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B.E. DEGREE EXAMINATION, 2011

(CIVIL, CIVIL & STRUCTURAL, MECHANICAL,
MANUFACTURING AND CHEMICAL ENGINEERING)

(FOURTH SEMESTER)

CLEC, CSEC, MEEC, MFEC, CHEC-401.
ENGINEERING MATHEMATICS - III /
PROBABILITY AND STATISTICS

(New Regulations)

(For the students joined during 2007-08 and
after)

November]

[Time : 3 Hours

Maximum : 60 Marks

Answer ONE FULL question from each unit.

ALL questions carry equal marks.

Use of statistical tables is permitted.

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UNIT - I

1. (a) A random variable X has the following probability function

x	0	1	2	3	4	5	6	7
p(x)	0	k	2k	2k	3k	k ²	2k ²	7k ² + k

- (i) Find k,
(ii) P(x ≥ 6), P(x < 6) and P(0 < x < 5)
(iii) If P(x ≤ k) > $\frac{1}{2}$, find the minimum value of k.
(b) Find the m.g.f. of the random variable X having the pdf

$$f(x) = \begin{cases} x & \text{for } 0 < x < 1 \\ 2-x & \text{for } 1 < x < 2 \\ 0 & \text{otherwise} \end{cases}$$

(OR)

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$$2. (a) \text{ If } f(x) = \begin{cases} -\frac{x^2}{2} & \text{for } x \geq 0 \\ 0 & \text{for } x < 0 \end{cases}$$

find the cumulative distribution function f(x).

- (b) The joint distribution of X and Y is given by

$$f(x, y) = \frac{x+y}{21}, \quad x = 1, 2, 3; \quad y = 1, 2$$

Find the marginal distributions.

UNIT - II

3. (a) The process {X(t)} whose probability distribution under certain conditions 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.

- (b) Define cross-correlation function and state its properties.

(OR)

4. (a) Prove that if the auto correlation function $R(\tau)$ of real stationary process $\{x(t)\}$ is continuous at $\tau = 0$, it is continuous at every other point.
- (b) Find the mean and variance of a stationary random process whose auto correlation function is given by

$$R_{XX}(\tau) = 18 + \frac{2}{6 + \tau^2}$$

UNIT - III

5. (a) In a sample survey of 50 individuals, the average income was found to be ₹ 2,172 per month. It is known that the S.D. of the distribution of the income is 90.11. Can we conclude that the average monthly income is ₹ 2,200?

UNIT - IV

7. Setup an analysis of variance of the following data :

A	B	C
20	20	12
10	14	18
18	16	20
8	14	22

(OR)

6. Three varieties A, B, C of a crop are tested in a randomized block design with four replications. The plot yields in pounds are as follows :

A6	C5	A8	B9
C8	A4	B6	C9
B7	B6	C10	A6

Analyse the experimental yield and state your conclusion.

- (b) Ten individuals are chosen at random from a population and their heights are found to be in inches

63, 63, 66, 67, 68, 69, 70, 70, 70, 71.

In the light of this data enquire if the mean height in the population is 66 inches.

(OR)

6. (a) Two samples of sizes 9 and 8 give the sum of squares of deviations from their respective means equal to 160 inches square and 91 inches square respectively. Can they be regarded as drawn from the same normal population.
- (b) Two groups of 100 people each were taken for testing the use of a vaccine 15 persons contracted the disease out of the inoculated persons, while 25 contracted the disease in the other group. Test the efficiency of the vaccine, using chi-square distribution.

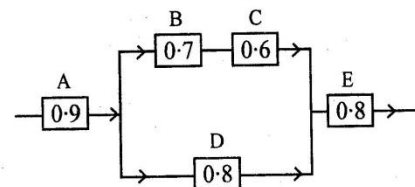
UNIT - V

9. (a) The design of a component with mean life equal to 10 hours is modified to improve its mean life to 20 hours. What is the increase in its reliability if in both the cases the component is tested for 20 hours.
- (b) Define hazard rate. Derive an expression for the reliability $R(t)$ and the failure density function $f(t)$ in terms of hazard rate.

(OR)

10. (a) A product with constant hazard rate is found to have a reliability of 80% for an operating time 500 hours. What is the failure rate of the product?

- (b) Calculate the unreliability of the system :



Register Number:

3107

Name of the Candidate:

B.E. DEGREE EXAMINATION, 2011
(CIVIL/ CIVIL AND STRUCTURAL ENGINEERING)
(FOURTH SEMESTER)
CLEC-404/CSEC-404/PCSEC-202.MECHANICS OF SOLIDS-II

(Old Regulation)
(For the students joined during 2006-07 and before)
(Common with Part-Time –Structural engineering-Second Semester)

Nov.)

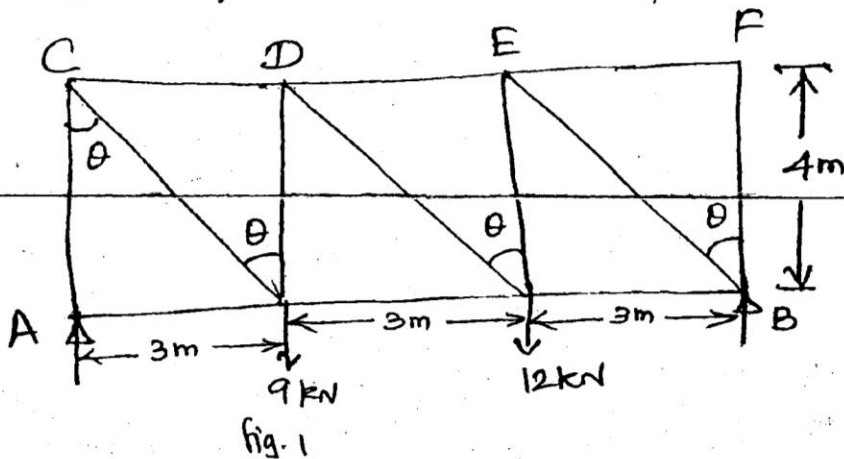
(Time: 3 Hours

Maximum: 60 Marks

Answer any ONE FULL question from each unit
All questions carry equal marks

UNIT-I

1. A truss of span 9m is loaded as shown in figure-1. Determine the forces in various members of the truss.



(OR)

2. A vertical load W is applied to the rigid cantilever frame shown in fig-2. Assuming EI to be constant throughout the frame, determine the horizontal and vertical displacements of the point C. Neglect axial deformations.

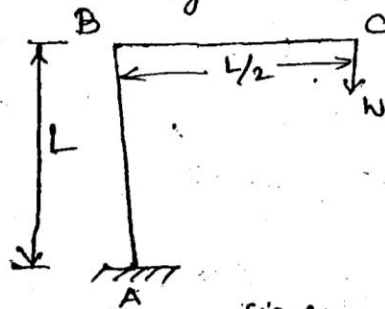


Fig. 2

UNIT-II

3. Determine the principal moments of inertia for an unequal angle section $200\text{mm} \times 150\text{mm} \times 10\text{mm}$.

(OR)

4. A beam of rectangular section, 80mm wide and 120mm deep is subjected to a bending moment of 12kNm. The trace of the plane of loading is inclined at 45° to the y-y axis of the section. Locate the neutral axis of the section and calculate the maximum bending stress induced in the section.

UNIT-III

5. A short column of external diameter 400mm and internal diameter 200mm carries an eccentric load of 80kN. Find the greatest eccentricity which the load can have without producing tension on the cross-section.

(OR)

6. A hollow cylindrical cast-iron column is 4m long with both ends fixed. Determine the minimum diameter of the column if it has to carry a safe load of 250kN with a factor of safety of 5. Take internal diameter as 0.8 times the external diameter. Take $\sigma_c = 550\text{N/mm}^2$ and $\alpha = \frac{1}{1600}$ in Rankine's formula.

UNIT-IV

7. A closed cylindrical vessel made of steel plates 4mm thick with plane ends, carries fluid under a pressure of 3N/mm^2 . The diameter of cylinder is 250mm and length is 750mm, calculate the longitudinal and hoop stress in the cylinder wall and determine the change in diameter, length and volume of cylinder. Take $E = 2.1 \times 10^5\text{N/mm}^2$ and $\mu = 0.286$.
8. Determine the maximum and minimum hoop stress across the section of pipe of 400mm internal diameter and 100mm thick, when the pipe contains a fluid at a pressure of 8N/mm^2 . Also sketch the radial pressure distribution and hoop stress distribution across the section.

UNIT-V

9. Determine the frequency of transverse vibration of a beam for following cases.
i) Concentrated load at the end of cantilever.
ii) concentrated load on a simply supported beam.

(OR)

10. A closed coil helical spring of 100mm mean diameter is made up of 10mm diameter rod and has 20 turns. The spring carries an axial load of 300N. Determine the shearing stress. Taking the value of modulus of rigidity as $8.2 \times 10^4\text{N/mm}^2$, determine the deflection when carrying this load. Also calculate the stiffness of the spring and frequency of free vibration for a mass hanging from it.

Register Number:

3109

Name of the Candidate:

B.E. DEGREE EXAMINATION, 2011

(CIVIL ENGINEERING)

(FOURTH SEMESTER)

CLEC-406/PLEC-304. STRUCTURAL DESIGN AND DRAWING-I

(Old Regulations)

(for the students joined during 2006-07 and before)

Nov.]

[Time : 3 Hours

Maximum : 60 Marks

Answer any ONE Question

Use of IS: 456-2000, IS: 800-2007 steel tables permitted

Assume suitable data wherever necessary

All questions carry equal marks

1. Design a staircase for a school building in which the height between floors is 3.75m, mid-landing is cantilevered out and the width is 1.5m. The number of steps not to exceed 10 in any flight. Take the dimensions for tread and rise as 30 cm and 15 cm. Use M20 grade of concrete and Fe250 grade of steel. Draw to suitable scale
 - (i) The section showing the flight position for a 3.75m height floor.
 - (ii) The reinforcement details for a staircase

2. Design a combined footing with a strap beam for two reinforced concrete column of size 300mm x 300mm spaced 4cm c/c and each supporting a service axial load of 500 KN. The safe bearing capacity of soil at site is 150 KN/sq.m. Adopt M20 grade of concrete and Fe 415 grade of steel. Sketch the details of reinforcements.
