

Register Number :

Name of the Candidate :

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B.E. DEGREE EXAMINATION, 2018

(CIVIL / CIVIL AND STRUCTURAL / MECHANICAL / MANUFACTURING / CHEMICAL ENGINEERING)

(FOURTH SEMESTER)

CLEC-401 / CSEC-401 / CHEC-401 / MEEC-401 / MFEC-401.

ENGINEERING MATHEMATICS - III / IV

PROBABILITY AND STATISTICS

November]

[Time : 3 Hours

Maximum : 75 Marks

Answer any ONE FULL question from each unit.

Use of statistical Table is permitted.

ALL questions carry EQUAL Marks.

- UNIT - I

- 1 (a) A random variable X has the following probability distribution :

Values of X = x :	0	1	2	3	4	5	6	7	8
P(x) :	a	3a	5a	7a	9a	11a	13a	15a	17a

(i) Determine a . (ii) Find $P(0 < x < 5)$

(iii) What is the smallest value of x for which $P(X \leq x) > 0.5$?

(iv) Find the distribution function of X.

(8)

- (b) The cumulative distribution function of a random variable x is

$$F(x) = 1 - (1 + x) e^{-x}, \quad x > 0.$$

Find the probability density of X. Also, find the mean and variance.

(7)

(OR)

2. (a) Find the moment generating function of the distribution whose probability density function is

$$f(x) = 2e^{-x}, \quad x \geq 0. \\ = 0, \quad x < 0.$$

Also, find the mean and variance.

(8)

(b) For the probability function of the random variable (x, y) is given by

$$f(x, y) = \frac{x(1+3y^2)}{4}, \quad 0 < x < 2, 0 < y < 1$$

$$= 0, \quad \text{otherwise.}$$

Find :

(i) Marginal density function of x and y . (ii) Conditional density of x given y .

(iii) $P\left(\frac{1}{4} < x < \frac{1}{2} / y = \frac{1}{3}\right)$. (7)

UNIT - II

3 The probability distribution of the process $\{x(t)\}$ is given by

$$P(x(t) = n) = \frac{(at)^{n-1}}{(1+at)^{n+1}}, \quad n = 1, 2, \dots$$

$$= \frac{at}{1+at}, \quad n = 0.$$

Show that $\{x(t)\}$ is not stationary. (15)

(OR)

4. (a) Find the mean and variance of a stationary random process whose auto correlation function is given by

$$R_{xx}(\tau) = \frac{25\tau^2 + 36}{6 \cdot 25\tau^2 + 4} \quad (8)$$

(b) Write short notes on :

(i) Classification of random processes.

(ii) Auto correlation function. (4 + 3)

UNIT - III

5 (a) Explain :

(i) Parameters nad statistic. (ii) Tests of correlation function. (4 + 3)

(b) The mean height of the samples of 1000 and 2000 members are respectively 67.5 and 68 inches. Can they be regarded as drawn from the same population with standard deviation 2.5 inches ? (8)

(OR)

6. Two random samples drawn from normal populations are

Sample - I	20	16	26	27	23	22	18	24	19	--	--
Sample - II	27	33	42	35	32	34	38	28	43	30	37

Obtain estimates of variances of the populations and test whether the two populations have same variance.

(Given $F_{0.05}$ for (11, 9) d.o.f. is 3.28)

(15)

UNIT - IV

7. A company appoints four salesmen A, B, C and D and observes their sales in three seasons. Summer, winter and monsoon. The figures (in lakhs of ₹) are given in the following table :

		Salesmen			
		A	B	C	D
Season	Summer	45	40	38	37
	Winter	43	41	45	38
	Monsson	39	39	41	41

Carry out an analysis of variance.

(15)

(OR)

8. An agriculture experiment on the Latin square design gave the following results for the yield of wheat per acre, the letters corresponding to varieties, columns to treatments and rows to blocks. Discuss the variation of yield with each of these factors.

(15)

A16	B10	C11	D9	E9
E10	C9	A14	B12	D11
B15	D8	E8	C10	A18
D12	E6	B13	A13	C12
C13	A11	D10	E7	B14

UNIT - V

9. Write short notes on :

(a) Harzard rate and mean time to failure.

(b) Exponential system reliability.

(c) Series system.

(5 + 5 + 5)

(OR)

10. Calculate the system reliability for the units as shown in figure - 1 below :

(15)

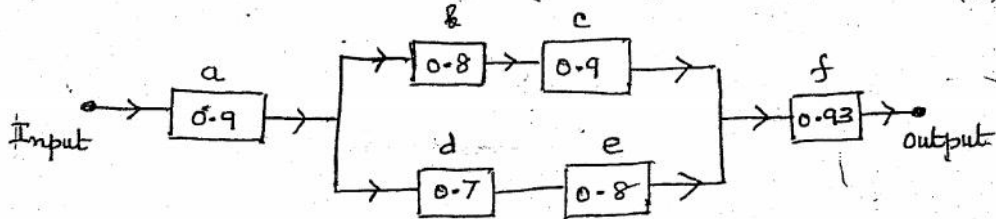


Figure -1

Register Number :

Name of the Candidate :

3699

B.E. DEGREE EXAMINATION, 2018

(COMMON TO CIVIL / CIVIL AND STRUCTURAL / MECHANICAL / MANUFACTURING /
ELECTRICAL AND ELECTRONICS / ELECTRONICS AND INSTRUMENTATION /
ELECTRONICS AND COMMUNICATION ENGINEERING)

(FOURTH SEMESTER)

01BS-401 / 02BS-401 / 03BS-401 / 04BS-401 / 05BS-401 / 06BS-401 / 10BS-401

PROBABILITY, RANDOM PROCESSES AND NUMERICAL METHODS

November]

[Time: 3 Hours

Maximum: 75 Marks

Answer any ONE FULL question from each unit.

Statistical Tables are permitted.

All questions carry EQUAL Marks.

UNIT - I

1. (a) The amount of bread (in hundreds of kgs) that a certain bakery is able to sell in a day is a random variable X with a *pdf* given by

$$f(x) = \begin{cases} Ax & \text{if } 0 \leq x < 5, \\ A(10-x), & 5 \leq x < 10 \\ 0, & \text{otherwise} \end{cases}$$

(i) Find the value of A .

(ii) Find the probability that in a day the sales is more than 500 kgs.

(iii) Less than 500 kgs. (iv) Between 250 and 750 kgs.

(v) Find $P [x > 5 / 2.5 \leq x < 7.5]$ (8)

- (b) Find the moment generating function of the random variable X whose probability function

is $P(x) = \frac{1}{2^x}$, $x = 1, 2, 3, \dots$. Hence find its mean and variance. (7)

2. Given the joint *pdf* of (x, y) as

$$f(x, y) = \begin{cases} 8xy, & 0 < x < y < 1 \\ 0, & \text{otherwise.} \end{cases}$$

Find the marginal and conditional probability functions of x and y . Are x and y independent? (15)

UNIT - II

- 3 Consider the random process $x(t) = A \cos(\omega t + \theta)$. Show that it is wide sense stationary if A and ω are constants and θ is uniformly distributed random variable in $(0, 2\pi)$ (15)

(OR)

- 4 (a) Given a stationary random process $x(t) = 10 \cos(100t + \theta)$ where $\theta \in (-\pi, \pi)$ followed uniform distribution. Find the autocorrelation function of the process. (8)

- (b) If $x(t) = 5 \sin(\omega t + \theta)$ and $y(t) = 2 \cos(\omega t + \theta)$ where ω is a constant, $\theta + \phi = \frac{\pi}{2}$ and ϕ is a random variable uniformly distributed in $(0, 2\pi)$, find $\Re_{xy}(\tau)$. (7)

UNIT - III

- 5 (a) A random samples of sizes 400 and 500 have mean 10.9 and 11.5 respectively. Can the samples be regarded as drawn from the same population with variance 25? (8)

- (b) A random sample of 10 boys has the following IQ's

70, 120, 110, 101, 88, 83, 95, 98, 107, 100.

Do these datas support the assumption of a population mean IQ of 100?

(Given $t_{0.05}$ for 9 d.o.f is 2.26)

(7)

(OR)

- 6 (a) The lives of 12 cars manufactured by two companies A and B are given below in years:

A:	14	15	18	12	17	19	21	19	16	12	11
B:	21	18	14	22	19	20	16	16	13	20	14

Which company will you choose to purchase? Give reasons.

($t_{0.05}$ for 22 d.o.f is 1.717)

(8)

- (b) A set of 5 identical coins is tossed 320 times and the number of heads appearing each time is recorded:

Number of heads:	0	1	2	3	4	5
Frequency :	14	45	80	112	61	8

Test whether the coins are unbiased at 5 % level of significance.

(Given $\chi^2_{0.05}$ for 5 d.o.f is 11.07)

(7)

UNIT-IV

- 7 (a) The population of a town in the census is given below. Estimate the population in the given year 1895 and 1925. (8)

Year X :	1891	1901	1911	1921	1931
Population (in 1000's)	46	66	81	93	101

- (b) Find the first two derivatives $[x]^{1/3}$ of at $x = 50$ and $x = 56$ given the table below : (7)

x	50	51	52	53	54	55	56
$y = x^{1/3}$	3.6840	3.7084	3.7325	3.7563	3.7798	3.8030	3.8259

(OR)

8. (a) From the following table, using Stirling's formula, estimate the value of $\tan 16^\circ$

x	0°	5°	10°	15°	20°	25°	30°
$y = \tan x$:	0.0	0.0875	0.1763	0.2679	0.3640	0.4663	0.5774

(8)

- (b) Compute the value of $\int_1^2 \frac{dx}{x}$ using Simpson's rule and Trapezoidal rule.

Take $h = 0.25$

(7)

UNIT-V

- 9 (a) Find the positive root $x^3 - x = 1$ correct to four decimal places by bisection method. (8)
 (b) Find the positive root of $f(x) = 2x^3 - 3x - 6 = 0$ by Newton-Raphson method. (7)

(OR)

10. Using Rung-Kutta method of fourth order, solve

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

given $y(0) = 1$ at $x = 0.2, 0.4$.

(15)

B.E. DEGREE EXAMINATION, 2018

(CIVIL ENGINEERING)

(FOURTH SEMESTER)

CLEC-402/PCLEC-102: SURVEYING-I

(Common with Part Time)

November]

[Time: 3 Hours

Maximum: 75 Marks

Answer One Full Question from each Unit. (5 × 15 = 75)

UNIT - I

1. Explain the principles of surveying? With a simple sketch state the construction and use of a cross staff. (15)
(OR)
2. a) Explain the different method of ranging with neat sketch. (7)
b) What are the accessories for a chain survey? Explain the functions of each. (8)

UNIT - II

3. Explain the different types of compass with neat sketch. (15)
(OR)

4. The following are the magnetic bearings of a closed traverse ABCD carried out in an area under the influence of local attraction. Find the correct magnetic bearings, if the magnetic declination for the area is $1^{\circ}45'E$, find also the true bearings.

Line	Magnetic bearing	
	FB	FB
AB	$21^{\circ}14'$	$202^{\circ}30'$
BC	$138^{\circ}20'$	$318^{\circ}20'$
CD	$202^{\circ}18'$	$23^{\circ}23'$
DA	$293^{\circ}41'$	$111^{\circ}20'$

(15)

UNIT - III

5. Explain intersection method of plane table surveying. (15)
(OR)
6. a) Describe briefly the use of various accessories of a plane table. (8)
b) What are the advantages and disadvantages of plane table surveying over other methods? (7)

UNIT - IV

7. Explain the different types of levels and staves with neat sketches. (15)
(OR)
8. a) Mention the differences between height of collimation method and rise and fall method. (7)
b) Record the following observation in the form of a levelling field book and obtain the reduced level of the each point. Give the necessary checks.
Reading on inverted staff on point A whose reduced level is $52.345 = 3.565$
Reading on staff on point B natural ground = 0.855 (8)

UNIT - V

9. Explain the different between tangential and stadia tachometry. How will you determine the stadia constants? (15)
(OR)
10. A staff was held vertically at distance of 45m and 120m from the centre of a theodolite fitted with stadia hairs and the staff intercepts with the telescope horizontal were 0.447m and 1.193m respectively. The instrument was then set over a station P of R.L 500.25m and the height of the instrument was 1.45m. The hair readings on a staff held vertically at station Q were 1.20, 1.93 and 2.66m while the vertical angle was $-9^{\circ}30'$. Find the distance PQ and the RL of Q. (15)

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Register Number:

3703

Name of the Candidate:

**B.E. DEGREE EXAMINATION, 2018**

(CIVIL ENGINEERING)

(FOURTH SEMESTER)

**01ES-402/02ES-402. SOLID MECHANICS**

(Common with Structural Engineering)

November]

[Time : 3 Hours

Maximum : 75 Marks

Answer any ONE FULL question from each unit

Assume suitable data if found necessary

**UNIT - I**

1. A steel tube of 30mm external diameter and 20mm internal diameter encloses a copper rod of 15mm diameter to which it is rigidly joined at each end. If at a temperature of  $10^{\circ}\text{C}$  there is no longitudinal stress, calculate the stresses in the rod and tube when the temperature is raised to  $200^{\circ}\text{C}$ , Take E for steel and copper as  $2.1 \times 10^5 \text{ MPa}$  and  $1.5 \times 10^5 \text{ MPa}$ , value of coefficient of linear expansion for steel and copper is given as  $11 \times 10^{-6}/^{\circ}\text{C}$  and  $16 \times 10^{-6}/^{\circ}\text{C}$ .
2. At a certain point in a strained material, the intensities of stresses on two planes at right angles to each other are 20MPa and 10MPa both tensile. They are accompanied by a shear stress of magnitude 15MPa. Find and locate the principal planes and evaluate principal stresses.

**UNIT - II**

3. Calculate and Plot SFD and BMD for the beam shown in fig.1

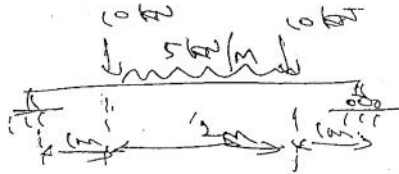


Fig-1

4. An I section beam 300mm  $\times$  150mm has a web thickness of 10mm and a flange thickness of 20mm, if the shear force acting on the section is 50kN, find the maximum shear stress developed in the section.

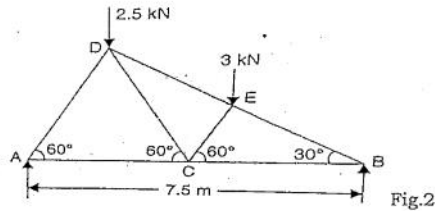
**UNIT - III**

5. A beam of uniform rectangular section 200mm wide and 350mm deep is simply supported at its ends. It carries a udl of 10kN/m over the entire span of 5m. if the value of E for the beam material is  $1 \times 10^4 \text{ MPa}$ , find the slope at supports and maximum deflection.
6. Determine the diameter of solid shaft which will transmit 90kW at 180 r.p.m. Also determine the length of the shaft if the twist must not exceed  $1^{\circ}$  over the entire length. The maximum shear stress is limited to  $60 \text{ N/mm}^2$ . Take the value of modulus of rigidity as  $8 \times 10^4 \text{ N/mm}^2$ .



UNIT - IV

7. A truss of span 7.5m is loaded as shown in fig-2, find the reactions and forces in the member of truss.



8. A truss is shown in fig.3. Find the forces in all the members of the truss and indicate the nature of force.

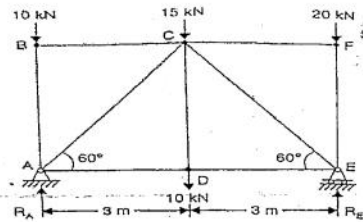


Fig-3

UNIT - V

9. A 1.5m long column has a circular cross section of 5cm diameter. One of the ends of the column is fixed in direction and position and other end is free. Taking factor of safety as 2.5, calculate the safe load using
- Rankine's formulas take  $\sigma_c = 580\text{N/mm}^2$ ,  $\alpha = 1/1600$
  - Euler's formula, Young's modulus =  $1.2 \times 10^5 \text{N/mm}^2$
10. A steel tube of 250mm external diameter is to be shrunk on another steel tube of 80mm internal diameter. After shrinking, the diameter at junction is 160mm, before shrinking on the difference in diameters at the junction was 0.08mm. Calculate the radial pressure at the junction and hoop stresses developed in the two tubes after shrinking.

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Register Number:

3748

Name of the Candidate:

**B.E. DEGREE EXAMINATION, 2018**

(CIVIL ENGINEERING)

(FOURTH SEMESTER)

**CLEC-403.MECHANICS OF SOLIDS-II**

November]

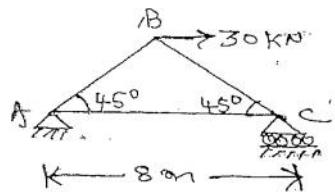
[Time : 3 Hours

Maximum : 75 Marks

Answer any ONE FULL question from each unit

**UNIT - I**

1. Find the horizontal and vertical displacement of joint B in the pin jointed frame shown in fig.



2. Find the maximum deflection due to point load applied at the free end of a elastic cantilever beam of a rectangular cross section considering flexural and shearing deformations

**UNIT - II**

3. Locate the shear centre of the channel section which has flanges of 40cm × 5cm with web 40cm × 5cm.
4. A steel plate of width 50mm and of thickness 8mm is bent into a circular arc of radius 10m. Determine the maximum stresses induced and the bending moment which will produce the maximum stress. Assume  $E = 2 \times 10^5 \text{N/mm}^2$ .

**UNIT - III**

5. Derive the expression to find the buckling load of a long column fixed at both ends.
6. Derive the expression to find the buckling load of column hinged at both ends.

**UNIT - IV**

7. A pipe of 400mm internal diameter and 100 mm thickness contains a fluid a pressure of 10N/mm<sup>2</sup>. Find the maximum and minimum hoop stress across the section. Also sketch the radial pressure distribution and hoop stress distribution.
8. Write short notes on: i) Compound cylinders and ii) Lames theory

**UNIT - V**

9. A propped cantilever beam of 10m length carries an UDL of 10kN/m for a distance of 5m from the fixed end. Calculate the reactions at the prop.
10. A continuous beam of ABC carries a UDL of 40kN/m run on AB and BC. The support B sinks by 5mm below A and C, the value of EI is constant. Take E as 200GPa,  $I = 300 \times 10^6 \text{mm}^4$ . Draw the shear force and bending moment diagram. AB=5m and BC=5m.

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Register Number:

3750

Name of the Candidate:

**B.E. DEGREE EXAMINATION, 2018**

(CIVIL ENGINEERING)

(FOURTH SEMESTER)

**CLEC-405. ESTIMATION AND VALUATION**

November]

Maximum : 75 Marks

[Time : 3 Hours

*Answer any ONE FULL question from each unit*

**UNIT-I**

1. a) Explain any two methods of estimating in detail. (9)
- b) Distinguish between the detailed estimate and approximate estimate. (6)
2. Prepare the preliminary estimate for a building with a total plinth area of 2000sq.m given the following details.
  - i) Plinth area a rate :Rs 800 per sq.m .
  - ii) Specific architectural design :2% of building cost
  - iii) Water supply and sanitary :5% of the building cost
  - iv) Electrical installation :20% of the building cost
  - v) Services :5% of the building cost
  - vi) Contingencies :3% of the building cost
  - vii) Supervision :10% of the building cost

**UNIT-II**

3. Explain the rate analysis for plastering 12 mm thick.
4. Explain the rate analysis for 1 m cube of RCC in 1:2:4.

**UNIT-III**

5. Explain the various types of specifications and explain any one in detail.
6. Write down the detailed specification for road work.

**UNIT-IV**

7. Discuss the tender documents and tender procedures.
8. Explain the different types of contracts in detail.

**UNIT-V**

9. How the fixation of rent for a building is done, explain.
  10. Explain the basic principles of valuation in detail.
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Register Number:

**3701**

Name of the Candidate:

**B.E. DEGREE EXAMINATION, 2018**

(CIVIL ENGINEERING)

(FOURTH SEMESTER)

**01PC-405. APPLIED HYDRAULIC ENGINEERING**

(COMMON WITH CIVIL AND STRUCTURAL ENGINEERING)

November]

[Time : 3 Hours

Maximum : 75 Marks

*Answer any ONE FULL question from each unit*

**UNIT-I**

1. Derive the geometrical properties of a most economical triangular channel section.
2. A most economical trapezoidal section is required to given a maximum discharge of  $20\text{m}^3/\text{sec}$  of water. The slope of the channel bottom is 1 in 1500. Taking  $C=70$ , in Chezy's equation, determine the dimensions of the Channel.

**UNIT-II**

3. Define Surges. What are its types? How the energy dissipated? Explain in detail.
4. Derive the dynamic equation of gradually varied flow. Write the assumptions made in it.

**UNIT-III**

5. Explain the methods of dimensional analysis in detail.
6. Write the short notes on: Reynolds number, Froude, Euler, Mach and Weber numbers.

**UNIT-IV**

7. Explain in details about pelton turbine as its design, classification, principle and its working procedure with neat sketch.
8. Kaplan turbine runner is to be designed to develop 9100Kw. The net available head is 5.6m. If the speed ratio=2.09, flow ratio=0.65, overall efficiency 86% and the diameter of boss is  $1/3$  the diameter of the runner. Find the diameter of the runner, its speed and specific speed of turbine.

**UNIT-V**

9. Explain the different efficiency of a centrifugal pump. And the specific speed of pump.
  10. A single acting reciprocating pump discharges 4.5 liters per second with cylinder bore diameter 200mm, and its stroke length 300mm. The pump runs at 350 rpm and lift water through a height of 25m. The delivery pipe is 30m long and 100mm in diameter. Find the theoretical discharge and the theoretical power required to run the pump also determine the percentage slip.
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Register Number:

**3751**

Name of the Candidate:

**B.E. DEGREE EXAMINATION, 2018**

(CIVIL ENGINEERING)

(FOURTH SEMESTER)

**CLEC-406. TRANSPORTATION ENGINEERING-I**

November]

[Time : 3 Hours

Maximum : 75 Marks

*Answer any ONE FULL question from each unit*

**UNIT-I**

1. Explain the various classifications of urban roads in detail.
2. a) Explain the highway economics in detail. (8)  
b) Explain the various sight distances. (7)

**UNIT-II**

3. Discuss the construction of water bound macadam roads with neat sketch.
4. Explain the highway materials and any one test done for aggregates.

**UNIT-III**

5. a) Explain the importance of traffic engineering under Indian conditions. (9)  
b) Write briefly about design of a vehicle and its types. (6)
6. List the different types of traffic signs and explain any three signs with neat sketches.

**UNIT-IV**

7. a) Discuss the merits and demerits of public transport systems in detail. (8)  
b) Explain the paths are designed for pedestrians. (7)
8. Explain the various types of pollution due to heavy traffic in a town.

**UNIT-V**

9. Explain the various facilities provided in a airport terminal building.
  10. Explain with sketch, how you will use wind rose diagram to determine the optimum runway orientation.
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