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**R-15**

**Code: 5GC42**

II B.Tech. II Semester Supplementary Examinations March 2021

# Probability and Statistics

( Common to CE, ME & IT )

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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Marks

## UNIT–I

1. a) In a bolt factory machine A, B, C manufacture 20%, 30% and 50% of the total of their output and 6%, 3%, and 2% are defective. A bolt is drawn at random and found to be defective. Find the probability that it is manufactured from (i) Machine A (ii) Machine B (iii) Machine C 7M

   b) A random variable X has the following probability distribution :

| x | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| P(x) | 0 | K | 2K | 2K | 3K | $K^2$ | $2K^2$ | $7K^2+K$ |

   Determine (i) K (ii) P(x<6) (iii) E[$x^2$ ] 7M

**OR**

2. a) The probability density *f(x)* of a continuous random variable is given by

   $f(x) = c\, e^{-|x|}$ , $-\infty < x < \infty$

   Find the value of *c*, mean and variance of the distribution. 7M

   b) Bag I contains 4 white and 6 black balls while another Bag II contains 4 white and 3 black balls. One ball is drawn at random from one of the bags and it is found to be black. Find the probability that it was drawn from Bag I. 7M

## UNIT–II

3. a) The probability that the bulb of 100 days life is 0.05. Find the probability that one of 6 bulbs (i) At least one (ii) greater than four (iii) none, will be having a life of 100 days. 7M

   b) If a random variable has a Poisson distribution such that P(1)=P(2), find (i) mean of the distribution (ii) P(4) (iii) P(x $\geq$1) (iv) P(1<x<4) 7M

**OR**

4. a) The mean weight of 500 college students is 70 kg and the standard deviation is 3 kg. Assuming that the weight is normally distributed, determine how many students weigh: (i) between 70 kg and 75 kg. (ii) more than 80 kg. (iii) less than 64 kg. 7M

   b) The following data was collected over a period of 10 years, showing the number of injuries from horse kicks in each of the 200 army corps. The distribution of injuries was as follows:

| No. of injuries | 0 | 1 | 2 | 3 | 4 | Total |
|---|---|---|---|---|---|---|
| Frequency | 109 | 65 | 22 | 3 | 1 | 200 |

   Fit a Poisson distribution to the data and calculate the theoretical frequencies: 7M

## UNIT–III

5. a) Traveling between two campuses of a university in a city via shuttle bus takes, on average, 28 minutes with a standard deviation of 5 minutes. In a given week, a bus transported passengers 40 times. What is the probability that the average transport time, i.e., the average for 40 trips, was more than 30 minutes? Assume the mean time is measured to the nearest minute. 7M

   b) The contents of seven similar containers of sulfuric acid are 9.8, 10.2, 10.4, 9.8, 10.0, 10.2, and 9.6 liters. Find a 95% confidence interval for the mean contents of all such containers, assuming an approximately normal distribution. 7M

**OR**

6. a) A population consists of the four numbers 3, 7, 11, 15. Consider all possible samples of size 2 which can be drawn with replacement from this population. Find the population mean and standard deviation, and mean and standard deviation of the sampling distribution of means. 7M

   b) Find 95% confidence limits for the mean of a normality distributed population from which the following sample was taken 15,17,10,18,16,9,7,11,13,14. 7M

**UNIT–IV**

7. a) Before an increase in excise duty on tea, 800 people out of a sample of 1000 were consumers of tea. After the increase in duty, 800 people were consumers of tea in a sample of 1200 persons. Find whether there is significant decrease in the consumption of tea after increase in duty? 7M

   b) Explain the following

   1) Null hypothesis 2) Critical region 3) Type I and Type II errors. 7M

**OR**

8. a) In a city A 20% of a random sample of 900 school boys had a certain slight physical defect. In another city B, 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between the proportions significant at 0.05 level of significance? 7M

   b) The following are the samples of skills. Test the significant difference between the means at 0.05 level

| | | | | | | |
|---|---|---|---|---|---|---|
| Sample I | 71.4 | 77.7 | 74.4 | 74 | 73.8 | - |
| Sample II | 70.8 | 74.9 | 74.2 | 70.4 | 69.2 | 72.2 |

7M

**UNIT–V**

9. a) The theory predicts the proportion of beans, in the four groups: A, B, C and D should be 9:3:3:1. In an experiment with 1600 beans the number in the four groups were 882, 313, 287 and 113. Does the experiment result support the theory. 7M

   b) Two random samples drawn from two normal populations have the variable values as below:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample1 | 28 | 30 | 32 | 33 | 31 | 29 | 34 |
| Sample2 | 29 | 30 | 30 | 24 | 27 | 28 | |

   Examine whether the samples have been drawn from a normal population having the same variance. 7M

**OR**

10. a) A sample of size 13 gave an estimated population variance of 3.0 while another sample of size 15 gave an estimate of 2.5. Could both samples be from population with same variance? 7M

    b) In a pre-poll survey out of 1000 urban voters 540 favoured B and the rest A. Out of 1000 rural voters, 620 favoured A and the rest B. Examine if the nature of the area is related to voting performance using the Chi-square test. 7M

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| Hall Ticket Number : | | | | | | | | | | |
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**R-15**

**Code: 5G641**

II B.Tech. II Semester Supplementary Examinations March 2021

# Strength of Materials-II

( Civil Engineering )

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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| | | | Marks | CO | Blooms Level |
|---|---|---|---|---|---|
| | | **UNIT–I** | | | |
| 1. | a) | A thin cylindrical pressure vessel of 500mm diameter is subjected to an internal pressure of 2 N/mm$^2$. If the thickness of the vessel is 20mm, find the hoop stress, longitudinal stress and the maximum shear stress. | 7M | 1 | L3 |
| | b) | Find the thickness for a tube of Internal diameter 100mm subjected to an internal pressure which is 5/8 of the value of the maximum permissible circumferential stress, Also find the increase in internal diameter of such a tube when the internal pressure is 90N/mm$^2$. Take E = 205 kN/mm$^2$ and μ=0.29. Neglect longitudinal strain. | 7M | 1 | L3 |
| | | **OR** | | | |
| 2. | a) | State the assumptions made in the theory of thick cylinders | 4M | 1 | L1 |
| | b) | A thick cylinder of steel having an internal diameter of 100mm and external diameter of 200mm is subjected to an internal pressure of 80N/mm$^2$. Find the maximum stress induced in the material and the change in the external diameter Take Young's modulus = 2 x 10$^5$ N/mm$^2$ and Poisson's ratio = 0.3. | 10M | 1 | L3 |
| | | **UNIT–II** | | | |
| 3. | | A steel shaft is required to transmit 75kW power at 100 rpm and the maximum twisting moment is 30% greater than the mean. Find the diameter of the steel shaft if the maximum stress is 70 MPa. Also determine the angle of twist in a length of 3m of the shaft. Assume the modulus of rigidity for steel as 90kN/mm$^2$. | 14M | 2 | L3 |
| | | **OR** | | | |
| 4. | | A close-coiled spring is required to have an axial stiffness of 5 N/mm and torsional stiffness of 100Nmm/degree angle of twist. The maximum bending stress should not exceed 120 MPa when subjected to an axial twist of 2.5 Nm. If E=200GPa and G=85GPa for the material of spring, find the diameter of wire, the mean radius of the coil and the number of turns. | 14M | 2 | L3 |
| | | **UNIT–III** | | | |
| 5. | a) | What are the limitations of Euler's Formula? | 4M | 3 | L1 |
| | b) | Determine the section of cast iron hollow cylindrical column 3m long with both ends fixed, if it carries an axial load of 800kN. The ratio of internal to external diameter of column is 5/8. Use Rankine's constant as 1/1600 & working crushing strength of material as 550 N/mm$^2$. | 10M | 3 | L3 |
| | | **OR** | | | |
| 6. | | A hollow cylindrical cast iron column whose external diameter is 200 mm and has a thickness of 20 mm is 4.5 m long and is fixed at the both ends. Calculate the safe load by Rankine's formula using a factor of safety of 2.5. Take the crushing strength of material as 550N/mm$^2$ and Rankine"s constant as 1/1600. Find also the ratio of Euler"s to Rankine"s load. Take E=150GPa. | 14M | 3 | L3 |

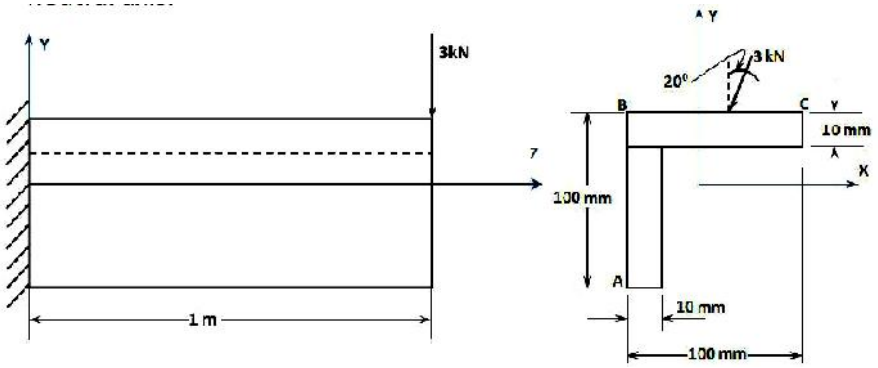
**UNIT–IV**

| | | | | | |
|---|---|---|---|---|---|
| 7. | a) | Explain middle third rule. | 4M | 4 | L1 |
| | b) | A short hollow pier of outer dimensions **1.6** m **x 1.6 m** and of inner dimensions **1.0**m **x 1.0** m supports a vertical load of **2000 kN** at a point located on a diagonal **0.5** m from the vertical axis of the pier. Calculate the normal stresses at the **4** corners of the section of **the** pier, neglecting its self-weight. | 10M | 4 | L3 |

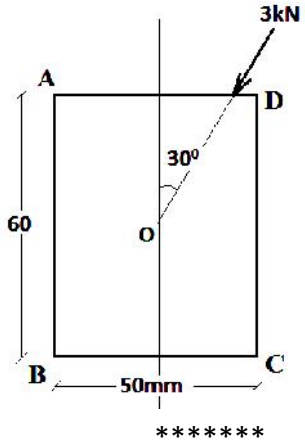
**OR**

| | | | | | |
|---|---|---|---|---|---|
| 8. | | In a rectangular section of dimensions 200mm x 100mm, a load of 80kN is applied 40mm and 20mm off the centroid parallel to the 200mm and 100mm sides, respectively. Find the stresses at the four corners. What is the additional compressive load that can be placed at the centroid of the section to make the tensile stress zero? | 14M | 4 | L3 |

**UNIT–V**

| | | | | | |
|---|---|---|---|---|---|
| 9. | | A cantilever of angle section is 1m long and is fixed at one end, while it is subjected to a load of 3kN at the free end at $20^o$ to the vertical. Calculate the bending stresses at A,B and C and also the position of neutral axis.   | 14M | 5 | L3 |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 10. | | Calculate the stresses at the corners of the rectangular section of a simply supported beam of span 6m which carries a load of 3kN at the mid-span. The load line is inclined at an angle of $30^0$ to the vertical longitudinal plane as shown in the figure and passes through the centroid of the section. The dimensions of the section are shown in the figure.   | 14M | 5 | L3 |

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**R-15**

**Code: 5G643**

II B.Tech. II Semester Supplementary Examinations March 2021

# Structural Analysis-I

( Civil Engineering )

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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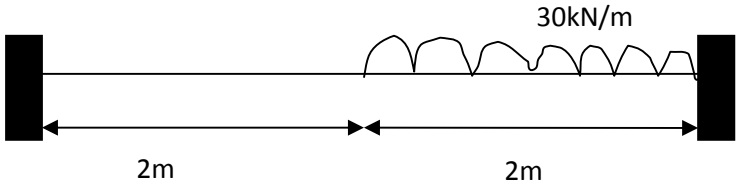
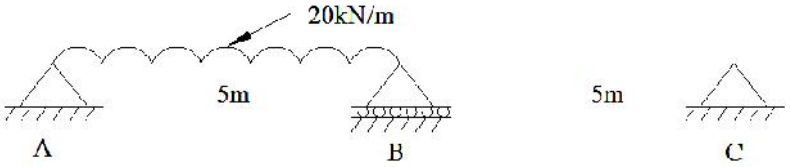
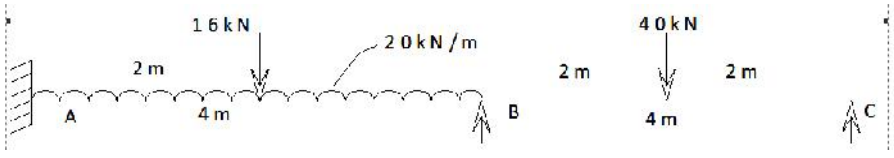
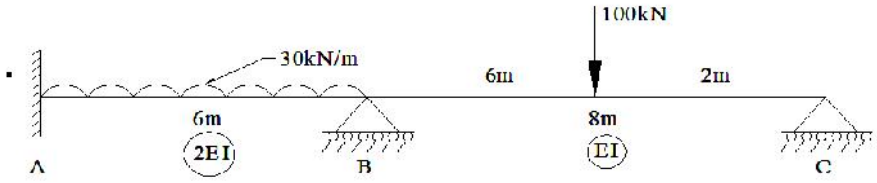
| | | | Marks | CO | Blooms Level |
|---|---|---|---|---|---|
| | | **UNIT–I** | | | |
| 1. | | Interpret analysis result of given fixed beam subjected to the partial UDL as shown in figure. Construct the shear force and bending moment for the same   | 14M | CO1 | L4& L6 |
| | | **OR** | | | |
| 2. | a) | Derive the equation to determine deflection of fixed beam subjected to central point load? | 9M | CO1 | L3 |
| | b) | Determine the deflection of a fixed beam of span 5m subjected to UDL of 20kN/m? Take EI= 15000kNm$^2$. | 5M | CO1 | L3 |
| | | **UNIT–II** | | | |
| 3. | | Analyse and Interpret the results of a continuous beam shown in the figure and construct the SFD and BMD for the same.   | 14M | CO2 | L4& L6 |
| | | **OR** | | | |
| 4. | a) | State the degree of indeterminancy for the continuous beam given below<br>i. Three supports-simply supported at the ends<br>ii. End support is fixed and the other two are simply supported.<br>iii. A four span continuous beam with three interior supports, an interior hinge and with ends fixed.<br>iv. A span continuous beam with an internal hinge in every span. | 4M | CO2 | L2 |
| | b) | A simply supported beam is of 5m span and is subjected to a central concentrated load. The deflection beneath the load is 400mm. if the ends are fully fixed then what will be the deflection? | 10M | CO2 | L3 |
| | | **UNIT–III** | | | |
| 5. | | Analyse the continuous beam by slope deflection method. Construct SFD and BMD for the same.   | 14M | CO3 | L4 & L6 |
| | | **OR** | | | |

6. Analyze the continuous beam by moment distribution method. Construct the shear force and bending moment diagram.




14M CO3 L4& L6

**UNIT–IV**

7. Show that when the train of loads rolls over the span the bending moment is maximum under the
   a) Load when the centre line is midway between the load and the resultant of all the loads acting on the span.
   b) A single rolling load of 100kN rolls over a simply supported girder of 20metres span.

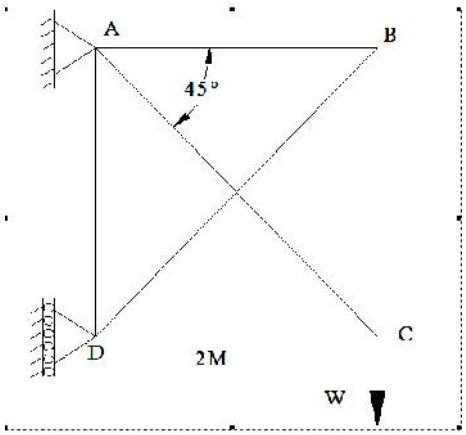
   Construct the diagram for the maximum shear force and maximum bending moment in the girder. 14M CO4 L4 & L6

**OR**

8. Two loads of 200kN and 250kN spaced at 5metres apart crosses a girder of 25 meters span from left to right with 200kN leading. Construct the maximum shearing force and bending moment diagrams stating the absolute maximum values. 14M CO4 L3

**UNIT–V**

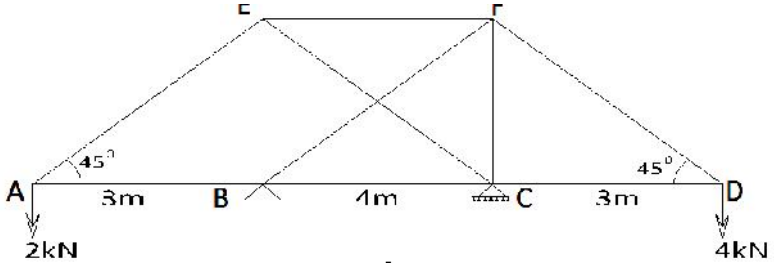
9. In the pin jointed frame work shown in Fig. all the members have the same cross sectional area. Determine the axial force in the member AC.




14M CO5 L3

**OR**

10. Distinguish between static and kinematic indeterminacy? Determine the static and kinematic indeterminacy of the given figures




14M CO5 L2

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