

END TERM EXAMINATION

THIRD SEMESTER [B.TECH.] DECEMBER 2015

Paper Code: ETCE-203

Subject: Strength of Material

Time: 3 Hours

Maximum Marks: 75

Note: Attempt any five questions including Q. no. 1 which is compulsory.
Scientific calculator is allowed.

- Q1 Attempt all of the following:- (2.5×10=25)
- The young's modulus of elasticity of a material is twice its modulus of rigidity. Find the Poisson's ratio of the material.
 - What do you mean by principal plane and principal stress?
 - A prismatic bar of volume V is subjected to a tensile force in longitudinal direction. If Poisson's ratio of the material is μ and longitudinal strain is e , find the final volume of the bar.
 - What is pure bending? Give two examples of pure bending.
 - Find the ratio of width to depth of a strongest beam that can be cut out of a cylindrical log of wood.
 - A beam of square section with side 100mm is placed with one diagonal horizontal. Find the maximum shear stress if shear force acting on the section is 12kN.
 - What is middle third rule? For no tension criteria find the expression for core of a solid circular section.
 - Explain Castigliano's first theorem.
 - A solid circular shaft of steel is 50mm in diameter. Find the power transmitted at 120 r.p.m if the permissible shear stress is 60 MPa.
 - What are the limitations of Euler's formula
- Q2 Two vertical rods, one of steel and other of copper, are each rigidly fastened at the upper end 600 mm apart. Each rod is 3.0 m long and 100mm² in cross-sectional area. A horizontal cross bar connects the lower end of rods and on it is placed a load of 100 KN so that the cross bar remains horizontal. Find the position of load on cross bar and estimate the stress in each rod. $E_{\text{steel}} = 210 \text{ GPa}$ and $E_{\text{copper}} = 120 \text{ GPa}$. (12.5)
- Q3 A simply supported beam of span L is loaded with a triangular load with intensity zero at one end and w per unit length at the other end. Draw S.F.D. and B.M.D indicating the principal values. (12.5)
- Q4 A simply supported beam of span L is loaded with u.d.l. of intensity w over the whole span. Using conjugate beam method, calculate slopes at the ends and central deflection. (12.5)
- Q5 Compare the ratio of strength of a solid steel column to that of a hollow of the same cross-sectional area. The internal diameter of hollow column is 75% of external diameter. The columns have the same length and are hinged at the ends. (12.5)
- Q6 Compare the flexural strength of the following three beams of equal weight:- (12.5)
- I-section 30cm x 15cm having 2cm thick flange and 1.25 cm thick web.
 - Rectangular section having depth equal to twice the depth.
 - Solid circular section.
- Q7 A square chimney 25m high, having an opening of 1m x 1m is subjected to a horizontal wind pressure of 1.50 KN/m². Find the necessary thickness at the base of chimney which is of brickwork. Unit weight of brick masonry is 19 KN/m³ and the maximum permissible stress on brick masonry is limited to 0.80 MPa. (12.5)
- Q8
- Explain the concept of Mohr's Circle for determining stresses and strain. (6.5)
 - Explain why do we need a failure theory. Explain in detail the concept of any one Failure theory. (6)

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH.] DECEMBER-2015

Paper Code: ETCE-205

Subject: Fluid Mechanics.

Time: 3 Hours

Five

Maximum Marks: 75

Note: Attempt any questions including Q.No1 which is compulsory.

- Q1 Attempt **any five** questions:- (5x5=25)
- What is viscosity? What is the unit of viscosity in MKS & SI system?
 - Define (i) Steady and unsteady flow.
(ii) Rotational and irrotational flow.
 - What are the assumptions and limitations of Moment of Momentum equation?
 - Explain Buckingham's Π theorem.
 - What is the engineering significance of Dimensionless numbers?
 - What are the applications of Bernoulli's equation?
 - What are the different types of motion? Explain vorticity.
- Q2 (a) What are thermodynamic properties of fluid? (4)
(b) A masonry dam 10 m high and 4 m wide, has water level with its top. Find
(a) The total pressure on 1 m length of dam. (b) depth of center of pressure
(c) the point at which resultant cuts the base. Density of masonry wall is 2000 kg/m³. (8.5)
- Q3 Velocity of a two dimensional flow is given by the equation

$$\vec{U} = (1 + 4xy + 2t^2) \mathbf{i} + (4x^2y + 7t) \mathbf{j}$$
 Determine the velocity, convective acceleration, local acceleration and total acceleration at a position say P(2, 3 cm) after 4 seconds. (12.5)
- Q4 In a two dimensional flow in x-y plane $\psi = 3xy$ Prove that flow is irrotational. Also determine the corresponding velocity potential. (12.5)
- Q5 (a) Write down the Euler's equation for 3-D, inviscid flow. (2.5)
(b) Rate of flow of water through a Francis turbine is 0.75 m³/sec. Inlet and outlet pressures at A & B are 175 kN/m² and -50 kN/m². Determine the power delivered to the turbine by water. Neglect losses in turbine. (10)

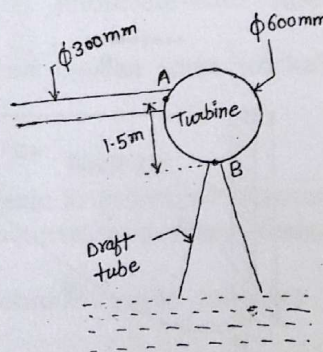


Fig 51

- Q6 An airplane wing 1 m chord moves through still air at 20 °C at 180 Km/hr. A 1:15 scale model of this wing placed in wind tunnel with air blowing at 75 m/s at the same temperature as that in the flight. What should be the pressure in the tunnel? (12.5)
- Q7 Show by Dimensional analysis that power developed by a hydraulic turbine is given by

$$P = \rho N^3 D^5 f\left(\frac{N^2 D^2}{gH}\right)$$

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P/h

Where ρ is the mass density of fluid,
N is speed of runner rotation in rpm
D is diameter of runner
H is working head
g is gravitational acceleration.

(12.5)

Q8

A fire brigade man is holding a fire stream nozzle of 5 cm dia. The jet issues out with a velocity of 13 m/sec and strikes the window. Find the angle or angles of inclination with which the jet issues from the nozzle. What will be the amount of water falling on the window? (12.5)

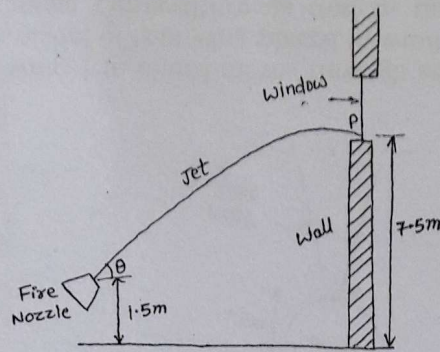


fig 8.1

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(Please write your Exam Roll No.)

Exam Roll No. 05125603414

END TERM EXAMINATION

THIRD SEMESTER [B.TECH] DECEMBER 2015-JANUARY 2016

Paper Code: ETCE-207

Subject: Building Materials & Construction

Time: 3 Hours

Maximum Marks: 75

Note: Attempt any five questions including Q.no.1 which is compulsory.
Select one question from each unit.

Q1 Write short notes on the following:

(2.5x10=25)

- (a) Polymer concrete.
- (b) Composition of cement.
- (c) Hollow block.
- (d) Admixtures.
- (e) Damp proofing.
- (f) Define Surkhi and flyash in brief.
- (g) Distinguish between escalator and ordinary stair.
- (h) Distinguish between flush doors and Louvered doors.
- (i) Explain air conditioning and its capacity estimation.
- (j) Describe the properties of Driers.

Unit-I

- Q2 (a) Explain the properties of Timber in brief. (6)
(b) Write a detailed note on sound proofing and also discuss the materials used in sound proofing. (6.5)

- Q3 (a) Discuss the composition of paint in brief. (4)
(b) Discuss the properties of Bitumen, Tar and Asphalt in detail. (8.5)

Unit-II

- Q4 (a) Discuss the batching of concrete by weight & volume in brief. (6.5)
(b) What do you understand by Compacting factor? Describe the test procedure to determine this factor. (6)

- Q5 (a) Discuss Ferro-cement & shotcrete-steel fiber reinforced concrete in detail. (6)
(b) What do you understand by the term workability? Discuss the major factors. (6.5)

Unit-III

- Q6 (a) What do you mean by term foundation? Discuss in detail. (6)
(b) Define the pitched roofs construction and their components in brief. (6.5)
- Q7 (a) Discuss the various characteristic features of Green Building & its construction detail. (6.5)
(b) Distinguish between bearing wall, partition wall and cavity walls. (6)

Unit-IV

- Q8 (a) Discuss with sketches various kinds of doors & windows. (8.5)
(b) Write a note on different types of flat roofs and add sketches to illustrate their constructions. (4)
- Q9 (a) Explain Fire? Classify various types of fire resistant materials & their use in constructions. (6.5)
(b) What do you mean by arches? Classify various types of arches in detail. (6)

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH] DECEMBER 2015

Paper Code: ETCE-209

Subject: Surveying

Time: 3 Hours

Maximum Marks: 75

Note: Attempt any five questions including Q. no. 1 which is compulsory.

Q1 Answer the following:-

- What are different sources of error in chain surveying? Explain with one example of each. (3)
- What do you understand by degree of accuracy? Discuss various methods of expressing degree of accuracy. (3)
- Explain different methods of chaining on sloping ground? Discuss the advantages of each method? (3)
- The true bearing of a tower as observed from a station A is $350^\circ 30'$ and the magnetic bearing of the tower is $2^\circ 30'$. The back bearing of the line AB when measured with same prismatic compass was found to be $330^\circ 30'$. What is the true bearing of line AB? (3)
- What are the effects of curvature of the earth and refraction on the accuracy of leveling? Derive an expression for the corrections due to both the effects. (3)
- Find the distance to the visible horizon from the top of a light house 50m high. What is the dip of horizon? Take radius of the earth equal to 6370km. (3)
- The line of sight is not perpendicular to the horizontal axis in a vernier transit theodolite. How can you adjust it? (3)
- Derive the relationship $\delta = 1718.9C/R$; where δ is the tangential angle of the chord of length C and R is the radius of the curve. (3)
- What is a satellite station? How would you reduce the horizontal angles? (3)

Q2 (a) Determine the correct length of a line reduced to the mean sea level when the recorded length with a tape hanging in centenary at a tension of 85N and at a temperature of 25°C is 30.073m. The difference between the ends is 0.42m and the site is 2000m above sea level. The tape had been previously standardized in centenary at a tension of 50N and at a temperature of 28°C , and the distance between zeros was 30.037m. Weight of tape = 7N; cross sectional areas = 3.9mm^2 ; Coefficient of expansion = $1.15 \times 10^{-5}\text{per}^\circ\text{C}$; Young's modulus = 200Gpa; Radius of earth = 6370km. (5)

(b) Below are the bearings observed in a traverse survey conducted with a prismatic compass at a place where local attraction was suspected?

Line	FB	BB
PQ	$124^\circ 30'$	$304^\circ 30'$
QR	$68^\circ 15'$	$246^\circ 00'$
RS	$310^\circ 30'$	$135^\circ 15'$
SP	$200^\circ 15'$	$17^\circ 45'$

At what stations do you suspect local attraction? Find the corrected bearings of the lines and also calculate the included angles. (7)

Q3 (a) A distance of 2000m was measured by a 30m chain. Late on it was detected that the chain was 0.1m too long. Another 500m (i.e. total 2500m) was measured and it was detected that the chain was 0.15m too long. If the length of the chain in the initial stage was correct, determine the exact length that was measured. (5)

(b) The following consecutive readings were taken with a dumpy level and a 4m leveling staff on continuously sloping ground at 30m intervals.
0.680, 1.455, 1.855, 2.330, 2.885, 3.380, 1.055, 1.860, 2.265, 3.540, 0.835, 0.945, 1.530, 2.250.

The R.L. of the starting point was 85.750m.

- Rule out a page of level book and enter the above readings.
- Determine the gradient of line joining the first and last point.

(7)
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- Q4 (a) Discuss the procedure of testing of a vernier transit theodolite for checking the permanent adjustments and making the adjustments, if necessary. (7)
 (b) Discuss the characteristics of contours. Give suitable examples. What are the advantages of direct contouring over indirect contouring? (5)
- Q5 (a) What is orientation? What are different methods of orientation of a plane table? Discuss the trial and error method for solution of three point problem. (5)
 (b) With a tacheometer stationed at P, sights were taken on three points A, B and C as follows:

Ins. Stn.	To	Vertical angle	Stadia readings	Remarks
P	A	$-4^{\circ} 45'$	2.405, 2.705, 3.005	R.L. of A = 107.08m; staff held normal
	B	$00^{\circ} 00'$	0.765, 1.070, 1.375	R.L. of B = 113.41m; staff held vertical
	C	$+2^{\circ} 45'$	0.720, 1.700, 2.680	Staff held normal

The instrument was fitted with an anallatic lens; the constant of instrument is 100. Calculate the distance of A, B and C from P. Also find vertical intercept of A, B and C from trunion axis. (7)

- Q6 (a) Describe the method of setting out curve by linear method (Perpendicular offsets from tangent). (5)
 (b) Two straight T_1V and VT_2 are intersected by a third line AB. The angles VAB and VBA are measured to be $27^{\circ} 45'$ and $35^{\circ} 55'$, and the distance AB = 358m. Calculate the radius of the simple circular curve which will be tangential to the three lines T_1A , AB and BT_2 and the chainages of point of curve, and point of tangency if the chainage of V = 6854.5m. (7)
- Q7 (a) Enumerate and derive the expressions for various elements of a reverse curve with help of a neat sketch. (5)
 (b) Calculate the chainages at the beginning and at the end of a broad gauge railway track when it deflects through an angle of 30° with a centre line radius of 300m. Also set out a transition curve using a unit chord of 10m. Take, $\alpha = 0.3\text{m/sec}^3$; $V = 60\text{km/hr}$ and chainage of intersection point is 1400.00m. (7)
- Q8 (a) An observer standing on the deck of a ship just sees the top of a light house which is 50m above the sea level. If the height of observer's eye is 6m above the sea level, determine the distance of the observer from the light house. (5)
 (b) From an eccentric station S, 13.25meters to the west of the main station, the following angles were measured:
 $\angle BSC = 76^{\circ} 32' 30''$; $\angle CSA = 54^{\circ} 25' 20''$
 The stations S and C are to the opposite sides of the line AB. Calculate the correct angle ABC if lengths AB and BC are 5280.5m and 4930.2m respectively. (7)

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH] DECEMBER 2015-JANUARY 2016

Paper Code: ETCE-211

Subject: Engineering Geology

Time: 3 Hours

Maximum Marks: 75

Note: Attempt any five questions including Q.no.1 which is compulsory.
Select one question from each Unit.

- Q1 Answer **any five** from the following: (5x5=25)
- (a) Write in detail about the structure of the earth and its composition with a neat diagram.
 - (b) Define dip and strike.
 - (c) Give an account of the various properties and function of an aquifer.
 - (d) What are the types of land slide? Briefly explain its preventive measures.
 - (e) Define the following:
 - (i) Spheroidal weathering.
 - (ii) Use of stereoscope.
 - (f) Write short notes on engineering significance of joints.

Unit-I

- Q2 Briefly explain the various physical properties which help in identification of minerals. (12.5)
- Q3 (a) Briefly explain the soil profile of residual soil. (4.5)
(b) Explain the physical properties of Mica group of minerals. (8)

Unit-II

- Q4 Describe fault structures with neat sketches and also write their engineering significance with suitable example. (12.5)
- Q5 What is a fold? Describe various type of fold structure with neat sketches and also write their engineering significance. (12.5)

Unit-III

- Q6 (a) Give a brief description of Seismic zone of India. (6)
(b) Define following term:
 - (i) L-wave (ii) P-wave (iii) Artesian aquifer(6.5)
- Q7 (a) Explain the investigation to be carried out in ground water exploration. (6)
(b) Briefly explain the cause and effects of earthquake. (6.5)

Unit-IV

- Q8 What are the Geological Consideration necessary in the selection of a Dam Site? Briefly explain the geological Causes for the Failure of Dams. (12.5)
- Q9 (a) What are the various geological factors to be considered for the construction of tunnels? Explain with suitable example. (6.5)
(b) What are the various geological factors to be considered for the construction of Highway? (6)

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH.] DECEMBER 2015

Paper Code: ETMA203

Subject: Numerical Analysis &
Statistical Techniques

Time : 3 Hours

Maximum Marks : 75

Note: Attempt any five questions including Q.no.1 which is compulsory.
Select one question from each unit. Scientific calculator is allowed.

- Q1 (a) Two dice are tossed once. Find the probability of getting an even number on first die or a total of 8. (4)
- (b) A coin is tossed 600 times and the head turned up 290 times. Test the hypothesis that the coin is unbiased. (4)
- (c) Find the mean and variance of the Binomial distribution $B\left(4, \frac{1}{3}\right)$. (3)
- (d) Prove that the total area under the normal probability curve is unity. (5)
- (e) Prove that $\mu^2 \equiv 1 + \frac{1}{4}\sigma^2$. (4)
- ✓ Evaluate $\int_0^1 \frac{dx}{1+x}$ using Simpson's One-Third rule with $h=0.25$. (5)

UNIT-I

- Q2 (a) Find the expectation and variance of the random variable X whose p.d.f. is given by $f(x) = \begin{cases} 2e^{-2x} & , x > 0 \\ 0 & , \text{otherwise} \end{cases}$. (6)

- (b) Fit a curve $y=ab^x$ from the following data: (6.5)

x	2	3	4	5	6
y	144	172.8	207.4	248.8	298.6

- Q3 (a) In a large group of men, 5% are under 60 inches in height and 40% are between 60 and 65 inches. Assuming a normal distribution, find the mean height and standard deviation. (6)
- (b) Fit a Poisson distribution to the following data and test the hypothesis that the data follow a Poisson distribution: (6.5)

x	0	1	2	3	4
y	109	65	22	3	1

UNIT-II

- Q4 (a) In a partially destroyed laboratory record of an analysis data, the following results are only legible: Variance of $X=9$, Regression equations: $8X - 10Y + 66 = 0$, $40X - 18Y = 214$. What were (i) the mean values of X and Y (ii) the correlation coefficients between X and Y and (iii) the standard deviation of Y? (6.5)

- (b) Two independent samples of sizes 7 and 9 have the following values:

Sample A	10	12	10	13	14	11	10		
Sample B	10	13	12	15	10	14	11	12	11

Test whether the difference between the means is significant. (6)

- Q5 (a) Discuss F-Test. (2.5)

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- (b) The following table gives the number of units of production per day turned out by four different types of machines:

Employee	Types of Machines			
	M ₁	M ₂	M ₃	M ₄
E ₁	40	36	45	30
E ₂	38	42	50	41
E ₃	36	30	48	35
E ₄	46	47	52	44

Using analysis of variance (i) test the hypothesis that the mean production is the same for the four machines and (ii) test the hypothesis that the employees do not differ with respect to mean productivity. (10)

UNIT-III

- Q6 (a) Using Newton-Raphson method, find the root of the equation $3x - \cos x = 1$. (6)

- (b) From the steam table we have the following data:

Temp in °C	140	150	160	170	180
Pressure in kg/m ³	3.685	4.854	6.303	8.076	10.225

Find the pressure at 142°C and 175°C. (6.5)

- Q7 (a) Determine $f(x)$ and $f(-2)$ from the following data: (6)

x	-4	-1	0	2	5
f	1245	33	5	9	1335

- (b) Solve the following system of simultaneous linear equations using Gauss-Seidal method upto four iterations: $9x + 4y + z = -17$, $x - 2y - 6z = 14$, $x + 6y = 4$. (6.5)

UNIT-IV

- Q8 (a) From the following data, find the maximum or minimum value of y : (6)

x	0.60	0.65	0.70	0.75
y	0.6221	0.6155	0.6138	0.6170

- (b) Evaluate $y(0.4)$ using Modified Euler's method from $y'' - y = e^x$, $y(0) = 0$ taking $h = 0.2$. (6.5)

- Q9 (a) A rocket is launched from the ground. Its acceleration f is noticed for first 80 seconds as given:

t	0	10	20	30	40	50	60	70	80
f	30	31.63	33.34	35.47	37.75	40.33	43.25	46.69	50.67

Estimate the velocity of the rocket at $t = 80$ sec. using Simpson's Three-Eighth rule. (6)

- (b) Using Runge-Kutta method of order 4, solve $\frac{dy}{dx} = \ln(x + y)$, $y(0) = 2$ for $x = 0.2$ in two steps. (6.5)

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