KATHMANDU UNIVERSITY
End Semester examination
May/June, 2022

Marks Scored:

Level : B.E.
Year : II
Course : CIEG 208
Semester : II

Exam Roll No :
Time: 30 mins
F.M : 10

Registration No:
Date :

SECTION "A"
[20 Q × 0.5 = 10 Marks]

Encircle the most appropriate answer.

1. A beam is said to be loaded in a pure bending when
   a. Bending moment and shear force are constant but not zero
   b. Bending moment is changing linearly
   c. Bending moment and shear force both are changing linearly
   d. Bending moment is constant

2. What will be the change in thickness of a steel bar of 2 m long, 40 mm wide and 20 mm thick when the bar is subjected to an axial pull of 160 kN in the direction of its length. If E = 200 GPa and Poisson's ratio = 0.3
   a. 0.006 mm b. 0.06 mm c. 0.6 mm d. 0.0006 mm

3. The steel plate is bent into a circular path of radius 10 meters. If the plate section be 120 mm wide and 20 mm thick, then the maximum bending stress will be ____ ($E = 2 \times 10^5$ N/mm^2)
   a. 350 N/mm^2 b. 400 N/mm^2 c. 200 N/mm^2 d. 500 N/mm^2

4. The maximum bending moment due to a moving load on a simply supported beam occurs
   a. At the mid span
   b. At the supports
   c. Under the load
   d. Anywhere on the beam

5. A solid circular shaft of 60 mm diameter transmits a torque of 1600 N-m. The value of maximum shear developed is _____.
   a. 37.72 MPa b. 47.72 MPa c. 57.72 MPa d. 67.72 MPa

6. The point of contra flexure in a loaded beam in the point where
   a. The bending moment is maximum
   b. The bending moment changes sign
   c. The shear force changes sign
   d. None

7. In a beam of I- section the maximum shear forces is carried by
   a. The upper flange
   b. The web
   c. The lower flange
   d. All of these

8. When a bar is subjected to a change of temperature and its deformation is prevented, the stress induced in the bar is
   a. Compressive stress
   b. Shear stress
   c. Thermal stress
   d. Tensile stress

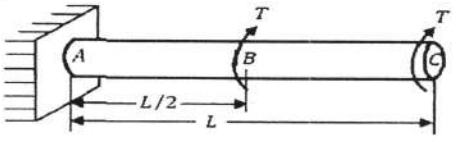
9. When a body is subjected to the three mutually perpendicular stresses, of equal intensity, the ratio direct stress to the corresponding volumetric strain is known as
   a. Young's modulus
   b. Modulus of rigidity
   c. Bulk modulus
   d. Poisson's ratio

10. Engineering stress-strain curve and True stress-strain curve are equal up to
   a. Proportional limit
   b. Yield point
   c. Elastic limit
   d. Tensile strength point

11. What is the elongation of the plate of 20 mm thickness tapers uniformly from 100 mm to 50 mm in a length of 400 mm if an axial force of 80 kN act on it? Given E = 200 GPa.
   a. 0.11 mm b. 0.22 mm c. 0.33 mm d. 0.44 mm

12. Identify the correct relationship that exist between the modulus of elasticity E, Modulus of rigidity G, Bulk modulus K
   a. $E = \frac{3K+G}{9KG}$ b. $E = \frac{3KG}{3K+G}$ c. $E = \frac{9KG}{3K+G}$ d. $E = \frac{K}{G}$

13. A circular shaft *ABC* of diameter, d and length, L is fixed at end *A*. It is subjected to the torsional moments at point *B* and point *C* as shown in the figure. The ratio of angle of twists at point *B* to point *C* is



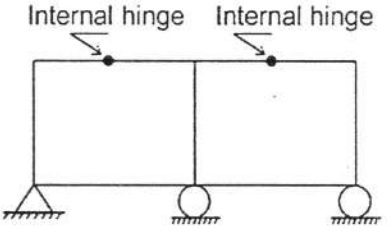
   a. 1.5: 1 b. 1: 3 c. 1: 2 d. 1: 1.5

14. The slenderness ratio of a vertical column of square cross- section of 10 cm side and 500 cm long, is
   a. 117.2 b. 17.3 c. 173.2 d. 137.2

15. A cantilever AB is subjected to a concentrated load at the free end the slope and deflection at the free end are $WL^2/2EI$ and $WL^3/3EI$. If the same load is applied at mid span point, the deflection at the free end will be
   a. $\frac{5}{384}\frac{WL^3}{EI}$ b. $\frac{5}{48}\frac{WL^3}{EI}$ c. $\frac{WL^3}{6EI}$ d. $\frac{WL^3}{16EI}$

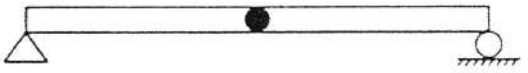
16. The major and minor principal stresses at a point are 5 and -5 MPa respectively. Maximum shear stress at the point is _____ MPa.
   a. 0 b. 5 c. 7 d. 10

17. Degree of static indeterminacy for the frame shown below is _____.



   a. 8 b. 7 c. 6 d. 5

18. A prismatic beam is shown in the figure given below

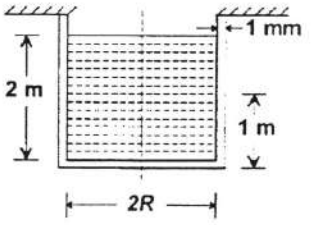


Consider the following statements:
I. The structure is unstable.
II. The bending moment is zero at support and internal hinge
III. It is a mechanism
IV. It is statically indeterminate

Which of the statements are **CORRECT**?
a. I, II and III b. I, II, II and IV c. I and II d. III and IV

19. A water supply pipe line 50 cm diameter contains water at a pressure head of 150 m. if the weight of water is 1000 kg/ m3, what is the thickness of the metal required for the water main, if the maximum permissible stress in the metal is 180 kg/ cm^2.
a. 2.4 cm b. 2.9 cm c. 2.1 cm d. 3.1 cm

20. A cylindrical container of radius R= 1 m, wall thickness 1 mm is filled with water up to a depth of 2 m and suspended along its upper rim. The density of water is 1000 kg/m^3 and acceleration due to gravity is 10 m/s^2.



If the young's modulus and Poisson's ratio of the container material are 100 GPa and 0.3, respectively the axial stress in the cylinder wall at mid depth is
a. 0.5×10^4 b. 1×10^4 c. 1.5×10^4 d. 2×10^4

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SECTION "B"

Attempt ***ALL*** questions. Any data you feel missing suitably be assumed and stated clearly.
A normal graph is provided with this question paper which should be attached with the answer sheet.

1. Derive the expression for the total elongation due to the circular tapering bar. The state of stress in a two dimensionally stressed body is shown in Figure 1. Determine principal stress, principal plane and maximum shear. Determine also the normal and tangential stress on inclined plane and verify results using Mohr's circle. [2 + 5]

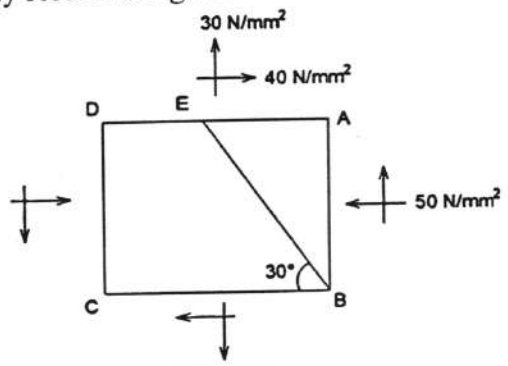

Figure 1

2. Determine the orientation of principal axes and principal moment of inertia about centroidal axes of the composite section shown in Figure 2. [6]

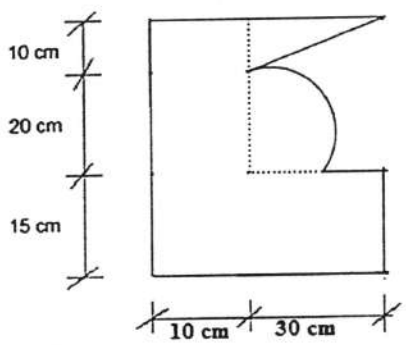

Figure 2

3. Prove that longitudinal stress is half of the circumferential stress for the thin cylinder with neat sketch. A cylinder is 150 mm diameter and 750 mm long with a wall thickness of 2 mm, is subjected to an internal pressure of 0.8 MN/m^2 greater than the outside pressure. Calculate the following. [4]
   a. The circumferential and longitudinal stresses
   b. The circumferential and longitudinal strains
   c. The changes in cross sectional area
   d. The change in length
   e. The change in volume

4. A hollow steel shaft 3m long must transit 150 kN of power at 150 rpm. The total angle of twist in this length should not exceed 2.5 degree and allowable shearing stress is 60 MPa. Determine the inside and outside diameter of the shafts if G = 85 GPa. [6]

5. A horizontal beam of the section shown in the Figure 3 is 3 m long and is simply supported at the ends. Find the maximum uniformly distributed load it can carry if the compressive and tensile stresses must not exceed 560 kg/cm^2 and 300 kg/cm^2 respectively. Draw a diagram showing the variation of stress over the mid span section of the beam. [6]

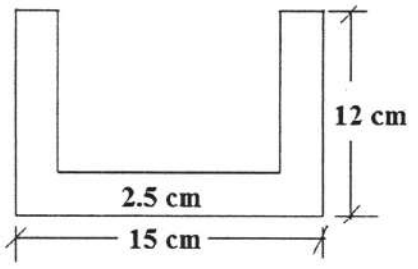

Figure 3

6. Derive the expression for Euler's critical load for strut with one end fixed and the other hinged. Explain the limitation to the use of this formula. [4]

7. Draw axial force, shear force and bending moment diagrams for the frame shown in the Figure 4 indicating the principal numerical values at salient point. [7]

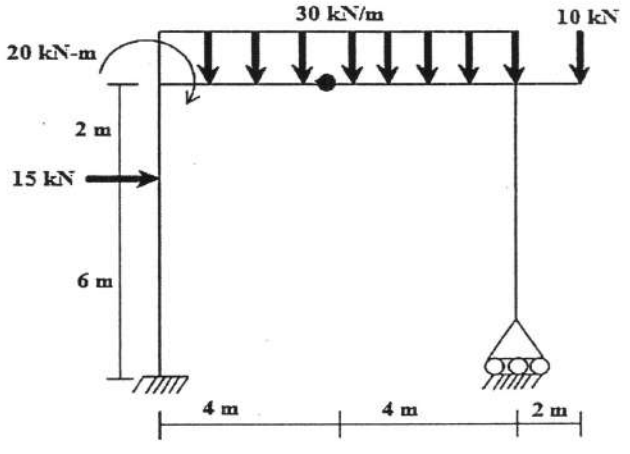

Figure 4

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F. M. : 20

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Date : 16 June

SECTION "A"
[20Q. × 1 = 20 marks]

Encircle the most appropriate answer.

1. Protein binding of drug helps in
   a. Distribution
   b. Prolongation of half life
   c. Limiting metabolism
   d. All of the above

2. Nicotinic receptors are seen in
   a. Skeletal muscle
   b. Cardiac muscle
   c. Visceral smooth muscle
   d. Salivary glands

3. Which of the following is a phase II drug metabolizing reaction?
   a. Acetylation b. Reduction c. Oxidation d. Deamination

4. Epinephrine added to a solution of lidocaine for local anesthesia
   a. Causes cyanosis locally
   b. Increases the absorption of lidocaine
   c. Increases the risk of convulsions
   d. Increases the duration of lidocaine

5. Ameliorative test is performed for the diagnosis of
   a. Opioid poisoning
   b. Organophosphate poisoning
   c. Myasthenia gravis
   d. Galucoma

6. Which of the following is considered as a high ceiling diuretics?
   a. Spironolactone b. Amiloride c. Furosemide d. Hydrochlorothiazide

7. Phocomelia is a known teratogenic effect of
   a. Anticancer drugs
   b. Antiepileptic drugs
   c. Antiviral drugs
   d. Thalidomide

8. Megaloblastic anemia is caused by the deficiency of
   a. Iron b. Vitamin C c. Vitamin B12 d. Vitamin D

9. Route of administration of heparin is
   a. Oral b. Subcutaneous c. Intramuscular d. Sublingual

10. Acetylcholine and atropine action on the muscarinic receptors is an example of
    a. Competitive antagonism
    b. Physiological antagonism
    c. Non-competitive antagonism
    d. Chemical antagonism

11. Which type of drugs do penetrate CNS better?
a. Lipid soluble b. Weak Acids c. Weak bases d. Water soluble

12. Which of the following helps to regenerate cholinesterase enzyme during organophosphate poisoning?
a. Pralidoxime b. Physiostigmine c. Atropine d. Neostigmine

13. Adrenalin is contraindicated in
a. Galucoma b. Hypertension c. Bronchial asthma d. Anaphylactic shock

14. Which one of the following drug is drug of choice in renal failure with shock?
a. Adrenaline b. Sotalol
c. Ipratropium bromide d. Dopamine

15. Which of the following is **TRUE** for Digitalis?
a. Increases force of contraction of heart b. Increases peripheral resistance
c. Decreases heart rate d. All of the above

16. Spina bifida is a condition in newborn associated with the deficiency of .....during pregnancy.
a. Folic acid b. Vitamin E c. Ferrous sulphate d. Vitamin A

17. Beta 3 receptors are located in
a. Bronchi b. Adipose tissue c. Liver d. JG cells in kidney

18. Drug of choice for the treatment of acute attack of migraine is
a. Beta blockers b. Rizatriptan
c. Amitriptyline d. Calcium channel blockers

19. Which one of the following drug is used in the recanalization of thrombosed coronary artery?
a. Streptokinase b. Heparin c. Tranexamic acid d. Aspirin

20. A woman in the 28th week of pregnancy has been diagnosed with pregnancy induced HTN with BP of 150/95 mmHg. Select the most appropriate antihypertensive drug for her.
a. Losartan b. Methyldopa c. Captopril d. Propranolol

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SECTION "B"

[5Q. × 3 = 15 marks]

Answer *ANY FIVE* questions.

1. Define bioavailability. What are factors affecting drug absorption?
2. Discuss on Paracetamol poisoning and its management.
3. Define apparent volume of distribution with an example.
4. Explain presystemic metabolism and methods to avoid it.
5. Define essential medicines. Discuss on criteria for the selection of essential medicines laid down by WHO.
6. Discuss on drug potency and efficacy with an illustration.
7. Explain on various drugs used for the treatment of Gout.

SECTION "C"

[5Q. × 5 = 25 marks]

Answer *ANY FIVE* questions.

8. Discuss on various routes of drug administration and the factors governing choice of route.
9. Discuss on different types of pharmacokinetic drug-drug interaction with example for each.
10. Classify skeletal muscle relaxants. Write short notes on Depolarizing blockers with examples.
11. What are purposes of drug metabolism? Discuss phase I and II drug metabolism with examples.
12. Elaborate on mechanism of action, therapeutic uses and ADRs of Warfarin.
13. What are the effects of prostaglandins as an autacoid in a human body? Explain its therapeutic uses.
14. Classify diuretics. Discuss on MOA and therapeutic uses of Spironolactone.

SECTION "D"

[2Q. × 7.5 = 15 marks]

Answer *ANY TWO* questions.

15. Classify anticholinesterases agents. Discuss in detail on the uses of these agents in Myasthenia gravis and postoperative decurarization.
16. What are different types of angina? Discuss in detail about the various drugs, their MOA of action, ADRs of anti-angina drugs?
17. a. Discuss on the role of Dopamine in the treatment of patients with a cardiogenic or septic shock. [4]
    b. Discuss on different types of antagonism with an example for each. [3.5]