid. [6]

3. (*a*) State the law of hydrostatics and derive an expression for the same. [4]

(*b*) A 10 m deep cylindrical tank contains water upto a depth of 5 m and oil of specific gravity 0.8 upto the top of tank. Determine the pressure at the bottom of the tank. [8]

(*c*) Write a short note on stable, unstable and neutral equilibrium conditions of a floating body with neat sketch. [4]

*Or*

4. (*a*) With the help of diagrammatic presentation explain : [4]

(*i*) Atmospheric pressure

(*ii*) Gauge pressure

(*iii*) Vacuum pressure

(*iv*) Absolute pressure.

(*b*) A cylindrical test tube made up of glass has 15 cm height and 1.5 cm diameter. It was filled with water and the depth of water column was recorded to be 2.5 cm. When it was gently placed in a water bath, it was floating with a draft of 10 cm. Determine the weight of the test tube. [8]

(*c*) Write a short note on differential manometers. [4]

**5.** (*a*) Derive continuity equation for *three* dimensional flow. [8]

(*b*) What is flow net ? Show that in a flow net, streamlines and equipotential lines meet orthogonally. [4]

(*c*) State Bernoulli's theorem and limitations of the same. [4]

*Or*

**6.** (*a*) Starting from Euler's equation along a streamline, integrate it to get Bernoulli's equation. Also state the assumptions made in. [8]

(*b*) In a two dimensional incompressible flow, the fluid velocity components are $u = x - 4y$ and $v = -y - 4x$. Determine the stream function and velocity potential function. [8]

## SECTION II

**7.** (*a*) Explain with neat sketch the working of pitot tube. Derive the expression for measurement of velocity in a pipe by pitot tube. [6]

(*b*) Draw a neat sketch of venturimeter showing total energy line and hydraulic gradient line along with piezometers mounted on inlet and throat. Also state the advantages of venturimeter over an orificemeter. [6]

(c) A horizontal venturimeter with inlet diameter 30 cm and throat diameter 15 cm is used to measure the flow of water. The pressure at inlet is 176.58 KPa and the vacuum pressure at the throat is 30 cm of Hg. Find the discharge of water through venturimeter. Take $C_d$ = 0.98. [6]

*Or*

**8.** (a) Draw a neat sketch of Rotameter and explain its working. [4]

(b) What is suppressed weir ? Write an equation for the discharge through rectangular weir with '*n*' end contractions considering velocity approach. [6]

(c) An orificemeter with orifice diameter 20 cm is inserted in a pipe of 30 cm diameter. The pressure gauges fitted upstream and downstream of the orificemeter give the reading of 19.62 N/cm$^2$ and 9.81 N/cm$^2$ respectively. Take $C_d$ = 0.6. Find the discharge of water through pipe. [8]

**9.** (a) Explain formation of boundary layer on a thin long plate. With the help of neat diagram show different types of boundary layers. [6]

(b) Starting from first principle, derive Hagen-Poiseuille equation for steady laminar flow in pipes. Also establish relation between Darcy-Weisbach friction factor and Reynold's number in laminar flow. [10]

*Or*

**10.** (*a*) Define boundary layer ? Comment on separation of boundary layer. How is the separation controlled ? [6]

(*b*) An oil of viscosity of 0.1 $Ns/m^2$ and relative density 0.9 is flowing through a circular pipe of diameter 50 mm and of length 300 m. The rate of flow of fluid through the pipe is 3.5 lit/sec. Find the pressure drop in a length of 300 m and also shear stress at pipe wall. [10]

**11.** (*a*) With the help of neat sketch explain siphon, its concept and working. [6]

(*b*) What do you understand by hydrodynamically smooth and rough pipes. [4]

(*c*) Write a short note no Prandtl's mixing theory. [6]

*Or*

**12.** (*a*) Briefly explain the following : [8]

(*i*) Temporal mean velocity;

(*ii*) Shear velocity;

(*iii*) Instantaneous velocity;

(*iv*) Karman-Prandtl velocity distribution equation.

(*b*) An old water supply distribution pipe of 250 mm diameter of a city is to be replaced by two parallel pipes of smaller equal diameter having equal length and identical friction factor. Find out the diameter of new pipe. [8]

Total No. of Questions—11] [Total No. of Printed Pages—7

# [3462]-107

## S.E. (Civil) (Second Semester) EXAMINATION, 2008

## BUILDING PLANNING AND BUILT ENVIRONMENT

## (2003 COURSE)

**Time : Four Hours** **Maximum Marks : 100**

*N.B.* :— (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

(*v*) *All* questions are compulsory.

### SECTION I

**1.** (*a*) Explain the importance of orientation of building with respect to cardinal direction. [5]

(*b*) Explain with suitable sketches the following principles of planning : [5]

(*i*) Grouping and

(*ii*) Rominess.

(*c*) Write a short note on Built Environment—integrated approach. [5]

*Or*

**2.** (*a*) What are the minimum sizes and width of one side of the following ? [5]

(1) Kitchen

P.T.O.

(2) Kitchen-cum-Dinner

(3) Hall

(4) Bedroom

(5) Master Bedroom

(6) Bathroom

(7) W.C.

(8) Combined W.C. and Bath

(*b*) A building located in actual city limit facing national high way, mention its distances of building line and control line in meters. [5]

(*c*) What is the parking space requirement of residential building to accommodate one car, two scooters and one cycle ? [5]

**3.** (*a*) Differentiate between weather and climate. [5]

(*b*) Discuss the factors on which the global climate is dependent. [5]

(*c*) Write a note on various materials used for thermal insulation of building. [5]

*Or*

**4.** (*a*) Write in detail about general rules for location of windows. [5]

(*b*) Explain with figures ventilation due to wind effects and ventilation due to stack effect. [5]

(*c*) What is day light factor ? What is its importance in lighting ? [5]

**5.** (*a*) How is the reverberation time calculated ? Mention the optimum reverberation time for the following building : [5]

(*i*) Cinema theatres

(*ii*) Public lecture hall

(*iii*) Music concert hall.

(*b*) What are the requirements and conditions of a good acoustic ? [5]

(*c*) Differentiate between sound foci and dead spots. [5]

*Or*

**6.** (*a*) Classify the various groups of building for fire protection based on occupancy ? [5]

(*b*) How would you plan, Means of escape in the event of a fire in a building ? [5]

(*c*) Explain the methods of extinguishing an accidental fire in a building. [5]

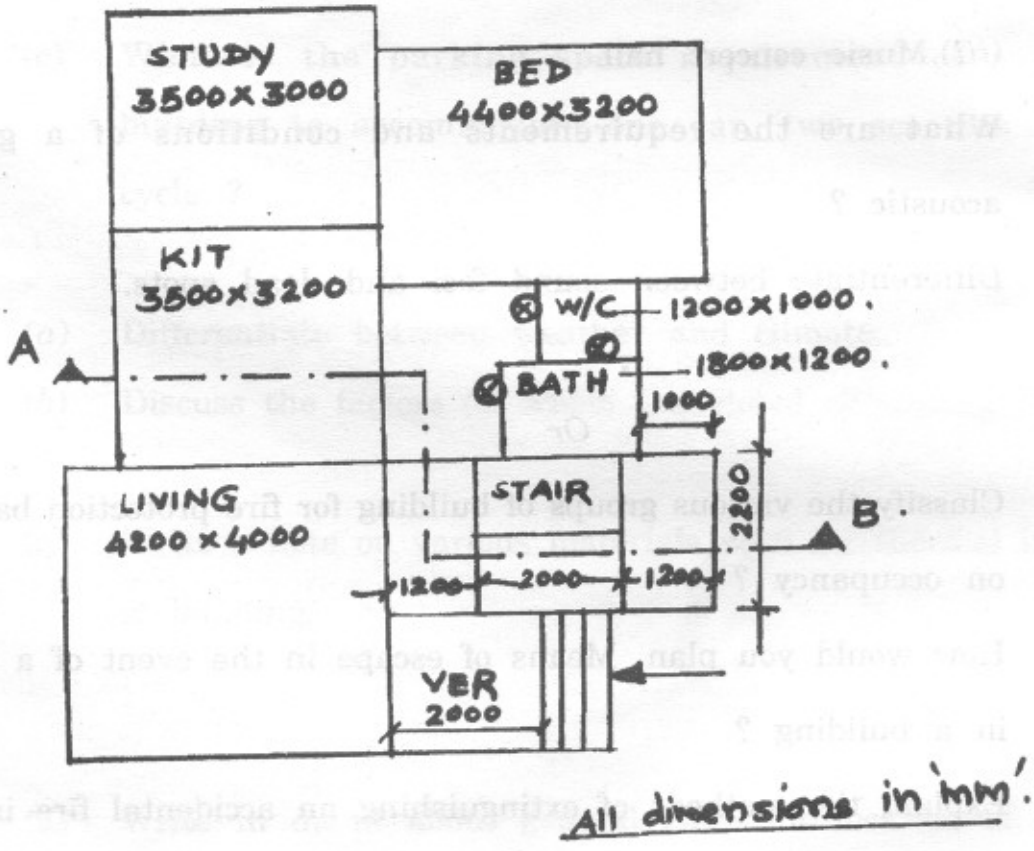
## SECTION II

7. A line plan for a residential building is given below. Draw to a scale 1 : 50 or suitable :

(*i*) Detailed plan for RCC framed structure. All walls are 230 mm thick and those marked by X are 115 mm thick. [10]

(*ii*) Detailed section along AB assuming depth of foundation as 1.8 m below ground level, show plinth filling. [8]

(*iii*) If floor to floor height is 3.20 m, show the details of staircase. [2]



*Or*

8. It is proposed to construct a bungalow for the Principal of an Engg. College. The bungalow is two storeyed and is RCC framed structure. It should satisfy the following requirements :

| Sr. No. | Name of Unit | Internal area in 'm$^2$' | No. of Units |
|---|---|---|---|
| 1. | Enclosed Verandah | 6 | 01 |
| 2. | Living room | 18 | 01 |
| 3. | Master bedroom with attached toilet | 20 | 01 |
| 4. | Kitchen-cum-dinning | 14 | 01 |
| 5. | Children bed | 12 | 01 |
| 6. | WC | 1.2 | 01 |
| 7. | Bath | 2.2 | 01 |
| 8. | Staircase | Decide suitable dimensions | 01 |
| 9. | Study room | 9 | 01 |

Draw :

(*i*) Detailed line plans (ground and first floor) to a scale 1 : 50. Show north line. [15]

(*ii*) Locate all openings and columns. [5]

9. (*a*) It is proposed to construct a vegetable market building for Municipal Corporation with the following data :

| Sr No. | Stalls | Nos | Size 'mm' |
|---|---|---|---|
| 1. | Open stalls for vegetable ottas to be provided at the central portion of the building | 20 | 2000 × 1000 |
| 2. | Closed stalls on periphery | 16 | 2000 × 2500 |
| 3. | Passage | As required | Min. 2000 wide |

(*b*) Load bearing structure with pitched roof of AC sheets on steel trusses over open stalls and RCC slab over closed stalls.

(*c*) Assume suitable data if required and state the same.

Draw to a scale 1 : 50 or suitable :

(*i*) Line plan showing location for door and window openings. [10]

(*ii*) Sketch the line diagram of roof truss according to span as per your plan. [5]

(*iii*) Write construction notes for flooring, doors and windows. [5]

*Or*

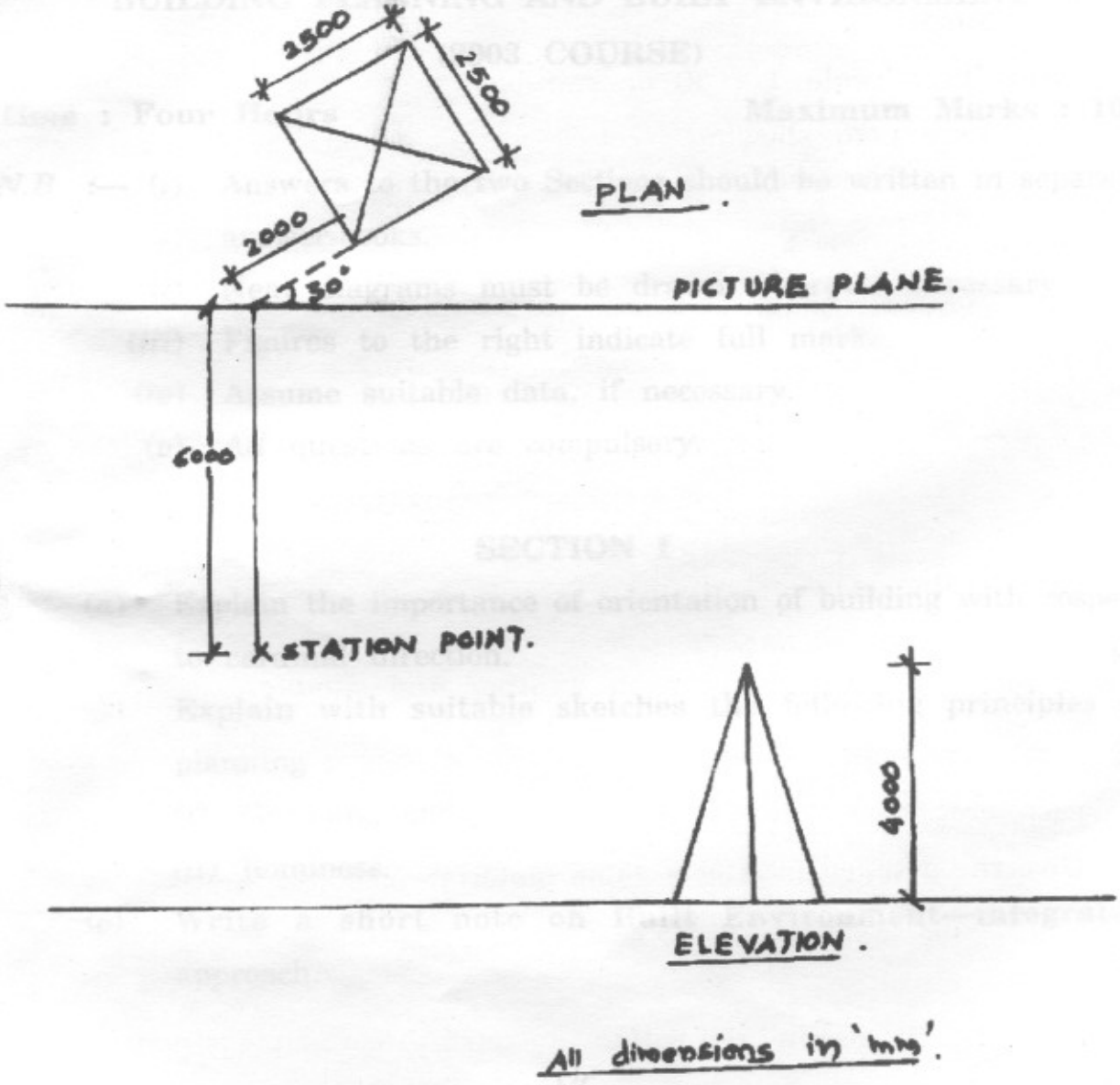
**10.** Draw a line plan for working women's hostel building. The building is single storeyed only. The capacity of hostel is 50 and each room accommodates 2 women only. Show all necessary units, also show north direction. Use standards norms to finalise the dimension of each unit. [15]

Give the detailed plan of a single room with furniture arrangement. [5]

**11.** (*a*) (*i*) Discuss in brief with neat sketch the principle of perspective drawing. [3]

(*ii*) List out the rules for one point perspective drawing. [2]

(*b*) Draw to a scale 1 : 100 or suitable a two point perspective view of the object given below. Eye level is at 4.0 m above ground level. [10]



Total No. of Questions—12] [Total No. of Printed Pages—7

# [3462]-108

## S.E. (Civil) (Second Semester) EXAMINATION, 2008

## SURVEYING—I

## (2003 COURSE)

**Time : Three Hours** **Maximum Marks : 100**

*N.B.* :— (*i*) Answer Q. No. **1** or Q. No. **2**; Q. No. **3** or Q. No. **4** and Q. No. **5** or Q. No. **6** from Section I and Q. No. **7** or Q. No. **8**; Q. No. **9** or Q. No. **10** and Q. No. **11** or Q. No. **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of electronic tables, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

### SECTION I

**1.** (*a*) State clearly all the temporary adjustments of transit theodolite and explain in brief. [4]

(*b*) How do curvature and refraction affect the levelling operations. Explain with the aid of sketches. [6]

(*c*) In testing a dumpy level, the following records were noted while undertaking reciprocal levelling : [8]

| Instrument at | Reading at A | Reading at B |
|---|---|---|
| A | 1.725 | 1.370 |
| B | 1.560 | 1.235 |

is the line of collimation in adjustment ? What should be the correct staff reading at A, during the second set-up to make the line of collimation truly horizontal ? Find the amount of collimation error also.

P.T.O.

*Or*

2. (*a*) Explain with the aid of a neat sketch, the working of "Tilt compensator" in auto level. [4]

(*b*) Explain how the procedure of reciprocal levelling eliminates the effect of refraction and curvature as well as the error of collimation. [8]

(*c*) A man on the deck of a ship observes a Luminous object which is 50 m. above m.s.l. If the man's eyelevel is 10 m. above sea level, find the distance between him and the object. Draw a neat suitable figure also. [6]

3. (*a*) Explain the procedure of measurement of Horizontal angle by "Repetition method". Also, state the errors eliminated by this method. [2+2=4]

(*b*) What is meant by open traverse ? Illustrate. Where is it mostly used ? State how this traverse is checked ? [1½+1½+3=6]

(*c*) Explain with reference to the theodolite traverse of the following : [1½each=6]

(*i*) Rectangular co-ordinates

(*ii*) Lattitude

(*iii*) Departure

(*iv*) Closing error.

*Or*

4. (*a*) Explain the procedure of measurement of magnetic bearing using 20 second thedolite. Draw necessary sketches. [4+1=5]

(*b*) Draw a neat sketch of transit theodolite showing its essential parts. Also, state its fundamental lines. [3+3=6]

(*c*) Write the full tabular format of a "Gales Traverse Table" which you have used during the calculations for theodolite project work. [5]

**5.** (*a*) Derive an expression for the horizontal distance of a vertical staff from a tacheometer when the L.O.S. of the telescope is horizontal. [4]

(*b*) With the aid of a neat sketch, explain any *one* method of tacheometric contouring. [4]

(*c*) Two points A and B are on the opposite sides of a summit. The tacheometer was set up at P on top of the summit and the following readings were taken :

| Inst. Stn. | Height of Inst. | Staff Stn. | Vertical Angle | Hair Readings | | | Remark |
|---|---|---|---|---|---|---|---|
| P | 1.500 | A | –10° 00' | 1.150 | 2.050 | 2.950 | RL of P |
| P | 1.500 | B | –12° 00' | 0.855 | 1.605 | 2.355 | =450.500 m. |

The tacheometer is fitted with an anallactic lens, the multiplying constant being 100. The staff was held NORMAL to the L.O.S.

Find :

(*i*) The distance between A and B and

(*ii*) Reduced levels of stn. A and stn. B

(*iii*) Draw a neat and suitable sketch. [8]

*Or*

**6.** (*a*) The following observations were made in a tacheometric survey. Determine the reduced levels of A, B and C and the horizontal distances AB and BC. The tacheometer is fitted with an anallactic lens and the multiplying constant being 100. Draw a neat suitable sketch also. [10]

| Inst. Stn. | Height of axis | Staff Stn. | Vertical Angle | Hair Readings (m) | | | Remark |
|---|---|---|---|---|---|---|---|
| A | 1.345 | B.M. | –5° 30' | 0.905 | 1.455 | 2.005 | R.L. of |
| A | 1.345 | B | +8° 00' | 0.755 | 1.655 | 2.555 | B.M. is |
| B | 1.550 | C | +10° 00' | 1.500 | 2.250 | 3.000 | 450.500 m. |

(*b*) What are tacheometric constants ? State clearly. Describe the field procedure to find out the tacheometric constants with the help of a neat sketch. Also, state the advantage of using an anallactic lens and its drawback too. [1+3+1+1=6]

## SECTION II

**7.** (*a*) Clearly state and derive various elements of simple circular curve. [4]

(*b*) Explain the field procedure for measuring ordinates by Long chord method. [6]

(*c*) Two tangents AB and BC intersect at B. Another Line DE intersects AB and BC at D and E such that $\angle$ ADE = 150° and $\angle$ DEC = 140°. The radius of the 1st curve is 200 m and that of the second is 300 m. The changing of B is 950 m. Calculate all data necessary for setting out the compound curve. [8]

*Or*

8. (*a*) Draw a neat sketch a reverse curve and show all the parts/ elements on it. [4]

(*b*) What are the requirements of a good. Transition curve ? State how is the length of this curve computed ? [6]

(*c*) Enlist all the cases of obstacles to the location of curves and explain any *two* in brief, how these obstacles can be overcome with the help of suitable sketches. [2+3+3=8]

9. (*a*) With a note on use of curves in Highways and Railways. [4]

(*b*) Write a note on use of transition curve. [3]

(*c*) The following data refer to a compound circular curve which bears to the right.

Total deflection angle = 93°

Degree of 1st curve = 04°

Degree of 2nd curve = 05°

Point of intersection at 45 + 61 (20 m units)

Determine in 20 m units the running distance of the tangent points and the point of compound curvature, given that the latter point is 6 + 24 from the point of intersection at a back angle of 290° 36' from the first tangent. [9]

*Or*

10. (*a*) What do you mean by the terms superelevation ? Derive the expression for the same. [1+3=4]

(*b*) Explain how you will determine the length of transition curve by "The Time Rate Method" ? [5]

(*c*) What is an Ideal Transition curve ? State the conditions. [3]

(*d*) A transition curve is required for a circular curve of 200 m radius the gauge being 1.5 m and max. superelevation restricted to be equal to 15 cm. The transition is to be designed for a velocity such that no lateral pressure is imposed on the rails and the rate of radial acceleration is 30 cm/sec$^2$/sec. Calculate the required length of the transition curve and the design speed. [4]

**11.** (*a*) State various methods of plane table surveying and hence explain with the help of neat and suitable sketches, the method of "Intersection". [2+4=6]

(*b*) State clearly the following terms in plane table surveying. Write sketches if necessary : [6]

(*i*) Orientation

(*ii*) Resection

(*iii*) Traversing

(*iv*) Strength of Fix.

(*c*) Write a short note on "Route Survey". [4]

*Or*

**12.** (*a*) Explain in brief the reconnaissance for a route. What information is normally required ? [4]

(*b*) Explain with the aid of a neat sketch, the procedure for setting out a building. [5]

(*c*) Why Back orientation is needed during plane tabling works ? Justify your answer giving a suitable example. [4]

(*d*) State clearly the uses of the following : [½ each=3]

(*i*) Alidate

(*ii*) Peg

(*iii*) Spirit level

(*iv*) Plumb fork

(*v*) Drawing sheet

(*vi*) Plumb bob.

Total No. of Questions—12] [Total No. of Printed Pages—4

# [3462]-109

## S.E. (Civil) (Second Semester) EXAMINATION, 2008

## CONCRETE TECHNOLOGY (Theory)

## (2003 COURSE)

**Time : Three Hours** **Maximum Marks : 100**

*N.B.* :— (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-book.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

### SECTION I

1. (*a*) What are the different types of cement ? Explain any *two* of them in detail. [6]

(*b*) Explain hydration process of cement. [6]

(*c*) Explain in detail Crushed Sand. [6]

*Or*

2. (*a*) Differentiate between dry and wet process of manufacturing of Portland cement. [6]

P.T.O.

(*b*) Explain—Bulking of Aggregates. [6]

(*c*) Explain—Test procedure to determine impact value of aggregates. Also write standard impact values for the construction works. [6]

**3.** (*a*) Define workability. Explain factors affecting workability. [6]

(*b*) Write a short note on Segregation of Concrete. [5]

(*c*) Write a short note on Precautions to be taken while placing the concrete. [5]

*Or*

**4.** (*a*) Write short note on Bond strength between cement paste and aggregate. [5]

(*b*) Explain Flexural Strength Test procedure for concrete. [6]

(*c*) Write a short note on Effect of water-cement ratio on the strength of concrete. [5]

**5.** (*a*) Explain the terms target mean strength and characteristic strength in case of concrete mix design. State the relationship factors affecting it. [5]

(*b*) What are the disadvantages of using too rich mix ? [5]

(*c*) Write in general step by step procedure of concrete mix design. [6]

*Or*

**6.** (*a*) What is the procedure of trial mixes when using a designed mix ? [5]

(*b*) Briefly outline the ODE method of concrete mix design. [6]

(*c*) Explain the factors affecting the choice of mix design. [5]

## SECTION II

7. (*a*) Write a short note on Light Weight Concrete. [6]

(*b*) Write a short note on Ferrocement. [6]

(*c*) Explain in detail Cold weather concreting. [6]

*Or*

8. (*a*) Write a short note on No fines concrete. [6]

(*b*) Write short notes on : [6]

(1) High density concrete

(2) Sulphur infiltrated concrete

(*c*) Write short notes on : [6]

(1) Ready-mixed Concrete

(2) Under Water Concreting.

9. (*a*) What are the different types of admixtures ? Explain any *two* in detail. [6]

(*b*) Write a short note on Analysis of Fresh Concrete. [5]

(*c*) Write a short note on Rebound Hammer Test. [5]

*Or*

10. (*a*) What are the functions of admixtures ? [5]

(*b*) Write short note on Retarding and Water Reducing Admixtures. [5]

(*c*) Write short notes on : [6]

(1) Pull out test

(2) Effect of sea water on concrete.

11. (*a*) Write a short note on Selection of Repair Crakcs. [5]

(*b*) Write short notes on : [6]

(1) Repair and Strengthening of column

(2) Repair of Slab.

(*c*) Write a short note on Shotcrete. [5]

*Or*

**12.** (*a*) Write short notes on : [6]

(1) Chloride Attack

(2) Sulphate Attack.

(*b*) Explain in detail—Permeability and factors affecting permeability of the concrete. [5]

(*c*) Explain in detail—Corossion of reinforcement and its control. [5]

Total No. of Questions—12] [Total No. of Printed Pages—8

**[3462]-110**

**S.E. (Civil) (Second Semester) EXAMINATION, 2008**

**THEORY OF STRUCTURES—I**

**(2003 COURSE)**

**Time : Three Hours** **Maximum Marks : 100**

*N.B.* :— (*i*) Answer Q. No. **1** or Q. No. **2**, Q. No. **3** or Q. No. **4** and Q. No. **5** or Q. No. **6** from Section I and Q. No. **7** or Q. No. **8**, Q. No. **9** or Q. No. **10** and Q. No. **11** or Q. No. **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary and clearly state them.

(*vii*) Use of cell phone is prohibited in the examination hall.

**SECTION I**

**1.** (*a*) Determine the static and kinematic degree of indeterminacy for the structures shown in Fig. 1 (*i*) and (*ii*) : [6]

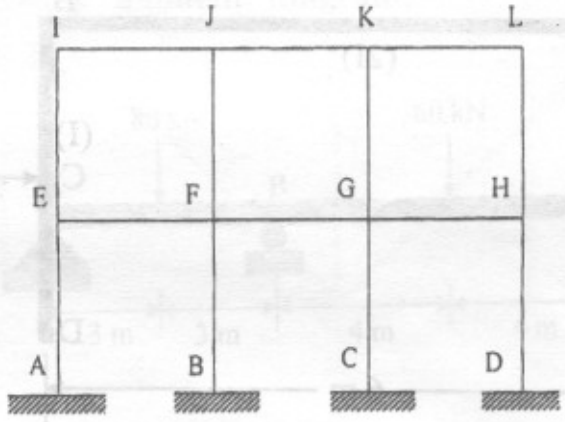



Fig. 1(i)

P.T.O.

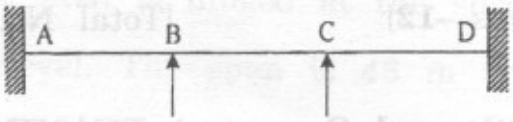



Fig. 1(ii)

(*b*) A cantilever AB of span L is loaded with point load W at free end B. Find the slope and deflection at B in terms of W, L, E and I by Castigliano's first theorem. [6]

(*c*) A weight of 5 kN falls through 10 mm on a collar rigidly attached to the lower end of a vertical bar of 4 m long and 600 $mm^2$ in cross-section. Calculate the maximum instantaneous stress. Take E = 200 $kN/m^2$. [6]

*Or*

**2.** (*a*) Define static and kinematic indeterminacy of a structure with suitable example. [6]

(*b*) Determine the horizontal deflection at point D for the frame as shown in Fig. 2(*b*), by Castigliano's first theorem. [6]

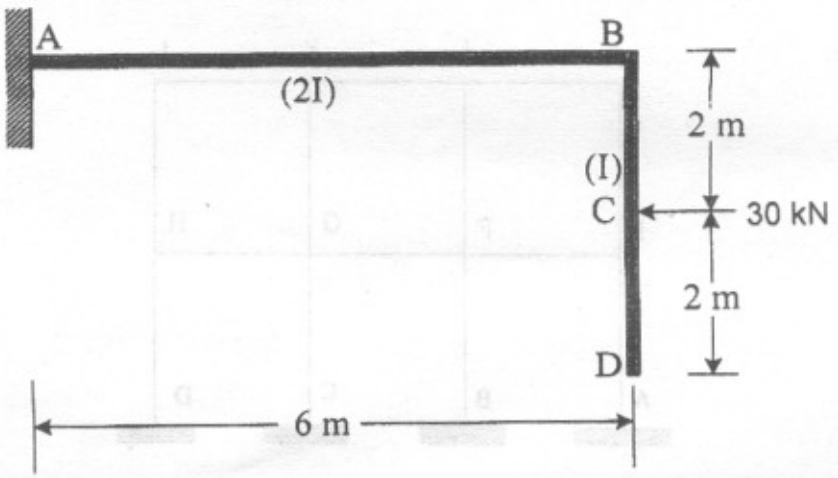



Fig. 2(*b*)

(c) A bar of length L and cross-sectional area A is subjected to an axial force P. Derive an expression of strain energy in terms of σ, E, A and L. [6]

3. (a) Determine the end moment for the fixed beam loaded and supported as shown in Fig. 3(a). Draw shear force and bending moment diagram. [8]

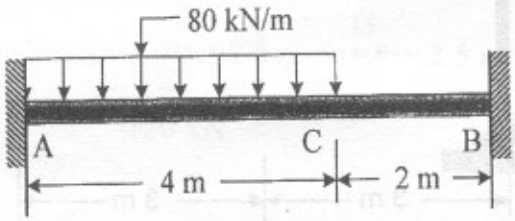



Fig. 3(a)

(b) Analyse the continuous beam loaded and supported as shown in Fig. 3(b), by Castigliano's second theorem. Draw shear force and bending moment diagram. [8]

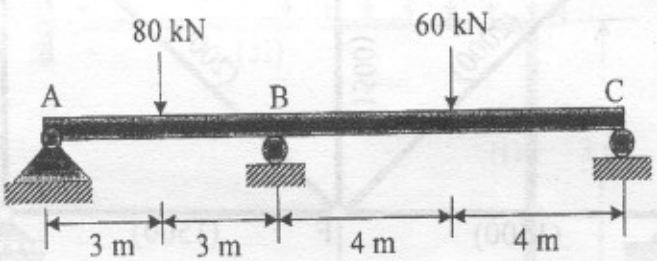



Fig. 3(b)

*Or*

4. (*a*) Analyse the continuous beam loaded and supported as shown in Fig. 3(*b*) by theorem of three moment. Draw shear force and bending moment diagram. [8]

(*b*) Determine the reaction component and draw the bending moment diagram for the frame loaded and supported as shown in Fig. 4(*b*). [8]

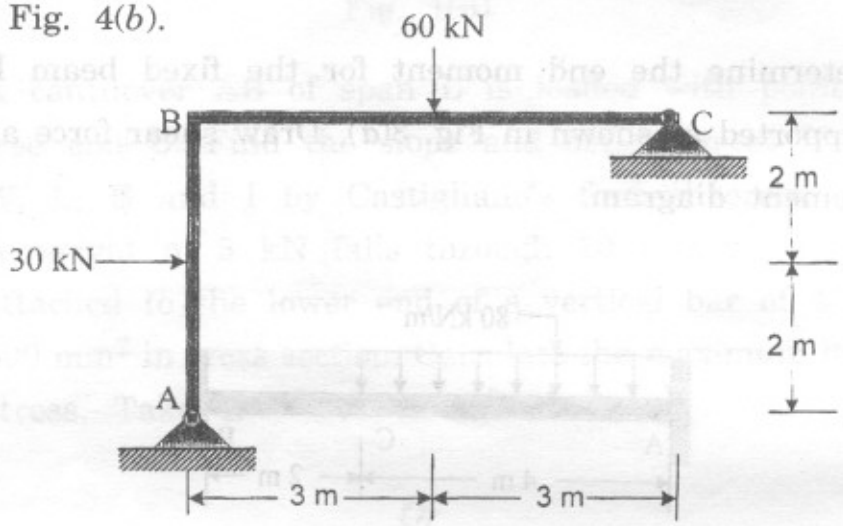



Fig. 4(*b*)

5. The truss shown in Fig. 5 is loaded with 100 kN load acting at the centre of the lower chord. The sectional areas in $mm^2$ are marked alongside of each member. Determine the values of horizontal and vertical displacement of joint D. Take E = 200 $kN/mm^2$. [16]

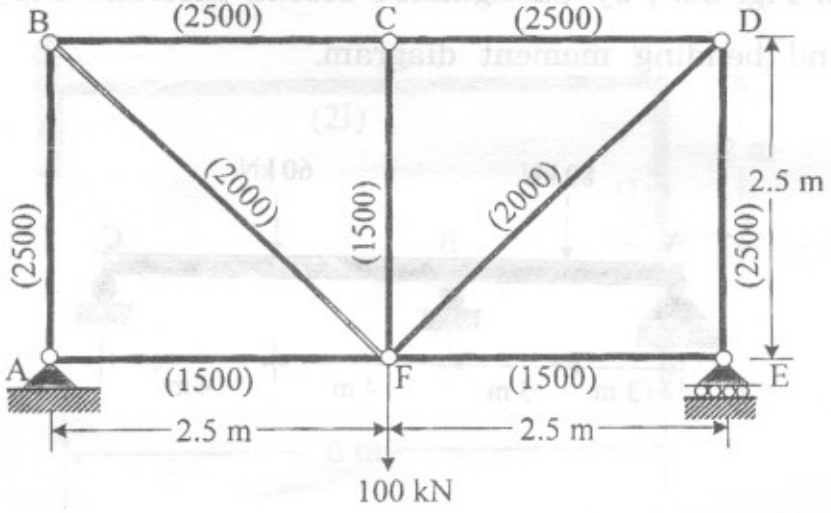



Fig. 5

*Or*

**6.** Determine the forces in all the members of the truss as shown in Fig. 6. The sectional areas of the members of the top chords are 7500 $mm^2$ each, of the members of the bottom chord are 5000 $mm^2$ each, of the verticals 3000 $mm^2$ each and of the diagonals 2500 $mm^2$ each : [16]

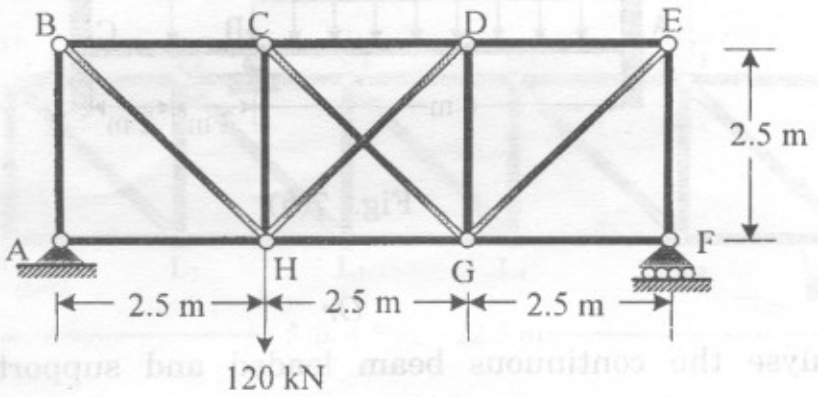



Fig. 6

## SECTION II

**7.** (*a*) The bent ABC as shown in Fig. 7(*a*) is fixed at A and hinged at C. Determine the moments at A, B and C by slope deflection method. For the bent $I_{AB}$ = 3I and $I_{BC}$ = I. [8]

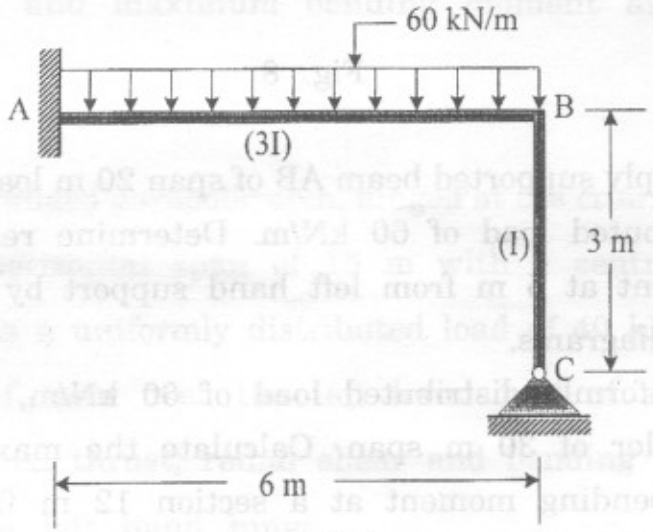



Fig. 7(*a*)

(*b*) Determine the end moments of the beam ABC loaded and supported as shown in Fig. 7(*b*) by slope deflection method. [8]

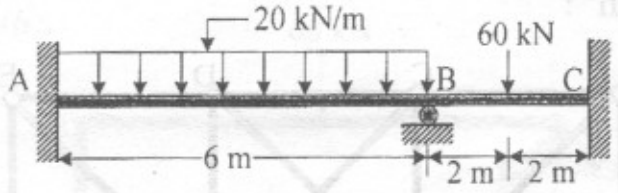



Fig. 7(*b*)

*Or*

**8.** Analyse the continuous beam loaded and supported as shown in Fig. 8 by moment distribution method. Also draw the shear force and bending moment diagram. [16]

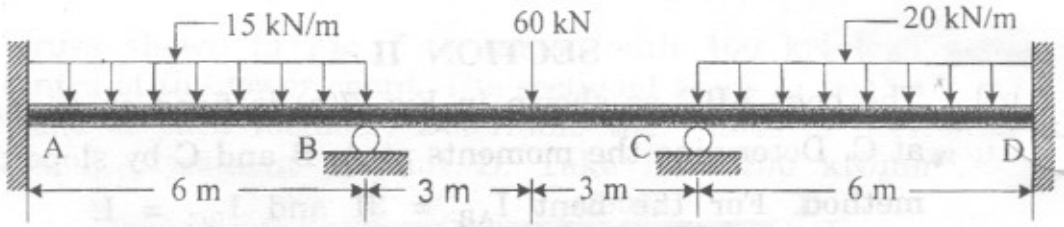



Fig. 8

**9.** (*a*) A simply supported beam AB of span 20 m loaded with uniformly distributed load of 60 kN/m. Determine reactions, shear and moment at 5 m from left hand support by drawing influence line diagrams. [8]

(*b*) A uniformly distributed load of 60 kN/m, 8 m long, crosses a girder of 30 m span. Calculate the maximum shear force and bending moment at a section 12 m from the left hand support. [8]

*Or*

**10.** (*c*) Draw the influence line diagram for the forces of the members, $U_2L_2$, $U_2U_3$, $L_3L_4$ and $U_2L_3$ for the N-type truss shown in Fig. 10(*a*). [8]

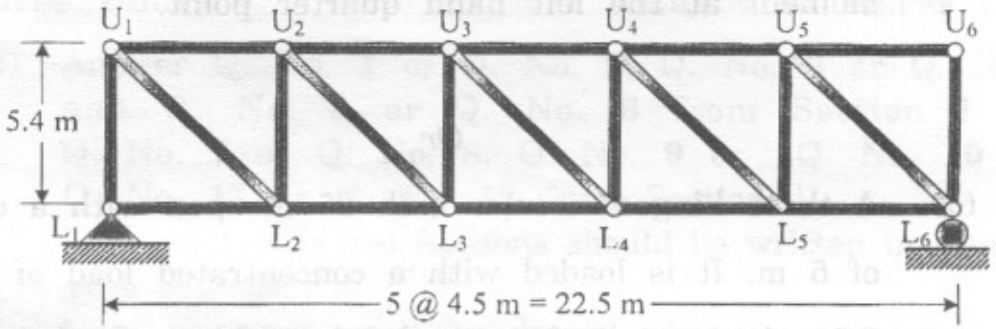



Fig. 10(*a*)

(*b*) Five points load 80, 80, 150, 150 and 90 kN spaced at 2.1, 2.4, 2.1 and 1.8 m in order cross a girder of 24 m span, from left to right with the 80 kN load leading. Determine the bending moment at 8 m from the left hand end and the position and maximum bending moment anywhere in the girder. [8]

**11.** (*a*) A three hinged parabolic arch, hinged at the crown and springings, has a horizontal span of 15 m with a central rise of 3 m. It carries a uniformly distributed load of 40 kN per horizontal meter of span over the left hand half of span. Determine the normal thrust, radial shear and bending moment at 5 m from the left hand hinge. [10]

(*b*) A parabolic arch is hinged at the springings, which are at the same level. The span is 48 m with a central rise of 6 m. It carries a point load of 160 kN at the crown. If $I = I_0 \sec \theta$, calculate the normal thrust, radial shear and bending moment at the left hand quarter point. [8]

*Or*

**12.** (*a*) A three hinged circular arch 25 m span with a central rise of 5 m. It is loaded with a concentrated load of 100 kN at 7.5 m horizontally from the left hand hinge. Find the horizontal thrust, reaction at each end and a bending moment under the load. [10]

(*b*) A two hinged parabolic arch is at the same level and loaded with uniformly distributed load throughout its span. Show that the bending moment and shear force at every section is zero. [8]