

Register Number:

Name of the Candidate:

0205

**B.E. DEGREE EXAMINATION, 2019**  
**(CIVIL ENGINEERING)**  
**(FOURTH SEMESTER)**  
**01BS-401: PROBABILITY, RANDOM, PROCESSES AND**  
**NUMERICAL METHODS**  
**(Common for all batches)**  
**(New Regulations)**

April / May]

[Time : 3 Hours

Maximum : 75 Marks

**Answer any ONE FULL question from each unit (5×15=75)**

**UNIT - I**

1. a) A discrete random variable  $X$  has the following probability (10)  
distribution:

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

- (i) Find the value of  $a$   
(ii) Find  $P(X < 3)$ ,  $P(X \geq 3)$ ,  $P(0 < x < 5)$   
(iii) Find the distribution function of  $X$ .

- b) Find the moment generating function of the random variable  $X$  (5)  
where probability function is  $P(X = x) = q^{x-1}p$ ,  $x = 1, 2, 3, \dots$

2. The joint pdf of the random variable  $(x, y)$  is given by (15)

$$f(x, y) = kxy e^{-(x^2+y^2)} \quad ; x > 0, y > 0.$$

- (i) Find  $k$ .  
(ii) Find the marginal distribution function.  
(iii) Prove that  $x$  and  $y$  are independent.

**UNIT - II**

3. a) Show that the process  $X(t) = A \cos \lambda t + B \sin \lambda t$  is WSS,  $A$  and  $B$  are (10)  
random variables if

- (i)  $E(A) = E(B) = 0$       (ii)  $E(A^2) = E(B^2)$   
(iii)  $E(AB) = 0$ .

- b) Determine the mean and variance of the process given that the auto (5)  
correlation function  $R_{xx}(\tau) = 25 + \frac{4}{1+6\tau^2}$ .

4. The process  $\{X(t)\}$  where probability distribution under certain conditions (15)  
is given by

$$P\{X(t) = n\} = \begin{cases} \frac{(at)^{n-1}}{(1+at)^{n+1}}, & n = 1, 2, \dots \\ \frac{at}{1+at}, & n = 0 \end{cases}$$

Show that it is not stationary.

**UNIT - III**

5. a) The following data gives the number of aircraft accidents that occurred during the various days of the week. (8)

Days :	Mon	Tue	Wed	Thur	Fri	Sat
Number of accidents :	15	19	13	12	16	15

Test whether the accidents are uniformly distributed over the week.

- b) A random sample of 10 boys has the following IQ's (7)  
70, 120, 110, 101, 88, 83, 95, 98, 107, 100  
Do these data support the assumption of a population mean IQ of 100?
6. 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 machine produces 16 imperfect articles in a sample of 500. After machine is overhauled, it produces 3 imperfect articles in a batch of 100. Has the machine improved? (7)

**UNIT - IV**

7. a) From the following data, find  $\theta$  at  $x = 43$  and  $x = 84$ . (8)

$x$ :	40	50	60	70	80	90
$\theta$ :	184	204	226	250	276	304

- b) Using Lagrange's formula, find  $y(10)$  from the following table. (7)

$x$ :	5	6	9	11
$y$ :	12	13	14	16

8. By dividing the range into ten equal parts, evaluate  $\int_0^{\pi} \sin x \, dx$  by Trapezoidal and Simpson's rule. Verify four answer with integration. (15)

**UNIT - V**

9. a) Find the positive root of  $x^3 - 4x + 1 = 0$  by Regula Falsi method. (8)
- b) Solve the system by Gauss - elimination method (7)

$$\begin{aligned} 2x + 3y - 2 &= 5 \\ 4x + 4y - 3z &= 3 \\ 2x - 3y + 2z &= 2 \end{aligned}$$

10. Solve the following system by Gauss-Seidel Iterative method. (15)

$$\begin{aligned} 10x - 5y - 2z &= 3 \\ 4x - 10y + 3z &= -3 \\ x + 6y + 10z &= -3. \end{aligned}$$

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Register Number:

0249

Name of the Candidate:

**B.E. DEGREE EXAMINATION, 2019**

**(CIVIL ENGINEERING)**

**(FOURTH SEMESTER)**

**CLEC-401/CSEC-401/CHec-401: ENGINEERING  
MATHEMATICS - III**

**MEEC-401/MFEC-401: PROBABILITY AND STATISTICS**

April /May]

[Time : 3 Hours

Maximum : 75 Marks

**Answer any ONE FULL question from each unit (5×15=75)**

**UNIT - I**

1. a) A random variables X has the following probability function:

x	0	1	2	3	4	5	6	7
p(x)	0	K	2K	2K	3K	K <sup>2</sup>	2K <sup>2</sup>	7K <sup>2</sup> +K

- (i) Find K (ii) Evaluate p(x < 6).

- b) A random variable X has the probability function  $p(x) = \frac{1}{2^x}, x=1,2,\dots$

Find its m.g.f. and mean.

2. The joint density function of a random variable (x, y) is given by  
 $f(x, y) = axy, 1 \leq x \leq 3, 2 \leq y \leq 4$   
 $= 0$  elsewhere.

Find (a) The value of a. (b) The marginal and conditional density function of X and Y. (c) Examine whether they are independent.

**UNIT - II**

3. a) Show that the random process  $X(t) = A \cos(\omega_0 t + \theta)$  is wide sense stationary if A and  $\omega_0$  are constants and  $\theta$  is a uniformly distributed random variable in  $(0, 2\pi)$ .  
b) Show that the process  $X(t) = A \cos \lambda t + B \sin \lambda t$  (where A & B are RVS) is wide senses stationary if (i).  $E(A) = E(B) = 0$  (ii)  $E(A^2) = E(B^2)$  and  $E(AB) = 0$ .
4. a) A stationary random process has an auto correlation function  
 $R_{xx}(\tau) = 25 + \frac{4}{1+6\tau^2}$ . Find the mean and variance of two process {x(t)}.  
b) Show that  $R_{xy}(\tau) = R_{yx}(-\tau)$ .

**UNIT - III**

5. a) The mean height of the sample 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?

5. b) A machine produced 16 imperfect articles in a sample of 500. After machine is overhauled it produces 3 imperfect articles in a batch of 100. Has the machine been improved?
6. a) In a sample of 500 people, 280 are rice eaters and the rest wheat eaters. Can it be assumed that both food articles are equally popular?
- b) Two independent samples of 8 and 7 items respectively have the following values of variable.

Sample I	39	41	43	41	45	39	42	44
Sample II	40	42	40	44	39	38	40	-

Do the estimates of the population variance differ significantly?

#### UNIT - IV

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

		Salesman			
		A	B	C	D
Season	Summer	45	40	38	37
	Winter	43	41	45	38
	Monsoon	39	39	41	41

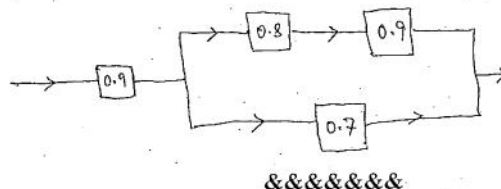
Carry out analysis of variance.

8. Analyse the variance in the following Latin Square of yield (in kgs) of paddy where A, B, C, D denote the different methods of cultivation. Examine whether the different methods of cultivation have given significantly different yields.

D122	A121	C123	B122
B124	C123	A122	D125
A120	B119	D120	C121
C122	D123	B121	A122

#### UNIT - V

9. A certain type of engine seal is found to have its life exponentially distributed with constant failure rate  $0.03 \times 10^{-4}$  failures per hour.
- (a) What is the probability that a given seal will last beyond ten thousand hours?
- (b) What is the MTTF Seal?
- (c) What is the reliability at MTTF?
- (d) If the reliability at design life has to be atleast 90%. What is the recommended design of life?
10. Calculate the system reliability for the units connected below (fig.)



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0250

Name of the Candidate:

**B.E. DEGREE EXAMINATION, 2019**

(CIVIL ENGINEERING)

(FOURTH SEMESTER)

**CLEC-402. SURVEYING - I**

April/May]

[Time : 3 Hours

Maximum : 75 Marks

*Answer any ONE FULL question from each unit*

**UNIT-I**

1. What is ranging? Explain the direct and in direct methods of ranging.
2. a) The following perpendicular offsets were taken at 30 m intervals from a chain line to a forest boundary line: 5.6, 12.2, 15.5, 15.1, 18.3, 20.6, 24.1, 20.8 and 18.2 m. Compute the area bounded between the chain line and the boundary line by any suitable method. (10)  
b) What are the different sources of errors in chain surveying? (5)

**UNIT-II**

3. The following bearings were taken during a compass survey:

Line	Fore Bearing	Back Bearing
PQ	55°00'	235°00'
QR	112°30'	294°00'
RS	205°00'	25°00'
ST	257°00'	75°30'
TU	295°30'	116°30'

Identify the station affected by local attraction and find the correct values of the bearing.

4. Define following terms:
  - a) True and Magnetic median (4)
  - b) True and Magnetic bearing (4)
  - c) Magnetic declination (3)
  - d) Define local attraction and write their sources. (4)

**UNIT-III**

5. How plane table surveying is different from other types of surveying? Where it is best suited?
6. The following are a series of offsets taken from a chain line to a curved boundary line with offset interval of 10m: 0, 2.62, 3.86, 5.62, 7.85, 8.25, 4.25, 0. Compute the area between the chain line and the curved boundary and the end offsets. Calculate by Simpsons and trapezoidal rules.

UNIT-IV

7. With the help of a sketch explain the parts of a Dumpy level
8. The page of a field level book is shown below. Fill the missing data and compute the RL of all the points.

BS	IS	FS	Rise	Fall	RL	Remarks
2.315					125.650	BM
	X		1.325			
X		1.35				
	2.805			0.635		
	1.605					
X		X	0.850			
	1.995					
		2.335				

UNIT-V

9. Describe the process of repetition and reiteration in horizontal angle measurements.
10. List the permanent adjustments of a theodolite. Explain any two methods.

**B.E. DEGREE EXAMINATION, 2019**

**(CIVIL ENGINEERING)**

**(FOURTH SEMESTER)**

**01PC-403. SURVEYING-I**

April /May]

[Time : 3 Hours

Maximum : 75 Marks

**Answer any ONE FULL question from each unit (5×15=75)**

**UNIT - I**

1. Find the stations which are affected by local attraction. Determine (15)  
the corrected bearings of the closed traverse.

Line	Fore Bearing	Back Bearing
AB	74°20	256°
BC	107°20	286°20
CD	224°50	44°50
DA	306°40	126°

2. Describe the different methods of plane table surveying. (15)

**UNIT - II**

3. The following staff readings were observed successively with a level. (15)  
The instrument having been moved after the second, fifth and eighth readings. 0.675, 1.230, 0.750, 2.565, 2.225, 1.935, 1.835, 3.220, 3.115 and 2.875. The first staff reading was taken with a staff held on a bench mark of reduced level 100.00m. Enter the readings in the level book form and find the reduced levels of all the points.
4. a) Define Contour and explain characteristics of contour? (8)  
b) Explain the different types of leveling. (7)

**UNIT - III**

5. Explain the various methods of measuring the horizontal angle using (15)  
Theodolite.
6. Explain. what are the Adjustments of a Theodolite. (15)

**UNIT - IV**

7. A Tacheometer was set up at an intermediate station between the line (15)  
PQ and the following observations are taken. The instrument was fitted with an anallatic lens. Find the gradient of the line joining the station P and Q

Staff at	Vertical Angle	Staff Readings (m)		
P	-3°30	0.495	1.265	2.035
Q	2°20	0.950	1.675	2.400

8. Define Curve. Explain the various methods and necessity of curves.

**UNIT - V**

9. Describe briefly about Watershed Management. (15)
10. a) Write Short notes on DBMS. (10)  
b) What are the basic components of GIS? (5)

**B.E. DEGREE EXAMINATION, 2019**  
**(CIVIL ENGINEERING)**  
**(FOURTH SEMESTER)**  
**CLEC-404/PCLEC-204: STRUCTURAL ENGINEERING – I**  
**(Old Regulations)**

April /May]

[Time : 3 Hours

Maximum : 75 Marks

**Answer any ONE FULL question from each unit (5 × 15 = 75)**

**UNIT – I**

1. Design a RC Lintel beam to be provided over an opening of 2 m wide. The height of Masonry above the lintel is 3 m. The opening is centrally located in a long wall, 300 mm thick. The unit weight of Masonry may be taken as 19 kN/m<sup>3</sup>. Use M20 concrete and Fe 415 steel. (15)
2. Design a reinforced concrete beam supported on two walls 500 mm thick, spaced at a clear distances of 6 m. The beam carries a super imposed load of 30 kN/m. The size of beam is restricted to 300 mm × 500 mm. Use M20 concrete and Fe 415 steel. (15)

**UNIT – II**

3. Design a dog legged stair for a building in which the vertical distance between floors in 3.6 m. The stair hall measure 2.5 m × 5 m. The live load may be taken as 2500 N/m<sup>2</sup>. Use M20 concrete and Fe 415 steel bars. (15)
4. Design a simply supported roof slab for a room 8 m × 3.5 m clear in size if the super imposed load is 5 kN/m<sup>2</sup>. Use M20 grade concrete and Fe 415 grade steel. Carry out the check for deflection. (15)

**UNIT – III**

5. Design a circular column to carry an axial load of 1000 kN. Use M20 concrete and Fe 415 grade of steel using helical reinforcement. (15)
6. A brick wall 300 mm thick carries a load of 190 kN/m length. Design a R.C.C. footing, if the safe bearing capacity of soil is 130 kN/m<sup>2</sup>. Use M20 concrete and Fe 415 steel. (15)

**UNIT – IV**

7. Determine the tensile strength of a tie member ISA 75 × 75 × 6 mm connected to a 8 mm thick gusset plate using a single row of 5 Nos. of 12 mm diameter bolts. Take  $f_y = 250$  Mpa,  $f_u = 410$  Mpa. (15)
8. A single bolted loop joint is used to connect two 10 mm thick plates. If 16 mm diameter 4.6 grade bolts are used at 60 mm c/c. Determine the strength of the joints and find the efficiency of the joint. Use steel of grade Fe 410 with  $f_y = 250$  Mpa. (15)

**UNIT – V**

9. Design a laterally restrained cantilever beam of effective span 4 m carrying a line load udl of 10 kN/m and a dead load udl of 20 kN/m. Assume stiff bearing length of 75 mm. Take  $f_y = 250$  Mpa and  $E = 200$  Gpa. (15)
10. Design a simply supported beam of effective span 6 m to carry a factored udl of 40 kN/m. The beam is laterally supported. Assume a bearing length of 80 mm. Use of steel of grade Fe 410 with  $f_y = 250$  Mpa. (15)

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Register Number:

0207

Name of the Candidate:

**B.E. DEGREE EXAMINATION, 2019**

**(CIVIL ENGINEERING)**

**(FOURTH SEMESTER)**

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

April /May]

[Time : 3 Hours

Maximum : 75 Marks

**Answer any ONE FULL question from each unit (5×15=75)**

**UNIT - I**

1. A trapezoidal channel has side slope of 1 horizontal to 2 vertical and the slope of the bed is 1 in 2000. The area of the section is 42 m<sup>2</sup>. Find the dimensions of the section if it is to be most economical. Determine the discharge of the most economical section of C=60
2. Describe various types of flow in an open channel.

**UNIT - II**

3. A channel is designed to carry a discharge of 20 m<sup>3</sup>/s with Manning's  $n=0.015$  and bed slope of 1 in 1000 (for trapezoidal channel side slope  $M=1\sqrt{3}$ ). Find the channel dimensions of the most efficient section if the channel is i) trapezoidal ii) rectangular.
4. A trapezoidal channel having a bottom width of 5.0 m and side slope 2: 1 is laid with a bottom slope of 1/750. If it carries a uniform flow of 8 m<sup>3</sup>/s. Compute the normal depth. Assume Manning's  $n=0.025$

**UNIT - III**

5. How do you classify surface profiles? Briefly explain the various salient features of various profiles. Also write a note on hydraulic jump.
6. A 50 m long laboratory flume has a rectangular section with a width of 2m and ends in a free overall. The channel is made of glass and the bed drops by 5 cm in the entire length. At a certain discharge, it was seen that the depth near the channel entrance was more or less constant at 0.5 m. use the direct step method to the length of profile. Use two equal depth increments.

**UNIT - IV**

7. A Pelton when operates with a jet of jet of 150 mm diameter under the head of 500m, its mean runner diameter is 0.25 m and it rates with a speed of 375 rpm. The angle of bucket tip at outlet as 15°, coefficient of velocity is 0.98, mechanical losses equal to 3% of power supplied and the reduction in relative velocity of water while passing through bucket is 15%. Find i) the force of jet on the bucket ii) the power developed iii) bucket efficiency and iv) overall efficiency.

8. A Pelton wheel generates 8000 kW under a net head of 130 m at a speed of 200 rpm. Assuming the coefficient of velocity for the nozzle 0.98, hydraulic efficiency 87%, speed ratio 0.46 and jet diameter to wheel diameter ratio 1/9, Determine.
- i) Discharge required
  - ii) Diameter of the wheel
  - iii) Diameter and number of jets required and
  - iv) Specific speed of the turbine. Take Mechanical efficiency is 75%

**UNIT - V**

9. A single acting reciprocating pump having a cylinder diameter of 150 mm and stroke of 300 mm is used to raise the water through a height of 20m. its crank rotates at 60 rpm. Find the theoretical power required to run the pump and the theoretical discharge. If actual discharge is 5 lit/s find the percentage of slip. If delivery pipe is 100 mm in diameter and is 15 m long, find the acceleration head at the beginning of the stroke.
10. i) With the help of neat sketches, explain the features of a volute type and a diffusion type centrifugal pump.
- ii) A centrifugal pump delivers salt water against a head of 15 m at a speed of 100 rpm. The vanes are curved backward at 30° with the periphery. Obtain the discharge for an impeller diameter of 30 cm and outlet width of 5 cm at a manometric efficiency of 90%.

Register Number:

0253

Name of the Candidate:

**B.E. DEGREE EXAMINATION, 2019**

**(CIVIL ENGINEERING)**

**(FOURTH SEMESTER)**

**CLEC-405: ESTIMATION AND VALUATION**

April /May]

[Time : 3 Hours

Maximum : 75 Marks

**Answer any ONE FULL question from each Unit (5 × 15 = 75)**

**UNIT - I**

1. The accompanying sketch with details given refers to a residential building. Estimate in detail the quantities for the following items of work. (a) Earth work excavation in Foundation (b) R.R.Masonry in foundation (c) Brick Masonry in basement.
2. For the same building estimate the quantities of the following items.
  - (a) Brick work in super structure in C.M. 1:5
  - (b) R.C.C. roof slab using 1:1:5:3, 12 cm thick
  - (c) Plastering on the inside and outside walls.

**UNIT - II**

3. Differentiate between 'Analysis of rates' and 'Schedule of rates'.
4. Assuming current schedule of rates for materials and labour, Prepare data for the work. Plain cement concrete 1:5:10 in foundation. Explain the labours and materials required for different works.

**UNIT - III**

5. a) Write the powers of different officers for accepting the tender. (8)  
b) Briefly explain the term tender notice. (7)
6. Write short notes on Earnest money deposit and Standard measurement Book.

**UNIT - IV**

7. What are the different types of contracts? Explain them briefly with their merits and demerits.
8. List out the duties of various levels of Engineers in the Public works department.

**UNIT - V**

9. What are the different purposes for which the valuation is undertaken?
10. Explain the different method of valuation in detail.

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Register Number:

0208

Name of the Candidate:

**B.E. DEGREE EXAMINATION, 2019**

(CIVIL ENGINEERING)

(FOURTH SEMESTER)

**01PC-406. ENGINEERING GEOLOGY**

April/May]

[Time : 3 Hours

Maximum : 75 Marks

*Answer any ONE FULL question from each unit*

**UNIT-I**

1. Discuss in detail about the various process of sea with suitable sketch.
2. Write briefly notes on following with neat sketch.
  - a) Theory of plate tectonics.
  - b) Structure of interior earth.

**UNIT-II**

3. Explain in detail about various physical properties of minerals.
4. Write the physical properties of following minerals
  - a) Quartz group (7)
  - b) Gypsum (4)
  - c) Marble (4)

**UNIT-III**

5. Briefly discuss about various engineering properties of rocks.
6. Differentiate between igneous sedimentary and metamorphic rocks?

**UNIT-IV**

7. Discuss in details about various types of folds and joints with neat sketch
8. Explain in details about seismic and electrical method for subsurface investigation.

**UNIT-V**

9. Brief discuss about the application of remote sensing in civil engineering.
  10. Write short notes on:
    - a) Coastal protection structure (5)
    - b) Investigation of landslides cause and litigation. (10)
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