**POORNIMA UNIVERSITY, JAIPUR**

**END SEMESTER EXAMINATION, APRIL 2023**

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|  | **2BT4101** | Roll No. | Total Printed Pages: 2 |
| **2BT4101** |  |
| B. Tech. II Year IV- Semester (Main/Back) End Semester Examination, April 2023  **(CV)** | |
| **BCVCCV4101 : Structural Analysis-I** | | | |

# Time: **3**Hours. Total Marks: **60**

Min. Passing Marks: **21**

Attempt **five** questions selecting one question from each Unit. There is internal choice from Unit I to Unit V. Marks of each question or its parts are indicated against each question / parts. Draw neat sketches wherever necessary to illustrate the answer. Assume missing data suitably (if any) and clearly indicate the same in the answer.

Use of following supporting material is permitted during examination for this subject.

# **1.--------------------------Nil--------------------** **2.------------------Nil-----------------------**

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|  |  | **UNIT-I (CO1)** | **Marks** | **Bloom Level** |
| **Q.1** | **(a)** | A beam 6m long, simply supported at its ends, is carrying a point load of 50KN at its centre. The moment of inertia of the beam is given as equal to 78\*106 mm4. If E for the material of the beam equal to 2.1\*105, calculate: (I) Deflection at the centre of the beam and (II) Slope at the supports. | **(7)** | **Evaluate** |
|  |  |  |  |  |
|  | **(b)** | A cantilever of length 3m is carrying a point load of 50KN at the free end. If I=108 mm4 and E=2\*105 N/mm2, find (I) slope at the free end and (ii) Deflection at the free end. | **(5)** | **Evaluate** |
|  |  |  |  |  |
|  |  | **OR** |  |  |
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| **Q.2** |  | Derive the maximum slope and deflection for simply supported beam, If uniformly distributed load acting on the beam, by using Double Integration method? | **(12)** | **Evaluate** |
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|  |  | **UNIT-II (CO2)** |  |  |
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| **Q.3** |  | A continuous beam ABC covers two consecutive span AB and BC of lengths 4m and 6m, carrying uniformly distributed loads of 6KN/m and 10KN/m respectively. If the ends A and C are simply supported, find the support moments at A, B and C. Draw also B.M. and S.F. diagrams. | **(12)** | **Evaluate** |
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|  |  | **OR** |  |  |
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| **Q.4** |  | A continuous beam ABCD of lengths 15m rests on four supports covering 3 equal spans and carries a uniformly distributed loads of 1.5KN/m. Calculate the moments and reactions at the supports. Draw also B.M. and S.F. diagrams. | **(12)** | **Evaluate** |
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|  |  | **UNIT-III (CO3)** |  |  |
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| **Q.5** | **(a)** | A closely coiled helical spring is to carry a load of 500 N. Its mean coil diameter is to be 10 times that of the wire diameter. Calculate these diameters, if the maximum shear stress in the material of the spring is to be 80 N/mm². Also derive the section modulus for rectangular section. | **(7)** | **Evaluate** |
|  |  |  |  |  |
|  | **(b)** | Find the maximum shear stress induced in a solid circular shaft of diameter 15 cm when the shaft transmits 150 kW power at 180 rpm. Also derive the section modulus for circular section. | **(5)** | **Evaluate** |
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|  |  | **OR** |  |  |
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| **Q.6** |  | Two shafts of the same material and of same lengths are subjected to the same torque, if the first shaft is of a solid circular section and the second shaft is of hollow circular section, whose internal diameter is 2/3 of the outside diameter and the maximum shear stress developed in each shaft is the same, compare weights of the shafts. | **(12)** | **Evaluate** |
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|  |  | **UNIT-IV (CO4)** |  |  |
|  |  |  |  |  |
| **Q.7** | **(a)** | Define the following term:  (i) Resilience (ii) Impact loading  (iii) Strain energy (iv) Spring | **(6)** | **Remember** |
|  |  |  |  |  |
|  | **(b)** | A steel rod is 2 m long and 50 mm in diameter, An axial pull of 100 KN is suddenly applied to the rod. Calculate the instantaneous stress induced and also the instantaneous elongation produced in the rod. Take E-200 GN/m2. Also define the any two theory of failure. | **(6)** | **Evaluate** |
|  |  |  |  |  |
|  |  | **OR** |  |  |
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| **Q.8** | **(a)** | The shear stress in a material at a point is given as 50 N/mm2 Determine the local strain energy per unit volume stored in the material due to shear stress. Take C = 8 \*104 N /mm2. Also define the proof resilience and modulus of resilience. | **(6)** | **Evaluate** |
|  |  |  |  |  |
|  | **(b)** | Prove that the maximum stress induced in a body due to suddenly applied load is twice the stress induced when the same load is applied gradually. | **(6)** | **Evaluate** |
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|  |  | **UNITV (CO5)** |  |  |
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| **Q.9** | **(a)** | A gun barrel of mass 500kg has a recoil spring of stiffness 3, 00,000 N/m. If the  barrel recoils 1.2 meters on firing, determine,  (a) Initial velocity of the barrel  (b) Critical damping coefficient of the dashpot which is engaged at the end of the  recoil stroke  (c) Time required for the barrel to return to a position 50mm from the initial position. | **(8)** | **Evaluate** |
|  |  |  |  |  |
|  | **(b)** | How do you use logarithmic decrement? | **(4)** | **Apply** |
|  |  |  |  |  |
|  |  | **OR** |  |  |
|  |  |  |  |  |
| **Q.10** | **(a)** | A 25 kg mass is resting on a spring of 4900 N/m and dashpot of 147 N-se/m in Parallel. If a velocity of 0.10 m/sec is applied to the mass at the rest position, what will be its displacement from the equilibrium position at the end of first second? | **(8)** | **Evaluate** |
|  |  |  |  |  |
|  | **(b)** | What is the difference between damped and undamped free vibration? | **(4)** | **Remember** |