I Year B.E/B.Tech

CIVIL ENGINEERING

MODEL QUESTION PAPERS

(Effective from 2005 admitted batch)

SCHOOL OF DISTANCE EDUCATION
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CONTENTS

I Year B.E./B.Tech Degree Examinations
MATHEMATICS - I
(Common to All Branches)

Time : Three hours **Maximum : 75 Marks**

Question 1 is compulsory
Answer any four from Questions 2 to 8
All questions carry marks

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1. a) If $z = \log(u^2 + v),\ u = e^{x^2},\ v = 2\ \sin(xy)$ *find* $\frac{\partial z}{\partial x}$

b) Express $\int_{-\infty}^{\infty} e^{-4x^2}\ \partial x$ in terms of gamma function

c) A lamina with constant density is bounded by the curves. $x = y^2 - 3y$ *and* $x = 2y$. Find by double integration, the mass of the lamina.

d) Find the distance between the parallel planes $3x - y + 2z + 4 = 0$ and $6x - 2y + 4z + 5 = 0$.

e) Show that the series $\sum_{n=1}^{\infty} \frac{1}{n^3 + n^4 x^2}$ converges uniformly in any interval.

2. a) If v be a function of r where, $r^2 = x^2 + y^2$,

show that $\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} = \frac{1}{r}\frac{\partial v}{dr} + \frac{\partial^2 v}{\partial r^2}$

b) Obtain Taylor's expansion of $Tan^{-1}(y/x)$ about (1,1) upto and including the second degree terms.

3. a) Evaluate $\int_0^a \int_{x/a}^{\sqrt{x/a}} (x^2+y^2)\,dx\,dy$ by changing the order of integration.

b) Determine the M.I. about the X-axis of the area of a triangle with the vertices A(1,1), B(2,1) and C(3,3).

4. a) Find the equations to the line that intersects the lines $x+y+z=1,\ 2x-y-z=2, x-y-z=3,$ $2x+4y-z=4$ and passes through the point (1,1,1)

b) Find the equation of the sphere having its center on the plane $4x-5y-z=3$ and passing through the circle

$$x^2+y^2+z^2-2x-3y+4z+8=0,\ \ x-2y+z=8$$

5. a) Show that if a series $\sum u_n$ is convergent than

$$\underset{n\to\infty}{Lt}\ u_n = 0.$$

b) Test the convergence of the following series

$$\frac{\sqrt{2}-\sqrt{1}}{1}+\frac{\sqrt{3}-\sqrt{2}}{2}+\frac{\sqrt{4}-\sqrt{3}}{3}+\ldots\ldots\ldots$$

6. a) Show that the harmonic series of order p, $\sum_1^\infty \frac{1}{n^p}$ converges for p > 1 and diverges for 0 < p < 1.

b) Test for uniform convergence of the following series

$$\sin x - \frac{\sin 2x}{2\sqrt{2}} + \frac{\sin 3x}{3\sqrt{3}} - \frac{\sin 4x}{4\sqrt{4}} + \ldots\ldots\ldots\infty$$

7. Express $f(x) = |x|, -\pi < x < \pi$ as a Fourier series. Hence obtain $\frac{\pi^2}{8} = 1 + \frac{1}{3^2} + \frac{1}{5^2} + \ldots\ldots\ldots\ldots\infty.$

8. Obtain the half range sine and cosine series for the function

$f(x) = (x+1)^2, 0 < x < 1.$

I Year B.E./B.Tech Degree Examinations

MATHEMATICS - II

(Common to All Branches)

Time : Three hours **Maximum : 75 Marks**

Question 1 is compulsory
Answer any four from Questions 2 to 8

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1. a) State Culey Hamilton theorem

b) Product of the eigen values of $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ is ?

c) Solve $\frac{dy}{dx} + 2x^2 y = 0$

d) Find the complementary function of $(D^2 + 3d + 4)Y = 0$

e) Find the laplace transform of t Sin t.

2. a) Find the rank of $\begin{bmatrix} 5 & 6 & 7 & 8 \\ 6 & 7 & 8 & 9 \\ 11 & 12 & 13 & 14 \\ 16 & 17 & 18 & 19 \end{bmatrix}$

b) For what values of k the equations

$x + y + z = 1,\ 2x + y + 4z = k, 4x + y + 10z = k^2$ have a solution and solve them completely in each case

3. a) Using elementary row operations find the inverse of

$$\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$$

b) Reduce the quadratic form $2xy + 2yz + 2zx$ into canonical form.

4. a) Using Gauss elimination method.

Solve $2x_1 + 4x_2 + x_3 = 3,\ 3x_1 + 2x_2 - 2x_3 = -2$

$x_1 - x_2 + x_3 = 6$

b) Using iteration method find the largest eigen value and eigen vector of the matrix $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

5. a) Solve $(2x + y - 3)\,dx = (x + 2y - 3)dy$

b) Solve $(x^3 dx - y^3 dy) = 3xy\,(y\,dx - x\,dy)$

c) Solve $x\ p^2 + p - y = 0$

6. a) Solve $\frac{d^2y}{dx^3} + 2\frac{d^2y}{dx^2} + \frac{dy}{dx} = e^{2x} + \sin 2x$

b) Solve $\frac{dx}{dt} = 5x + y,\ \frac{dy}{dt} = y - 4x$

7. a) Find the Laplace transform of f(t) given

i) $f(t) = t\,e^{t} \sin t$

ii) $f(t) = \sin t \qquad 0 < t < \pi$

$= 0 \qquad t > \pi$

b) Find the inverse transform of

i) $\log\left(\frac{1+s}{s}\right)$ ii) $\frac{e^{-s}}{(s-1)(s-2)}$

8. a) Using convolution theorem find the inverse transform of

$$\frac{1}{(s-1)(s-9)^2}$$

b) Using transform method solve $y'' + 4y' + 3y + e^{-t}$

$y(0) = y'(0) = 1$

I Year B.E./B.Tech Degree Examinations

PHYSICS

(Common to All Branches)

Time : Three hours **Maximum : 75 Marks**

Question 1 is compulsory
Answer any four from Questions 2 to 8
All questions carry equal marks

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1. a) State and explain entropy.

b) Write the difference between Diffraction and Interference phenomena.

c) Explain Hall effect.

d) Write applications of optical fibers.

e) Explain Type-I and Type-II superconductors.

2. a) State and explain first law of thermodynamics.

b) Describe various operations of Cannot's cycle and derive an expression for its efficiency.

3. a) State and explain Gauss law and discuss the application

b) Discuss the growth and decay of current in an LR circuit.

4. a) Discuss the construction and working of Michelson's interferometer and write applications of Michelson's interferometer.

b) Explain the construction and working of Nicol's prism.

5. a) What is population inversion? Describe the construction and working of He-Ne laser.

b) Write applications of lasers

6. a) What is Piezo electric effect? Describe how this effect can be used to produce ultrasonic waves.

b) Mention applications of ultrasonic waves.

7. a) Derive Schrodinger time independent wave equation and obtain energy Eigen value and Eigen functions of a particle moving in one dimensional box using Schrodinger wave equation.

b) State and explain Heisenbergs uncertainty principle.

8. a) Distinguish between metals, semiconductors and insulators based on band theory of solids.

b) Define Super conductivity, Meisner effect and write applications of Super conductors.

I Year B.E./B.Tech Degree Examinations

CHEMISTRY

(Common to Mechanical, Civil, EEE, ECE Branches)

Time : Three hours **Maximum : 75 Marks**

Question 1 is compulsory
Answer any four from Questions 2 to 8

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1. a. Explain hardness of water?

b. What are galvanic cells? Give example?

c) Define HCV and LCV?

d) What are polymers? Classify

e) What are semi conductors?

2. a) What are boiler troubles? Explain.

b) Explain Green house effect

3. Write short notes on

a) Break point chlorination

b) Desalination

c) BOD and COD

4. a) What are defects in solids? Explain

b) Explain about organic semiconductors

5. a) What are primary and secondary cells?

b) Write the working of lead acid battery?

6. a) Differentiate between termo plastics and thermosetting plastics.

b) Write the synthesis, properties and uses of polyethylene and PVC

7. a) How does the percentage of C,H,N,O,S calculated in a fuel?

b) What is knocking? Explain.

8. Write short note on

a) setting and hardening of cement.

b) Lubricants

c) Paints and Varnishes.

I Year B.E./B.Tech Degree Examinations

COMPUTER PROGRAMMING AND NUMERICAL TECHNIQUES

(Common to All Branches)

Time : Three hours **Maximum : 75 Marks**

Question 1 is compulsory
Answer any four from Questions 2 to 8
All questions carry marks

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1. a) What is an algorithm and flow chart ?

b) What is a variable, explain rules to follow in FORTRAN to write a Variable name.

c) What are different data type in C ?

d) Explain False position method.

e) What is numerical integration? Write the formula for Trapezoidal rule.

2. a) Write a flow chart to find biggest of three numbers.

b) Write a program in FORTRAN to find the roots of a given quadtric equation.

3. a) Write a flow chart to find HCF a given two integers.

b) Write a program in C to test whether the given integer is prime or not.

4. a) Explain various types of error in numerical computation. Define absolute error, relative error.

b) Calculate the values of $\left(x^2 - y^2\right) \Big/ (x+y)$ with $x = 0.4845$ and $y = 0.4800$, using normalized floating point airthematic. Compare the value with $(x - y)$. Determine relative error of the former.

5. a) Find the root of the following equations correct upto 2 decimal places using false position method.

$$x^3 - 2x^2 + 3 = 0$$

b) Find the root of the following equation correct upto 2 decimal places using Newton - Raphson method.

$$\sin x = 1 - x$$

6. a) From the following table find the value of $f(x)$ when $x = 0.21$.

x	0.20	0.22	0.24	0.26	0.28	0.30
$f(x)$	1.6596	1.6698	1.6804	1.6912	1.7024	1.7139

b) From the following table find the value of $f(x)$ when $x = 4$.

x	-1	0	3	6	7
$f(x)$	3	-6	39	822	1611

7. a) Calculate the value of $I = \int_0^{\pi/2} \sin x \, dx$ by Simpson rule with 8 intervals.

b) Solve the following system by Gauss - Elimination method

$$5x - 2y + z = 4$$

$$7x + y - 5z = 8$$

$$3x + 7y + 4z = 10$$

8. a) Use Euler's method to find $y(0.1)\, y = x + y$ with $y(0) = 0$ with $h = 0.01$.

b) Use Runge - Kutta method to find

$y(0.2)$ in steps of 0.1

$\frac{dy}{dx} = x + y^2$ with $y(0) = 1$.

I Year B.E./B.Tech Degree Examinations

ENGINEERING MECHANICS

(Common to Mechanical, Civil branches)

Time : Three hours **Maximum : 75 Marks**

Question 1 is compulsory
Answer any four from Questions 2 to 8
All questions carry equal marks

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1. a) What is the .law of superposition?

b) What is cone of static friction?

c) Two parallel forces of magnitude 3N and 7N are acting on a body. Then what could be thje magnitude of the resultant force in Newtons

i) 3 or 7 ii) 2 or 8 iii) 4 or 10 iv) 11 or 12

d) State the D' Alembert's principle with an example.

e) Defferentiate circular frequency from natural frequency.

2. a) State and prove the theorem of Varignon for two concurrent forces.

b) Determine by applying the Pappus theorem (i) the surface area and (ii) volume of a hemisphere of radius 'a'.

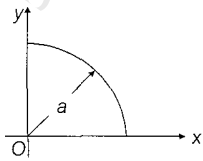

Fig. 1(a) Surface area of hemisphere

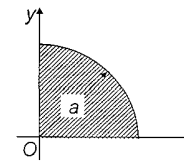

Fig. 1(b) Surface volume of hemisphere

3. a) Discuss in detail about trusses and explain method of joints of trusses with an example.

b) IN the plane of a figure OX and OY are one set of orthogonal axes. OX' and OY' are another set of orthogonal axes and OZ an axis perpendicular to the plane. If moments of inertia are Ix = 10, Iy = 15 and Ix1 = 8 units. Find out Iy1 and Iz.

c) State the principle of virtual work.

4. a) For a general case of forces in a plane show that the equilibrium can be established by three moment equation.

b) State and prove parallel axis theorem and perpendicular axis theorem for moment of inertia of a plane lamina with an example.

5. a) A train moves with a uniform speed of 60 KMPH along a straight level track. At a certain instant the engineer moves the throttle soas to increase thetraction by 20 per cent. What distance 'x' will the train cover before acquiring a speed of 70 KMPH if the resistance to motion is constant and equal to 1/200 of the weight of the train?

b) In Fig.2, a small car of weight 'w' starts from rest at 'A' and rolls without friction along an inclined plane to 'B' where it strikes a block also of weight 'W' and initially at rest. Assuming a plastic impact at B, the car and block will move from B to C as one particle. If the coefficient of friction between the block and plane is μ = ½, calculate the distance x to point 'C' where the bodies come to rest.

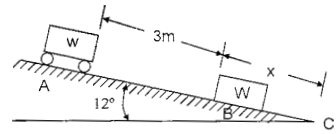

Fig : 2

6. a) Two adjacent guns having the same muzzle velocity of 400 m/sec fire simultaneously at angles of elevation for the same target at range 5000 m. Compute the time difference between the two hits.

b) Compute the circumferential tension produced in a uniformly rotating thin circular ring of uniform cross-sectional area of 10 cm^2 and mean radius 5 cm if the peripheral velocityof the ring is 3 m/sec.

7. a) A simple pendulum of weight 'w' and length '' as shown in Fig.3 is released from rest at A($= 60^0$), swings downward underthe influence of gravity and strikes a spring of stiffness K at 'B'. Neglecting the mass of the spring, determine the compression that it will suffer.

b) The two step pulley in Fig.4 has weight W = 2 KN and radius of gyration K0 = 18cm. Develop a formula for the downward acceleration of the falling weight 'P' on the right if P = 250 N, r1 = 25 cm and r2 = 40 cm.

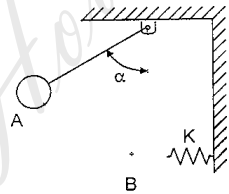

Fig : 3

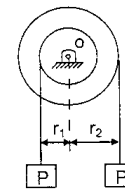

Fig : 4

8. a) Find the period for small amplitudes of rotation of the horizontal bar AB in Fig.5 about the vertical axis through its mid-point 'C'. Neglect the thickness of the bar.

b) A homogeneous square plate of wight 'W' and having dimensions 'a' hangs in a vertical plane by two pins 'A' and 'B' as shown in Fig.6. Calculate the horizontal and vertical components of the reaction at 'A' an instant after the pin at 'B' is removed.

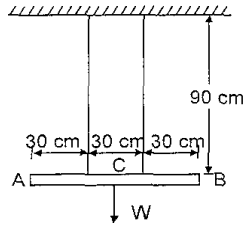

Fig : 5

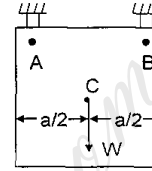

Fig : 6

I Year B.E./B.Tech Degree Examinations

STRENGTH OF MATERIALS & THEORY STRUCTURES-I

(Civil Engineering)

Time : Three hours **Maximum : 75 Marks**

Question 1 is compulsory
Answer any four from Questions 2 to 8
All questions carry equal marks
Assume any data if necessary

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1. a) For a material the values of E = 2.1 x 10^5 N/mm^2 and μ = 0.25 are given. Find the values of other Elastic constants G and K.

b) Find the maximum normal stress in a beam having a span of 10m and cross section 300 x 800mm is subjected to a central concentrated load of 40 KN. Beam is simply supported.

c) The stress at a point in a material are = 150 N/mm^2; = 110 N/mm^2; = 50 N/mm^2. Find the maximum normal stress at the point and their inclinations with respect to the plane on which the above stress are acting.

d) A cantilever having a span of 8m is subjected to a concentrated load of 30KN acting at 5m from fixed end. Determine the slope and deflection at free end in terms of EI.

e) Using castigriano's theirem *1* determine the displacem under the central concentrated load of W, acting on a simply. Supported beam having a span of *l* and modules of regidity E.I.

2. a) Determine the change in0 length of the bar shown in Eg.1 due to the loads. E = 2.1 x 10^5 N/mm^2. The diameters of the portions AB, BC, CD are 30, 25, 40mm.

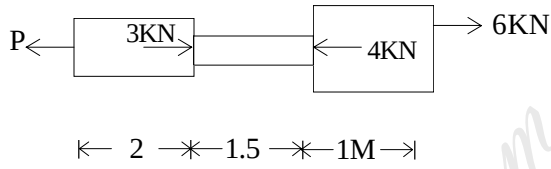

Fig.1

b) A rectangular block 300 x 50 x 20mm is acted on by the following axial forces i) 30 KN teusile along lenght, ii) 300 KN compressive along width and iii) 250k tensil along the direction of thickness.Findthe change in volume. E = 2.1 x 10^5 N/mm^2; = 0.25

3. a) Derive the equations for the stresses in composite bars having the same length and subjected to axial force.

b) A load of 2500 N is applied axially, on a composite copper. Steel imposite bar of length 4m and diameters the stress in each.

4. a) Draw the BMD and SFD stetches for a beam loaded as shown in Fig.2

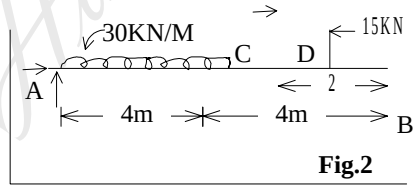

Fig.2

b) Sketch the shear stress distribution in an I section (Fig.3) subjected to flexural shear force of 50KN.

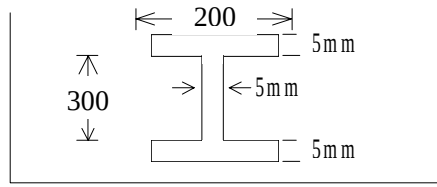

Fig.3

5. a) Describe Mohr's circle representation for finding stresses on inclined planes in a stressed body subjected to principal stresses.

b) Aaxial load of 60 KN. The mean radius of the spring 100mm. Find the maximum shear stress and deflection. $G = 0.8 \times 10^5$ N/mm^2.

6. a) Derive the formulate for stress and angle of twist in torsion of a bar and write down the assumptions made there in

b) A shaft of diameter 25mm and length 1.5 m is subjected to a twisting moment 100 KNM. If $G = 0.8 \times 10^5$ Find the maximum angle of twist and shear stress.

7. a) Determine the maximum displacement in a cantilever beam load as shown in terms of EI (Fig.4)

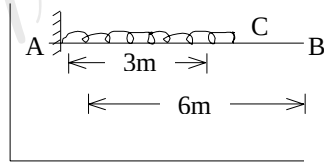

Fig.4

b) Detemine the forces in a truss loaded as shown in Fig.5 using Tension coefficient method.

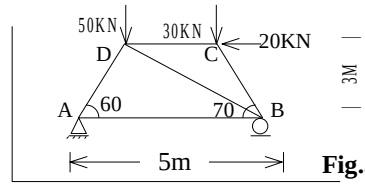

Fig.5

8. a) Determine the strain energy stored in a beam loaded as shwon in Fig.6 in terms of EI.

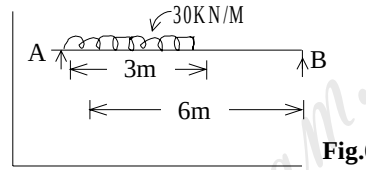

Fig.6

b) Using castigliano's theoren I, determine the displacement under the central concentrated load of 4.0 KN acting on a simply supported beam with a span of 8m interms of EI.

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