(3 Hours) [Total Marks : 100

N.B. : (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.
(3) Assume any **suitable** data wherever **required** and state the **same**.
(4) **Illustrate** answers with **neat sketches** wherever **required**.
(5) Use **legible** handwriting.

SE Civil, Sem - III, Building Const^{n}, May '07

1. (a) State **true** or **false** : 10
   (i) Pointing should be avoided as far as possible.
   (ii) King closer is the portion of a brick obtained by cutting a brick lengthwise into two portions.
   (iii) The window which is provided at the gable ends of a pitched roof is called as dormer window.
   (iv) In coastal regions where rainfall is heavy but temperature is more or less equal, flat roofs are considered suitable.
   (v) Wall footings, combined footings, pad footings, continuous footing are the types of open foundation.
   (vi) The operation of concreting carried out at a surrounding temperature more than 40°C is termed as Hot weather concreting.
   (vii) Traps are the fittings used to prevent the entry of foul sewer and drain gares into the houses.
   (viii) The temporary structure to confine and support the concrete till it gains sufficient strength for self supporting is known as shuttering.
   (ix) The vertical post placed at the top and bottom ends of flight supporting the hand rails are known as Baluster.
   (x) A damp building creates healthy living and working conditions for the occupants.
   (b) State advantages and disadvantages of precast concrete. 5
   (c) State disadvantages of load bearing structure when compared to framed structure. 5

2. (a) What are the principles of construction common to stone and brick masonry construction. 10
   (b) Explain various stages in concrete manufacturing. 10

3. (a) Discuss the classification of stone masonry. Explain briefly coursed random rubble and ashlar fine masonry. 10
   (b) Enlist various types of roof covering. Compare G. I. sheet with asbestos sheet as a roof covering material. 10

4. (a) Enumerates various methods of dewatering. Explain any one of them with the help of neat sketch. 10
   (b) Design and draw plan of a R.C.C. stair case to suit a staircase hall 2.3 × 4.8 m. Vertical distance between the floor is 3.0 m. 10

5. Draw only sketches for any **four** : 20
   (i) Any two types of painting
   (ii) Plan and Elevation of 1½ brick thick english bond
   (iii) Any two types of door
   (iv) Any two types of window
   (v) P, Q and S traps
   (vi) Parapet wall with coping and throating.

6. (a) Discuss the systems of ventilation. 10
   (b) Discuss briefly fire resisting properties of any five building materials. 10

7. Write short notes on any **four** : 20
   (i) Workability
   (ii) Placing concrete underwater
   (iii) Damp proofing
   (iv) Accoustical defects
   (v) Any two systems of plumbing
   (vi) Painting wood work.

Liabrary S.E. (Civil & construction) (III) (Rev.) 5/12/07

Building Construction

Con. 5153–07. (REVISED COURSE) CD–6618

(3 Hours) [Total Marks : 100

Dec' 07 MASTER

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.
(3) Assume **suitable** data if **required**.

1. (a) Differentiate between Load Bearing and framed structure. 20
(b) Importance of fly ash in concrete.
(c) Explain the term, plastering and pointing.
(d) What are the characteristics of good concrete ?

2. (a) Explain about single joist, Double Joist, and Triple Joist timber floor. 10
(b) Explain water cement ratio and Bulking of sand. 10

3. Draw neat sketches of the following :– 20
(a) Metal Windows
(b) Doglegged Stair Case
(c) Collapsible Door.

4. (a) Write short notes on : 10
(i) Isolated Footing
(ii) Shoring Dewatering.
(b) Discuss the procedure of laying marble flooring for room size 3·3 m × 5·8 m; using slabs of 1 m × 0·5 m size. 10

5. (a) Explain the following :– 10
(i) Roof drainage
(ii) Surface Preparation before plastering.
(b) Draw King post Roof Truss for span 5·5 m and compare with asbestos sheet and G-I sheet roof covering. 10

6. (a) Briefly discuss the five resisting capacity of various building materials like, Stone, Brick, Concrete, Steel and Timber. 10
(b) How will you ensure good quality of formwork and concrete for high rise structures ? 10

7. Write short notes on (any **four**) :– 20
(a) Air conditioning (b) False ceiling
(c) Sound Insulation (d) Damp proofing
(e) Placing concrete underwater (f) Workability.

(3 Hours) [Total Marks : 100

Note: (1) Q. No. 1 is **compulsory.**
(2) Solve any **four** questions from the remaining.
(3) Assume **suitable** data, if necessary & state it clearly.
(4) Draw **neat** sketches.

S.E. Civil, Sem-III, Fluid Mech. May'07

Q. No. 1 (a) (i) Explain Newtonian & non-Newtonian fluids with examples. 05
(ii) What do you understand by 'Total pressure' & 'Centre of pressure'? 05
(b) (i) A plate is moving over the another stationary plate with a velocity of 4.50 m/sec. the gap between the plate is of 0.65 mm and is filled with a oil of viscosity of 1.50 N.s/m^2. Find a shear stress on the top plate. 05
(ii) Find the intensity of pressure at a depth of 20 m. below the free surface of water in the storage reservoir. 05

Q. No. 2 (a) A cylinder 10 cm diameter rotates in an annular sleeve 10.25 cm internal diameter at 120 r.p.m. The cylinder is 25 cm long. If the dynamic viscosity of the lubricant between the cylinder and sleeve is 0.5 poise, find the torque needed to drive the cylinder against viscous resistance. 10
(b) A rectangular plate 1.20 m wide and 2.40 m deep lies within water such that its plane is inclined at 30^0 to the horizontal and top edge is 0.80 m below the water surface. Determine the total pressure force on one side of the plate and the location of the centre of pressure. 10

Q. No. 3 (a) A tank 1m. x 1m. in plan contains water up to a height of 4 m above the base. An immiscible liquid of specific gravity 0.82 is filled on top 2.50 m. depth. Calculate the pressure; (i) at a point 2 m. below the free surface.
(ii) at the interface of two liquids.
(iii) at 3 m. below the free surface. 10
(b) Explain with neat sketches; the principle of flotation and condition of equilibrium of a floating and submerged bodies. 10

Q. No. 4 (a) Define: velocity potential function (Ø), stream function (ψ), flow net, stream lines and equipotential lines. Show that equipotential lines and stream lines are orthogonal to each other. 12
(b) A 20 cm x 10 cm horizontal venturimeter carries 30 liters/sec of water. If coefficient of discharge of venturimeter is 0.98, find the reading of the differential mercury manometer. 08

Q. No. 5 (a) Water flows over a rectangular sharp crested weir 1.20 m long; the head over the sill of the weir is 0.50 m. The approach channel is 1.30 m. wide, and depth of flow in the channel is 1.10 m. Determine the discharge. Consider velocity of approach. Take coefficient of discharge for the weir as 0.62. 10
(b) Explain with neat sketches; (i) Borda's mouthpiece (ii) Rotameter 10

Q. No. 6 (a) An open cylindrical tank 1.25 m. in diameter and 2.50 m. high contains water up to 1.50 m. depth. If the cylinder rotates about its vertical axis, what maximum angular velocity can be attained without spilling any water and maximum speed of rotation of tank? 10
(b) Define; Mach number, Mach cone, Sonic, subsonic & supersonic velocity 10

Q. No. 7 Write short notes on: 20
(i) Hydraulic coefficients of orifice
(ii) Cippolletti weir
(iii) Bernoulli's equation
(iv) Free vortex and Forced vortex.

S.E. (Civil) III (Rev) Fluid Mechanics 31/1/08

Con. 5921–07. [REVISED COURSE] CD–6639

(3 Hours) [Total Marks : 100

Dec '07 Master

N.B. : (1) Question No. 1 is **compulsory**.
(2) Solve any **four** questions from the remaining **six** questions.
(3) Assume suitable data, if **necessary** and state it **clearly**.
(4) Draw neat **sketches**.

1. (a) Define the following terms :– 8
   (i) Gauge pressure
   (ii) Absolute pressure
   (iii) Viscosity
   (iv) Surface Tension.

   (b) State and prove Pascal's Law. 6

   (c) A square metal plate 1·8 m side and 1·8 mm thick weighing 60 N is to be lifted through a vertical gap of 30 mm of infinite extent. The oil in the gap has a specific gravity of 0·95 and viscosity 3 N·S /m^2. If the metal plate is to be lifted at a constant speed of 0·12 m/s, find the force and power required. 6

2. (a) How will you determine the metacentric height of a floating body experimentally ? Explain with neat sketches. 6

   (b) A block of wood of specific gravity 0·7, flots in water. Determine the metacentric height of the block if its size is 2m x 1m x 0·8m. 6

   (c) A circular plate 3·0m diameter is immersed in water in such a way that its greatest and least depth below the free surface are 4m and 1·5m respectively. Determine the total pressure on one face of the plate and position of the centre of pressure. 8

3. (a) Distinguish between Eulerian approach and Lagrangian approach of fluid flow analysis. 5

   (b) A horizontal venturimeter with inlet and throat diameters 300 mm and 100 mm respectively is used to measure the flow of water, the pressure intensity at inlet is 130 kN/m^2, while the vacuum pressure need at the throat is 350 mm of mercury. Assuming that 3% head is lost in between the inlet and throat, find – 8
   (i) Rate of flow
   (ii) Coefficient of discharge (Cd) for the venturimeter.

   (c) Sketch the streamlines represented by $4 = x^2 + y^2$. Also find out the velocity and its direction at point (1, 2). 7

[TURN OVER

Fluid Mechanics, Dec'07, Lg.2

4 (a) Derive an expression for the effect on discharge over a notch or a weir due to error in the measurement of head. 6

(b) An external convergent–divergent mouth-piece has 5 cm diameter at the section where the convergent and divergent portions meet. Water is discharged through the mouth-piece under a head of 3 m above its centre line. Determine the maximum discharge and the corresponding diameter at the outlet. The maximum vacuum head allowed is 8 m of water. 8

(c) A circular tank of diameter 1·25 m contains water upto a height of 5m. An orifice of 30 mm. diameter is provided at is bottom. Find the height of water above the orifice after 1·5 minutes. Take Cd = 0·62. 6

5. (a) Derive an expression for maximum discharge over a broad crested weir. 10

(b) Determine the discharge over a weir 44 m long divided into 10 equal bays by vertical posts. The width of each post is 80 cm. The head of water over the crest is 1·4 m and velocity of approach is 2 m/sec. 7

(c) Write a short note on Borda's mouth-piece. 3

6. (a) Explain with neat sketches the following terms :– 10
   (i) Source
   (ii) Sink
   (iii) Doublet
   (iv) Vortex flow.

(b) A source of strength $3m^3/s/m$ is placed at the origin and the other source of strength $5\ m^3/s/m$ is placed at (1, 0). Find the velocity components at point (2, 2). 10

7. Write short notes on :– 20
   (a) Micromanometer
   (b) Prandtl Pitot Tube
   (c) Circulation and Vorticity
   (d) Orificemeter.

VT May 07 41

SE (C) Sem III (R) C.M.T. May '07 Library 29.5.07

Con/2989–07. (REVISED COURSE) ND–410

Const Mat & Testing (3 Hours) [Total Marks : 100

MASTER

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.

1. (a) Classify the materials. Give requirements of building materials. **10**
   (b) Discuss desirable qualities of the following materials : **10**
   (i) Bricks
   (ii) Stone.

2. (a) Enlist various laboratory tests on cement. Describe various field tests to be conducted on cement. **10**
   (b) Describe water absorption test and compressive strength test on bricks. **10**

3. (a) Define 'seasoning of timber'. What are the objects of seasoning of timber ? Discuss any one method of artificial seasoning. **10**
   (b) Discuss in detail manufacturing process of tiles, from preparation of clay to finished product. **10**

4. (a) What is pre-cast concrete ? State its advantages and disadvantages. **10**
   (b) What is plastics ? Give its types. Write applications of plastics in construction industries. **10**

5. (a) List various roofing materials and flooring materials ? **10**
   (b) What is objects of painting or varnishing a surface ? Where will you prefer a paint to varnish and vice-versa. **10**

6. (a) What is glass ? Give its types and uses. **10**
   (b) Explain any three types of mortar. Write uses of asbestos. **10**

7. Write short notes on : (any **four**) – **20**
   (i) R. M. C.
   (ii) Grade of Cement
   (iii) Composite materials
   (iv) Preservation of timber
   (v) Non Ferrous products in construction.

****

Library S.E. (Civil) (Sem. III) (Rev.) 15/12/07

Construction Materials & Testing

Con/5135–07. (REVISED COURSE) CD–6630

(3 Hours) [Total Marks : 100

Dec'07 Master.

N.B. : (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.

1. (a) Enlist various laboratoy tests on cement. Explain in detail soundness test. 10
(b) Explain grades of cement and grades of concrete. 10

2. (a) Describe any two tests on bricks. 10
(b) Describe any two tests on stone. 10

3. (a) Explain any five defects in timber. 10
(b) What is precast concrete ? State advantages and disadvantages of precast concrete. 10

4. (a) Define seasoning of timber. What are the objects of seasoning of timber ? Describe any one method of artificial seasoning of timer. 10
(b) Explain any three types of mortar. Write any four uses of Asbestos. 10

5. (a) Discuss different types of paints and their utility in building construction. 10
(b) Describe in detail manufacturing process of bricks. 10

6. (a) What is plastic ? What are its types ? Write applications of plastics in construction industry. 10
(b) What is plywood ? Describe how it is manufactured. Where it is used with advantage ? 10

7. Write short notes on (any **four**) : 20
(a) R.M.C.
(b) Composite Material
(c) Water Proofing Materials
(d) Asbestos Cement Products
(e) Plaster of Paris.

****

S.E (Civil) III (Rev)
S.O.M., May '07

Civil

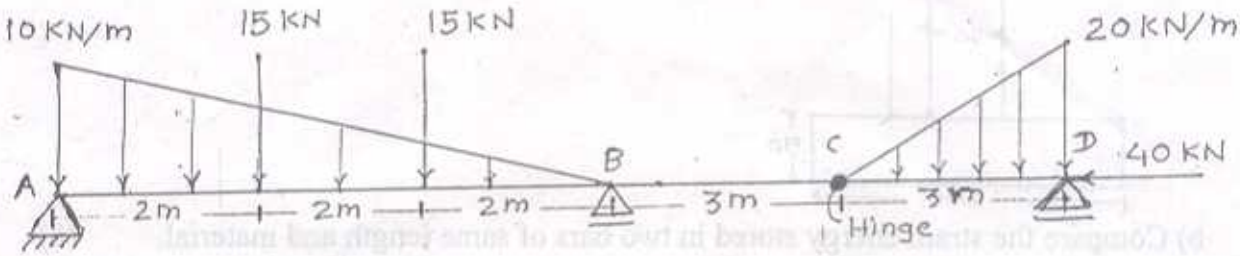
24/5/07

Con. 2868-07. [REVISED COURSE] ND–407

(3 Hours) [Total Marks : 100

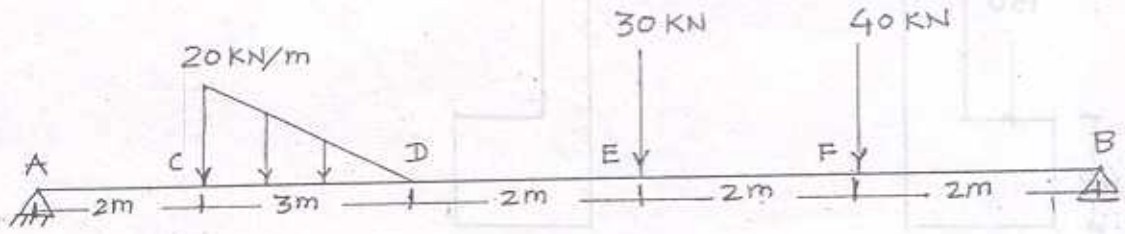
N.B. 1) Question No.1 is compulsory
2) Attempt any four questions from remaining six questions
3) Assume suitable data if required

1] Draw Shear force, Bending Moment and Axial force diagram for the given beam. (20)



2] 20mm diameter steel rod passes through steel tube of 30mm internal and 35mm external diameter. The tube is 1 m long and is closed by rigid washers of negligible thickness which are fastened by nuts threaded on the rod. The nuts are tightened until compressive load on the tube is 20 K.N.Calculate stresses in tube and rod. Also find increase these stresses one nut is tightened by one quarter of a turn relative to other. There are four threads per 10 mm.Take E = 200 KN/mm^2 (20)

3]. Determine slope at supports and maximum deflection for the given beam (20)



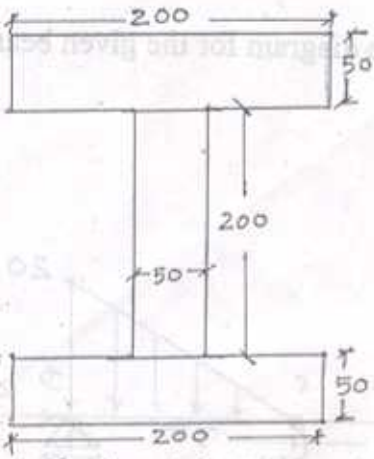
4] a) Discuss the assumptions of simple bending theory and their validity in practical applications (8)

b) At a point in elastic material, a direct tensile stress of 60 N/mm^2 and direct compressive stress of 40 N/mm^2 are applied on planes right angle to each other. If max. Principal stress is limited to 75 N/mm^2 (tensile),find the shear stress that may be allowed on the planes. Also determine max. Principal stress and max. Shear stress (12)

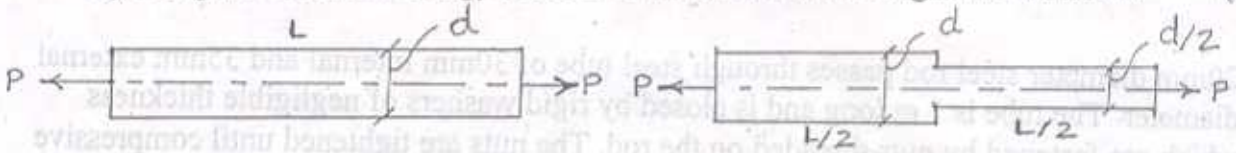
[TURN OVER

S.E. Civil, Sem. III
S.O.M. Pg. 2

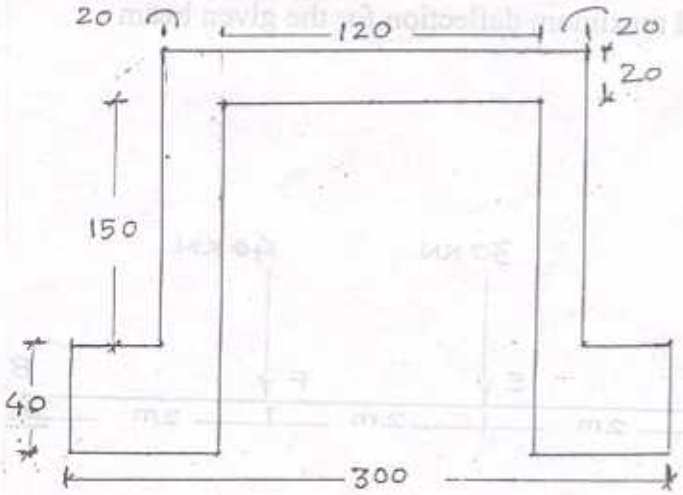
5] a) Three planks each of 50 mm X 200 mm are arranged to form an I –section. The section is subjected to shear force of 14 KN.Suggest alternative rectangular section of the same material so that same max. Shearing stress is produced due to same Shear force. The width of rectangular section shall be two third the depth. (12)



b) Compare the strain energy stored in two bars of same length and material. (8)



6] a) A cast iron beam has section as shown. Find
- Position of neutral axis
- M.I. about neutral axis
- B.M. and stress at top edge when tensile stress at bottom edge is 25 N/mm^2 (14)



b) Explain the flitch beam with it^5 advantage over regular wooden beam. (6)

7] a) A cylindrical shell 1 m long,180 cm internal diameter and 8 mm thick is filled with a fluid at atmospheric pressure. If an additional 20000 m^3 of fluid is pumped into the cylinder, find the pressure exerted by fluid on the wall of cylinder. Also find the hoop stress ibduced.Take E = 2X10^5 N/mm^2 and 1/m = 0.3 (12)

b) A solid shaft 100 mm in diameter transmits 120 KW at 200 r.p.m. Find the maximum intensity of shear stress induced and the angle of twist for a length of 6m.Take C = 8X10^4 N/mm^2 (8)

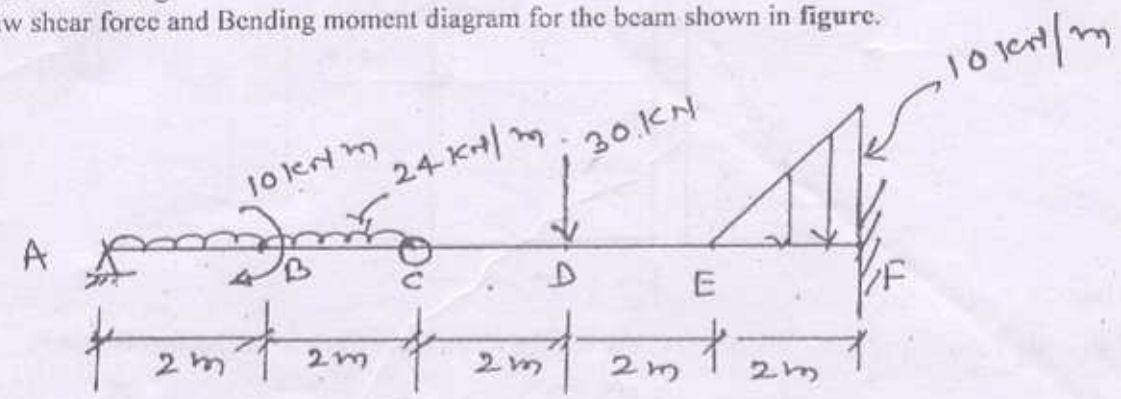
(3 Hours) [Total Marks : 100

B.E. Civil - IV, S.O.M, Dec 07, Ex. 1 MASTER

N.B. : (1) Question No. 1 is **compulsory.**
(2) Attempt any **four** questions from remaining **six** questions.
(3) Assume any **suitable data** if **required** and mention it **clearly.**

1: (a) Derive the relationship between shear force V and bending moment 'M' for a member subjected to transverse loading. 5

(b) Draw shear force and Bending moment diagram for the beam shown in **figure.** 15

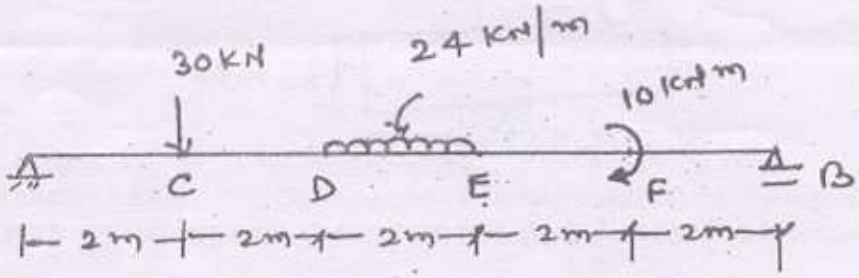


Note : C – internal hinge.

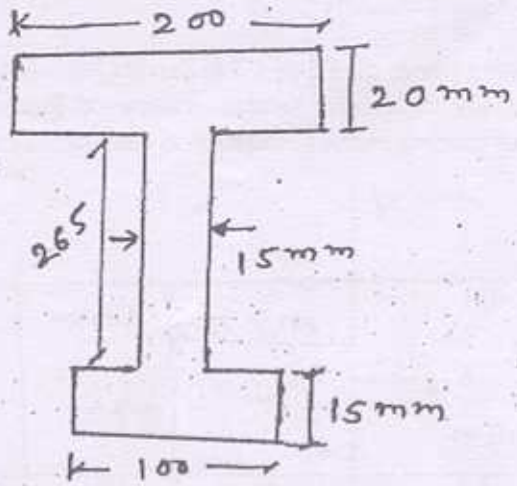
2. (a) Prove that— $\frac{f}{y} = \frac{M}{I} + \frac{E}{R}$ 5

where f – bending stress
I – moment of inertia
M – Moment of resistance

(b) Determine slope at supports A and B and deflection under point loads and maximum deflections. 15
Take E = 2 x 10^5 N/mm² I = 85 x 10^6 mm⁴ (By Maculay's method).



3. (a) A cast iron beam section is of I section as shown in **figure.** The beam is freely supported on a span of 5 m. If the tensile stress is not to exceed 20 N/mm². Find the safe uniformly distributed load which the beam can carry. Find also the maximum compressive stress. 10



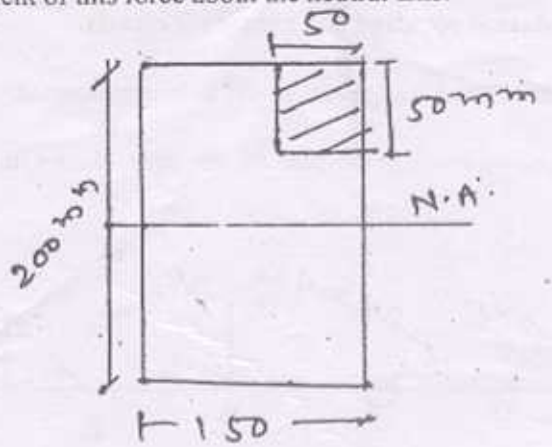
(b) A timber beam 200 mm wide and 400 mm deep is strengthed by a steel plate 200 mm wide and 10 mm thick connected to its lower face so that overall section is 200 x 410 mm. Determine the stresses in steel and timber when the beam section is subjected to a sagging moment of 50 kNm. Assume $E_s = 20\ E_t$. 7

SE. Civil - III, S.OM. Pg. 2

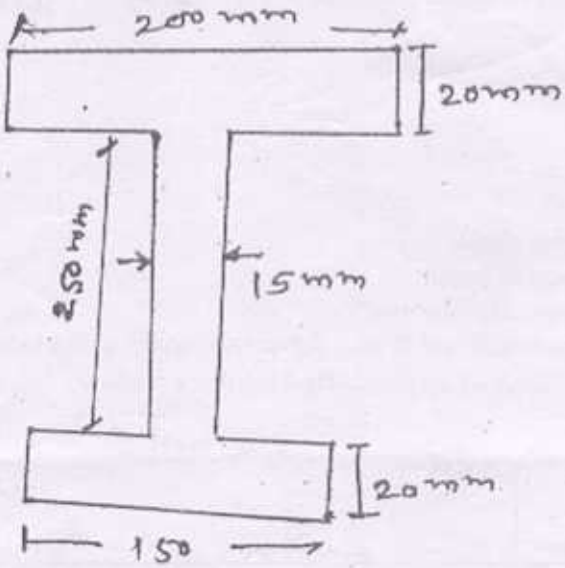
(c) **Figure** shows a rectangular beam section 150 mm wide and 200 mm deep. If the maximum flexural stress is 10 N/mm². 3

Find: (i) the total force on the area shaded.

(ii) and the moment of this force about the neutral axis.



4. (a) Plot the variation of shear stress across the section. The shear force at the section is 50 kN. 12



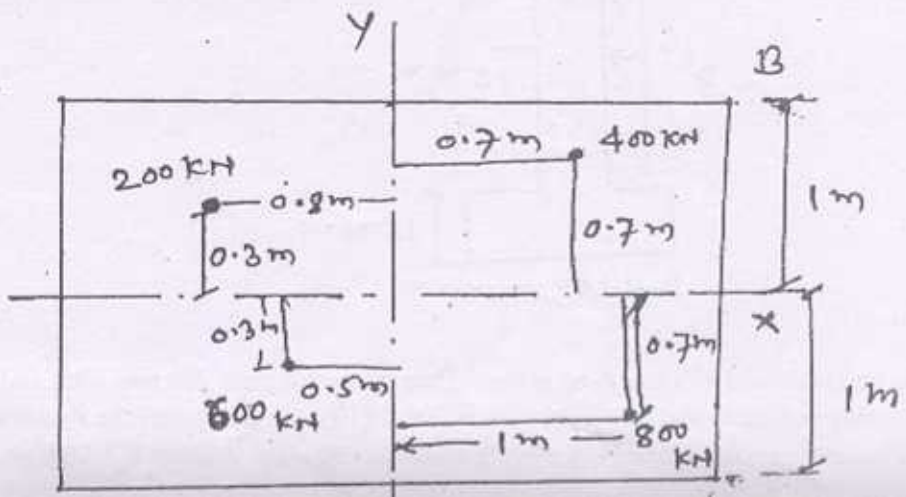
(b) A beam is triangular in section having a base b and an altitude h. It is placed with its base horizontal. If at a certain section of the beam the S.F. is V, find the max shear stress and the sheaf stress at the neutral axis. 8

5. (a) A shell 3·0 m long, 1 mt in diameter is subjected to an internal pre of 2 N/mm². If the thickness of the shell is 10 mm, find the circumferential and longitudinal stresses find also the max. shear stress and the changes in the dimensions of the shell. 10

Take E = 2 x 10^5 N/mm² and $\frac{1}{m} = 0{\cdot}25$.

(b) An R.C.C. footing rectangular in plan 2 m x 3 m carries four vertical concentrated loads of 200 kN, 400 kN, 600 kN and 800 kN. Which are located as shown in **figure**. 10

Calculate the intensity of loading on the foundation at each of the corners A, B, C and D.



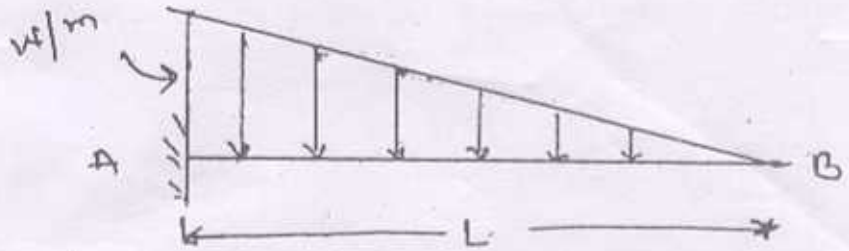
S.E. Civil III, S.O.M., Dec'07, Pg.3

6. (a) A solid shaft 8 metres long is securely fixed at each end. A torque of 100 Nm is applied to the shaft at a section 2·5 mt from one end, find the fixing torques set up at the ends of the shaft. If the shaft is 30 mm diameter find the max. shear stresses in the two portions. Find also the angle of twist for the section where the torque is applied. Take $C = 8{\cdot}4 \times 10^4$ N/mm². **10**

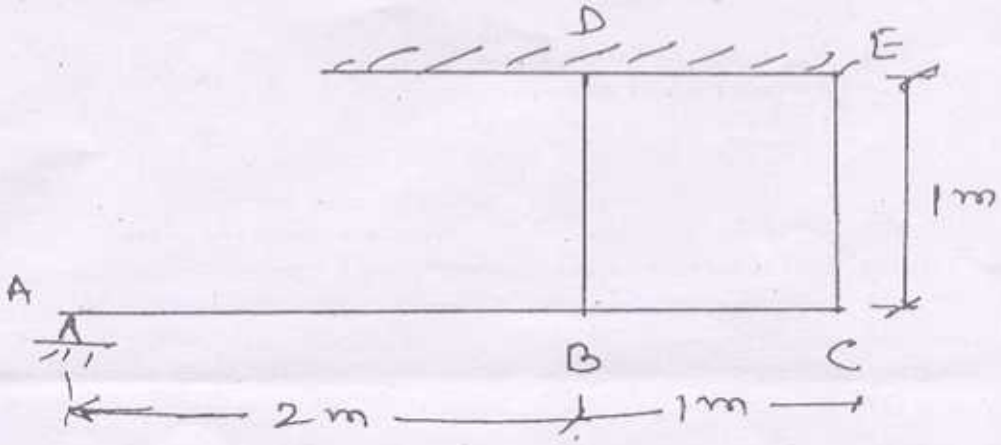
(b) Define strain energy write expression for strain energy stored due to— **4**

(i) axial loading (ii) due to Bending.

(c) Determine strain energy stored due to bending in cantilever beam as shown in **figure** in terms of EI. **6**



7. (a) **Figure** shows a rigid bar ABC hinged at A and suspended at two points B and C by two bars BD and CE made of aluminium and steel resp. The bar carries a load of 30 kN midway between B and C. The c/s area of Aluminium bar BD is 3 Sq. mm and that of steel bar CE is 2 Sq. mm. Determine the load taken by the two bars BD and CE. Take $E_{Al} = 7 \times 10^4$ N/mm² $E_s = 2 \times 10^5$ N/mm². **10**



(b) At a point in a strained material, the principal stresses are 100 N/mm² tensile and 50 N/mm² compressive. Determine the resultant stress in magnitude and direction on a plane inclined at 50° to the axis of the major principle stress. What is the maximum intensity of shear stress in the material at the point. **10**

———V———

(REVISED COURSE)

(3 Hours) [Total Marks : 100

MASTER

N.B. (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.
(3) Assume **suitable data**, wherever **necessary** and state them **clearly**.

S.E. Civil, Sem III (Rev.) Surveying-I, May '07

1. Write short notes on any **four** :— 20
   (a) Errors in chaining
   (b) Temporary adustments of dumpy level
   (c) Characteristics of contours
   (d) Planimeter and its uses
   (e) Methods of theodolite traversing.

2. (a) Define surveying. Explain along with its places of uses the basic classifications and types of surveying. 10
   (b) A river is flowing from west to east. For determining the width of the river two points A and B are selected on southern bank such that distance AB = 75 m. Point A is westwards. The bearing of a tree C on the northern bank are observed to be 38° and 338° respectively from A and B. Calculate the width of the river. 10

3. (a) Differentiate between prismatic and surveyors compass. 8
   (b) The following fore and back bearings were observed in traversing with a compass. Correct for local attraction. 12

Line	Fore Bearing	Back Bearing
AB	44° 30'	226° 30'
BC	124° 30'	303° 15'
CD	181° 00'	1° 00'
DA	289° 30'	108° 45'

4. (a) Define contour and explain the characteristics of contours giving suitable sketches. 8
   (b) The following reciprocal levels were taken with one level on two points A and B, 1645 mt apart. Calculate the true difference in elevation between A and B and the error due to refraction when the collimation error is – 0·003 mt per 100 mt. 12

Level Near	Staff Readings on	
	A	B
A	2·165	3·810
B	0·910	2·355

5. (a) Explain the following types of levelling : 8
   (i) Differential levelling (ii) Fly levelling.
   (b) The following consecutive readings were taken with a level and 4 mt staff on continuously sloping ground at a common interval of 20 mt. 12
   0·855 (on Q), 1·545, 2·335, 3·115, 3·825, 0·455, 1·380, 2·055, 2·855, 3·455, 0·585, 1·015, 1·850, 1·850, 2·755 and 3·845 (on R)
   Enter the readings as on a field books page, reduce the levels and apply the checks and determine the gradient of line Q. R.

6. (a) Define two point problem and explain how it can be solved on field. 8
   (b) The perpendicular offsets taken at 10 m intervals from a survey line to an irregular boundary are 2·25, 3·85, 4·50, 6·80, 5·20, 7·35, 8·90, 8·30 and 5·45 mt. Determine the area enclosed between the survey line, the irregular boundary, the first and last offsets by 12
   (i) Average-ordinate rule
   (ii) Trapezoidal Rule
   (iii) Simpson's Rule

7. (a) Enumerate the fundamental lines of transit theodolite and explain the temporary adjustments of a transit theodolite. 8
   (b) Calculate Lattitudes, departures and closing error for the following traverse and adjust using Bowditch Rule. 12

Line	Length	W.C.B
AB	89·31	45° 10'
BC	219·76	72° 05'
CD	151·18	161° 52'
DE	159·10	228° 43'
EA	232·26	399° 42'

N.B. : (1) Question No. 1 is **compulsory**.

(2) Attempt any **four** questions out of remaining **six** questions.

(3) Assume **suitable** data, wherever **necessary** and **state them clearly**.

Dec'07, Ex.1

1.a) Explain how the orientation of plane table is carried out. 04

b) Discuss the classifications of surveying based on 06

i) the function of survey, and

ii) instrument employed.

c) A line was measured with a steel tape which was exactly 30 m at 25^0 C 05 at a pull of 10 kg, the measured length being 1700m . The temperature during measurement was 34^0 C and the pull applied was 18 kg. compute the length of the line if the cross –sectional area of the tape is 0.025 cm^2 . take $\alpha = 3.5 \times 10^{-6}$ per 1^0C and $E = 2.1 \times 10^6$ kg/cm^2 for the materials of the tape.

d) Write a short note on Spire Test of theodolite. 05

2.a) What is magnetic declination ? What are different types of variation in declination? Discuss also the importance of isogonic lines. 08

b) The true bearing of a pole as observed from station P is $340^0 40'$ and magnetic bearing of pole is $353^0 20'$ .The magnetic bearing of line PQ is also observed to be $148^0 40'$. What is the true bearing of line PQ? 06

c) How would you chain a survey line if there is obstacle which obstruct both ranging and chaining . 06

3.a) Explain the Reciprocal Ranging, where it is suitable ? 05

b) Describe the procedure to execute chain survey in field. 05

c) Following are the observed magnetic bearings of the traverse legs: 10

Line	PQ	QR	RS	SP
F.B.	$124^0 30'$	$68^0 15'$	$310^0 30'$	$200^0 15'$
B.B.	$304^0 30'$	$246^0 00'$	$135^0 15'$	$17^0 45'$

At what stations local attraction is suspected? Determine the correct bearings of the Traverse legs and also calculate the included angles.

4.a) Describe briefly the various methods of levelling. 10

b) The following is the page of a level book. Fill the missing readings and calculate the reduced levels of all the points. Apply usual checks. 10

Point	B.S.	I.S.	F.S.	Rise	Fall	R.L.	Remarks
1	3.150					?	
2	1.770		?		0.700	?	
3		2.200			?	?	
4	?		1.850	?		?	
5		2.440			0.010	?	
6	?		?	1.100		?	
7	1.185		2.010	?		222.20	
8		1.735			?	?	
9	?		1.685	0.050		?	
10			1.525		0.805	?	
Sum	12.055						

[TURN OVER

SE Civil, Sem III, Surveying-I, Dec 07, Pg. 2

5. a) Discuss the advantages and disadvantages of plane tabling. 05

b) What is resection? Describe any two methods of resection. 05

c) Determine the area of zero circle from the following data: 10

i) Needle point outside the plan

Initial reading = 8.364, Final reading = 4.234

The zero of the dial passed the index mark once in the clockwise direction.

ii) Needle point inside the plan

Initial reading = 2.484, Final reading = 5.443

The zero of the dial passed the index mark twice in the counter clockwise Direction. Take M= 100 cm^2

6 a) what do you understand by 'Temporary Adjustments'? Describe in brief the various temporary adjustments of a theodolite. 04

b) Discuss the procedure of measuring a vertical angle using a theodilite. 04

c) Discuss the uses of contour maps. 04

d) A traverse ABCDA was run but due to an obstruction between the stations A and B , it was not possible to measure the length and direction of the line AB.the following data could only be obtained. 08

Line	Length (m)	R.B.
AD	44.5	N 50^0 20'E
DC	67.0	S $69^0$45'E
CB	61.3	S $30^0$10'E

Determine the length and directions of BA.

7 a) the following reciprocal levels were taken with one level: 12

Instrument At	Staff reading on		Remarks
	A	B	
A	1.564	2.787	AB=900 m
B	0.436	1.695	R.L. of A = 200.00m

Determine a) The true difference in elevation between A & B

b) The R.L. of B

c) the collimation error.

b) What do you understand by balancing of sights? How it helps in reducing the errors in leveling ? 08

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. 1 is **compulsory.**
(2) Attempt any **four** questions out of remaining **six** questions.
(3) **Figures** to the **right** indicate **full** marks.
(4) **Programmable** calculator is **not allowed.**

1. (a) Obtain C-R equation in Polar form. 20
(b) Show that every square matrix can be uniquely expressed as the sum of a Hermitian matrix and a Skew Hermitian matrix.
(c) Find half range Cosine Series for $f(x) = x, 0 < x < 2$.
(d) Find the inverse Laplace transform of $\log\left(1 + \frac{a^2}{s^2}\right)$.

2. (a) (i) If $L\left[\frac{1}{\sqrt{\pi t}}\right] = \frac{1}{\sqrt{s}}$, find $L\left[\sqrt{\frac{\pi}{t}}\right]$ 12
(ii) Find the Laplace transform of—
$\frac{\sin at}{t}$. Does Laplace transform of $\frac{\cos at}{t}$ exist ?
(iii) Find Laplace transform of $t^2 H(t-3)$.
(b) (i) Determine l, m, n and find A^{-1} if— 8

$$A = \begin{bmatrix} 0 & 2m & n \\ l & m & -n \\ l & -m & n \end{bmatrix}$$ is orthogonal.

(ii) For the matrix $A = \begin{bmatrix} 2 & 1 & 3 \\ 3 & 1 & 2 \\ 1 & 2 & 3 \end{bmatrix}$ verify that $A(\text{adj } A) = |A| I$.

3. (a) (i) Find the image of $|z - 2i| = 2$ under the transformation $w = 1/z$. 10
(ii) If $f(z) = u + iv$ is analytic and $u + v = e^x(\cos y + \sin y)$, find $f(z)$ in terms of z.
(b) (i) Find the Fourier expansion for $f(x) = \sqrt{1 - \cos x}$ in $(0, 2\pi)$. Hence deduce that $\frac{1}{2} = \sum_1^\infty \frac{1}{4n^2 - 1}$. 10
(ii) Obtain complex form of Fourier Series for $f(x) = e^{ax}$ in $(-\pi, \pi)$ where a is not an integer.

4. (a) Find the inverse Laplace transform of the following :— 12

(i) $\frac{s+1}{(s^2 + 2s + 2)^2}$ (ii) $\frac{e^{-\pi s}}{s^2 - 2s + 2}$ (iii) $\tan^{-1}\frac{2}{s^2}$.

(b) (i) Find the bilinear transformation which maps the points $z = \infty, i, 0$ onto the points $0, i, \infty$. 8
(ii) Find the orthogonal trajectories of the family of curves $e^{-x}\cos y + xy = \alpha$, where α is the real constant in the xy plane.

5. (a) (i) Find the non-singular matrices P and Q such that PAQ is in normal form. Also find the rank of 12

A and A^{-1}. $A = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$

(ii) Show that the following system of equations is consistent if a, b, c are in A.P.
$3x + 4y + 5z = a,\ 4x + 5y + 6z = b,\ 5x + 6y + 7z = c.$

(b) Find the Fourier Series for $f(x) = \begin{cases} \cos x & -\pi < x < 0 \\ \sin x & 0 < x < \pi \end{cases}$ 8

SE-Civil, Sem-III, Applied Maths-III
May-07, Pg-2

6. (a) (i) Solve the differential equation by using Laplace transform— 10

$$y + \int_0^t y\,dt = 1 - e^{-t}.$$

(ii) Find $L^{-1}\left[\frac{s}{(s^2+a^2)^2}\right]$ using convolution theorem.

(b) (i) Show that the set of functions $\sin(2n+1)x$, $n = 0, 1, 2, \ldots$ is orthogonal over $[0, \pi/2]$. Hence, construct orthonormal set of functions. 10

(ii) Find a half range Cosine series for $f(x) = \sin x$ in $0 \le x \le \pi$.

7. (a) (i) Show that the matrix— 10

$$A = \frac{1}{2}\begin{bmatrix} \sqrt{2} & -i\sqrt{2} & 0 \\ i\sqrt{2} & -\sqrt{2} & 0 \\ 0 & 0 & 2 \end{bmatrix}$$

is unitary and hence, find A^{-1}.

(ii) Find rank of matrix by reducing it to normal form.

$$\begin{bmatrix} 1 & -1 & -2 & -3 \\ 4 & 1 & 0 & 2 \\ 0 & 3 & 1 & 4 \\ 0 & 1 & 0 & 2 \end{bmatrix}$$

(b) (i) Show that the unit circle $|z| = 1$ in the z-plane is mapped onto the parabola $\frac{1}{\rho} = \frac{1}{2}(1 + \cos\phi)$ 10
in the w-plane under the transformation $(z+1)^2 = 4/w$.

(ii) If $f(z)$ is analytic function, prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$

———v———

Library S.E. (civil) sem III (Rev.), Dec'07 8/1/08

2nd-f-12-Dec-Nk-07-64

Applied Mathematics - III

Con. 5763-07. **CD-6645**

(REVISED COURSE)

(3 Hours) **[Total Marks : 100**

Master

N.B. (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions from the remaining **six** questions.
(3) If in doubt, make **suitable** assumption, **justify** your **assumption** and proceed.
(4) Non-programmable calculator is **allowed**.

1. (a) Find the Fourier Series of $f(x) = x, -\pi < x \leq 0$
$= 2x, 0 \leq x < \pi.$
which is assumed to be periodic with period 2π. 5

(b) Using C-R equation in polar form, prove that 5

$$\frac{\partial^2 u}{\partial r^2} + \frac{1}{r}\frac{\partial u}{\partial r} + \frac{1}{r^2}\frac{\partial^2 u}{\partial \theta^2} = 0.$$

(c) Use Laplace transform to find α, 5

$$\text{If } \int_0^\infty e^{-2t} \sin(t+\alpha)\cos(t-\alpha)\,dt = \frac{3}{8}.$$

(d) Show that 5

$$A = \frac{1}{2}\begin{bmatrix} \sqrt{2} & -i\sqrt{2} & 0 \\ i\sqrt{2} & -\sqrt{2} & 0 \\ 0 & 0 & 2 \end{bmatrix}$$ is Unitary. Also write A^{-1}.

2. (a) If $J_0(t) = \int_0^\pi \cos(t\sin\theta)\,d\theta$. 6

Then show that $L\{J_0(t)\} = \frac{1}{\sqrt{s^2+1}}$

(b) Find (i) $L\{\cosh^4 t\}$ 6

(ii) $L\left\{\frac{\sin t \sin 5t}{t}\right\}$

(c) Determine non-singular matrices P and Q. Such that PAQ is in the normal form. 8

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 4 & 3 \\ 3 & 0 & 5 & -10 \end{bmatrix}$$

Also find its rank.

3. (a) Find the analytic function $f(z) = u + iv$ such that— 6

$$u - v = \frac{\cos x + \sin x - e^{-y}}{2\cos x - e^{y} - e^{-y}} \quad \text{when } f(\pi/2) = 0$$

(b) Show that the transformation $w = \frac{2z+3}{z-4}$ maps the circle $x^2 + y^2 - 4x = 0$ into the st. 6
line $4u + 3 = 0$.

(c) Obtain the Fourier Series expansion of $f(x) = x \sin x$ in $(-\pi, \pi)$ hence deduce that 8

$$\frac{\pi-2}{4} = \frac{1}{1\cdot3} - \frac{1}{3\cdot5} + \frac{1}{5\cdot7} - \frac{1}{7\cdot9} + \ldots\ldots$$

4. (a) Show that $u = e^{-2xy} \sin(x^2 - y^2)$ is a harmonic function. Find its harmonic conjugate and corresponding analytic function. 6

(b) Obtain the Fourier Cosine Series of $f(x) = \sin x$ in the interval $0 < x < \pi$. 6

(c) Solve the following equation by using Laplace transform method. 8

$$\frac{dy}{dt} + 2y + \int_0^t y\,dt = \sin t$$

with $y(0) = 1$.

5. (a) Determine the values of λ for which the simultaneous equations 6

$$\begin{aligned} 3x + y - \lambda z &= 0 \\ 4x - 2y - 3z &= 0 \\ 2\lambda x + 4y + \lambda z &= 0 \end{aligned}$$

may possess non-trivial solutions also solve completely for each value of λ.

(b) Using row transformations, find the inverse of the matrix. 6

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

(c) Find the half range sine series for $f(x) = \frac{\pi}{4}$ in $(0, \pi)$. 8

Hence show that— (1) $\frac{\pi}{4}\left(\frac{\pi}{2} - x\right) = \frac{1}{1^2}\cos x + \frac{1}{3^2}\cos 3x + \ldots\ldots$

(2) $\frac{\pi}{8} x (\pi - x) = \frac{1}{1^3}\sin x + \frac{1}{3^2}\sin 3x + \ldots\ldots$

6. (a) Obtain the complex form of Fourier series for $f(x) = e^{ax}$ in $(-\pi, \pi)$ where a is not an integer. 6

(b) Find the bilinear transformation under which 1, i, – 1 from z-plane are mapped onto 0, 1, ∞ of w- plane. Show that under this transformation the unit circle in the w-plane is mapped onto a st. line in z-plane. 6

(c) Find— (1) $L^{-1}\left\{\frac{1}{s^3 + 1}\right\}$ 8

(2) $L^{-1}\left\{\frac{s}{s^4 + s^2 + 1}\right\}$

7. (a) State convolution theorem and use it to find— 6

$$L^{-1}\left\{\frac{1}{(s^2 + 4)(s + 1)^2}\right\}.$$

(b) Find the rank of matrix by reducing it to normal form— 6

$$A = \begin{bmatrix} 2 & -4 & 3 & 1 & 0 \\ 1 & -2 & 1 & -4 & 2 \\ 0 & 1 & -1 & 3 & 1 \\ 4 & -7 & 4 & -4 & 5 \end{bmatrix}$$

S.E(Civil) Sem-III (old)
Applied Maths-III
16/06/07
3T06

530-E : 1stHf07

Con. 3339-07. (OLD COURSE) ND-1258

(3 Hours) [Total Marks : 100

N.B. (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** out of remaining **six** questions.
(3) **Figures** to the **right** indicate **full** marks.

1. (a) Find Laplace transform of $e^{4t}\sin^3 t$. 5
(b) Find adjoint of the matrix 5

$$A = \begin{bmatrix} -1 & -2 & -2 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}. \text{ Prove that adj } A = 3\bar{A}.$$

(c) Prove that $f_1(x) = 1$, $f_2(x) = x$, $f_3(x) = \frac{3x^2 - 1}{2}$ are orthogonal. 5
(d) Find the orthogonal trajectory of the family of the curves $x^3y - xy^3 = c$. 5

2. (a) Using Convolution theorem evaluate — 8

$$L^{-1}\left\{ \frac{(s+2)^2}{(s^2+4s+8)^2} \right\}.$$

(b) Find P if $f(z) = r^2\cos 2\theta + ir^2 \sin p\theta$ is analytic. 6
(c) Find Fourier series of $f(x) = x^2 \quad 0 < x < 2\pi$. 6

3. (a) Find l, m, n and find A^{-1} if $A = \begin{bmatrix} 0 & 2m & n \\ l & m & -n \\ l & -m & n \end{bmatrix}$ is orthogonal. 8
(b) Find half range cosine series for $f(x) = e^x \quad 0 < x < 1$. 6
(c) Find the image of $|z - 2i| = 2$ under the transformation $w = \frac{1}{z}$. 6

4. (a) Find two non-singular matrices P and Q so that PAQ is in normal form where — 8

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 4 & 3 \\ 3 & 0 & 5 & -10 \end{bmatrix}.$$

Also find its rank.
(b) Find bilinear transformation which maps points $z = 1, i, -1$ to $w = i, 0, -i$. 6
(c) Obtain complex form of Fourier series for $f(x) = e^{-x}$ in $-1 < x < 1$. 6

5. (a) Using Laplace transform solve $(D^2 + 3D + 2)y = 2(t^2 + t + 1)$ with $y(0) = 2$ and $y'(0) = 0$. 8
(b) If $v = 3x^2y + 6xy - y^3$. Show that v is harmonic and find the corresponding analytic function. 6
(c) Verify (adj A)' = (adj A') for the matrix — 6

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

[TURN OVER

6. (a) Find Fourier series for the Periodic function — 8

$f(x) = -\pi \quad -\pi < x < 0$

$= x \quad 0 < x < \pi$

State the value of f(x) at x = 0 and hence deduce that —

$$\sum_{n=1}^{\infty} \frac{1}{(2n-1)^2} = \frac{\pi^2}{8}.$$

(b) Test the consistency and solve — 6

$x + y + z = 6,\ x - y + 2z = 5,\ 3x + y + z = 8,\ 2x - 2y + 3z = 7.$

(c) Find Laplace transforms of $t^2 \sin a\,t$. 6

7. (a) If $A = \begin{bmatrix} 1 & 2 & 1 \\ 1 & 2 & 3 \\ 1 & 4 & 9 \end{bmatrix}$ $B = \begin{bmatrix} 2 & 5 & 3 \\ 3 & 1 & 2 \\ 1 & 2 & 1 \end{bmatrix}$ 8

Show that $(AB)^{-1} = B^{-1}A^{-1}$.

(b) Prove that 6

$$\int_0^{\infty} \frac{e^{-t} \sin^2 t}{t}\, dt = \frac{1}{4} \log 5.$$

(c) If $u = \dfrac{\sin 2x}{\cosh 2y + \cos 2x}$ Find f(z). 6