KATHMANDU UNIVERSITY
End Semester Examination
August/September, 2017

Mark Scored:

Level : B. Tech.
Year : II

Course : ENVE 205
Semester : II

Exam Roll No. :

Time: 30 min

F. M. : 20

Registration No.:

Date : SEP 13 2017

SECTION "A"
[20 Q. × 1 = 20 marks]

Circle the correct answer from the given choices. Attempt all the questions.

1. Modulus of rigidity may be defined as the ratio of
   a) Linear stress to lateral strain
   b) Lateral strain to linear strain
   c) Linear stress to linear strain
   d) Shear stress to shear strain

2. Volumetric strain for cylindrical rod is equal to
   a) Sum of twice the strain in diameter and strain in length
   b) Sum of twice the strain in length and strain in diameter
   c) Thrice the strain in diameter
   d) Equal to strain in diameter

3. Modular ratio of the two materials is the ratio of
   a) Linear stress to linear strain
   b) Shear stress to shear strain
   c) Their modulus of elasticities
   d) Their modulus of rigidities

4. When a cube is subjected to three mutually perpendicular tensile stresses of equal intensity (σ), the volumetric strain is
   a) 3σ/E*(1-2/m) b) E/3σ*(1-2/m) c) 3σ/E*(2/m-1) d) E/3σ*(2/m-1)

5. The total strain energy stored in the body is termed as
   a) Resilence b) Proof Resilence c) Impact Energy d) Modulus of resilence

6. The strain energy stored in a body, when loaded suddenly, is _____ times the strain energy stored when same load is applied gradually.
   a) equal b) two c) one-half d) four

7. The term EI used in moment curvature relationship is:
   a) Torsional rigidity b) Axial Rigidity c) Flexural Rigidity d) Section Modulus

8. For a tapering rod of diameter 'd1' and 'd2' and length 'L' subjected to axial force of 'P' at the ends, the extension will be:
   a) (4*P*L)/(л*E*d1*d2)
   b) (8*P*L)/(л*E*d1*d2)
   c) (4*P*L*d1*d2)/(л*E)
   d) (8*P*L*d1*d2)/ (л*E)

9. The strain energy stored in the body when subjected to maximum load is termed as
   a) Resilence
   b) Proof Resilence
   c) Proof Stress
   d) Modulus of Resilence

10. The beam with both ends fixed and a internal hinge at between will be statically indeterminate by _____ Degree
    a) 1 b) 2 c) 3 d) 4

11. The maximum deflection of cantilever beam subjected to UDL of "w" per unit run is:
a) $wl^3/3EI$ b) $wl^2/2EI$ c) $wl^4/8EI$ d) $wl^3/8EI$

12. The shear stress at the center of a circular shaft under torsion is
a) zero b) minimum c) maximum d) infinity

13. When a shaft is subjected to a twisting moment, every cross-section of the shaft will be under
a) Tensile stress b) Compressive stress c) Shear stress d) Bending stress

14. The square root of the ratio of moment of inertia to the area of a cross section is called a
a) Section Modulus b) Slenderness Ratio c) Radius of Gyration d) Shear Modulus

15. Two shafts 'A' and 'B' are made of same material. The shaft 'A' is of diameter 'D' and shaft 'B' is of diameter 'D/2'. The strength of shaft 'B' is _____ as that of shaft 'A'.
a) One-eighth b) One-fourth c) One-half d) Four times

16. The expression EId^4y/dx^4 at a section of a member represents:
a) Shearing Force b) Rate of loading c) Bending Moment d) Slope

17. The relationships between three elastic constants E,G and K are:
a) $E = \frac{9KG}{3K+G}$ b) $G = \frac{9KE}{3E+G}$ c) $E = \frac{9KG}{K+3G}$ d) $K = \frac{9EG}{3G+E}$

18. Compression member always tend to buckle in the direction of the
a) Axis of load b) Perpendicular to axis of load
c) Minimum cross section d) Least radius of gyration

19. The direct stress in long column is _____ as compared to bending stress.
a) same b) more c) less d) negligible

20. When a beam is subjected to bending moment, the stress at any point is _____ the distance of the point from the neutral axis.
a) Equal to b) Directly proportional to
c) Inversely proportional to d) Independent to

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SECTION "B"

Answer *ALL* the questions. The data or information not given in the questions should be assumed properly.

1. Two vertical rods one of steel and the other of copper are each rigidly fixed at the top and are 500 mm apart. Diameter and length of each rod are 20 mm and 4 metres respectively. A cross bar fixed to the rods at the lower ends carries a load of 5000 N such that the cross bar remains horizontal even after loading. Find the tension in each rod and the position of the load on the bar. Take Elasticity of steel and Elasticity of copper as $2*10^5$ N/mm^2 and $1*10^5$ N/mm^2 respectively. [3+3+2]

2. A horizontal beam is simply supported at the ends and carries a uniformly distributed load of 10 KN/m between the supports placed 10 m apart. Anticlockwise moments of 150 KN/m and 100 KN/m are applied to the left and right ends of the beam at the supports. Determine the position and magnitude of the maximum bending moment and draw Shear force diagram and Bending moment diagram. [2+3+3]

3. A beam ABC of length *(l+a)* is supported at one end A and at B distant 'l' from A with an overhang BC of length 'a'. It carries a point load 'W' at C. Find the deflection at 'C' and the maximum deflection between 'A' and 'B'. Use Macaulay's method. [4+4]

4. A hollow shaft with diameter ratio 0.6 is required to transmit 450 KW at 120 rpm with a uniform twisting moment. The shearing stress in the shaft must not exceed 60 MPa and the twist in a length of 2.5 m must not exceed 1 degree. Calculate the minimum external diameter of the shaft satisfying these conditions. Take modulus of rigidity = $8*10^4$ N/mm^2 [7]

5. For a cantilever beam of length 4m loaded with gradually varying load of zero in the fixed end and 5KN/m in the free end, draw the bending stress diagram(with magnitude) for section at fixed end and section at 1m from fixed end. The cross section of beam is solid regular hexagon with length of each side as 100mm. [4+4]

6. A vertical tie, fixed rigidly at the top end consists of a steel rod 2.50 m long and 20 mm diameter encased throughout in a brass tube 20 mm internal diameter and 30 mm external diameter. The rod and the casing are fixed together at both ends. The compound rod is suddenly loaded in tension by a weight of 10 KN falling freely 3 mm before being arrested by the tie. Calculate the maximum stress in steel and brass. Take Elasticity of steel and Elasticity of brass as $2*10^5$ N/mm^2 and $1*10^5$ N/mm^2 respectively. [4+4]

7. Find the ratio of the strength of a solid circular column with that of a hollow circular column of equal area, whose internal diameter is 2/3 times the external diameter. Both the columns are of same material, having the same length and are hinged at their ends. [8]

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Time: 30 mins

F. M. : 10

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Date : SEP 13 2017

SECTION "A"
[20Q × 0.5 = 10 marks]

Mark " √ " in the appropriate box.

1. The study of the processes of formation of continents is called _____
   a. Petrology b. Plate tectonics c. Mineralogy d. Volcanology

2. Mantle is divided into _____ parts.
   a. Four b. Three c. Two d. Five

3. The most destructive seismic wave is _____
   a. Body wave b. P-wave c. Rayleigh Wave d. Love wave

4. The density of Core lies in the range of _____
   a. 9.9-12.8 g/cm^3 b. 2.8-3.1 g/cm^3 c. 4.8-5.2 g/cm^3 d. 5.5-6.3 g/cm^3

5. _____ are formed either by water waves or by winds piling up the sediment into long ridges.
   a. Mud cracks b. Ripple marks c. Sole marks d. Cross-bedding

6. Mineralogy is _____.
   a. study of minerals, including their formation, composition, properties, and classification
   b. the study of rocks and the condition in which rocks form.
   c. study of geometrical appearances of crystals
   d. the science of evolutionary history of fossils

7. Intrusive rocks are formed due to _____.
   a. cooling of lava on the surface of the earth
   b. cooling of magma beneath the surface of the earth
   c. rapid cooling of molten lava
   d. crystallization of specific minerals beneath the surface of the earth

8. Most of the sedimentary rocks exhibit _____
   a. Platy structures b. Primary structures c. Foliations d. Gneissosity

9. Metamorphic rocks are derived from _____.
   a. rapid cooling of lava on the surface of the earth
   b. slow cooling of magma beneath the surface of the earth
   c. changes in pressures and temperatures below the melting of any igneous and/or sedimentary rocks
   d. sedimentary basin

10. Strike of a bedding/foliation plane is _____.
    a. trend measured on a horizontal surface
    b. line formed by the intersection of the bedding and a horizontal plane.
    c. slope of a layered rocks
    d. a & b

11. Overturned fold is _____.
    a. in which axial plane is inclined, and both limbs dip in the same direction
    b. in which axial plane is vertical, and both limbs dip in the same direction
    c. in which axial plane is inclined, and both limbs dip in the opposite direction
    d. in which axial plane is vertical, and both limbs dip in the opposite direction

12. Debris flow is _____.
    a. detachment and down slope transport of soil and rock material under the influence of gravity
    b. downward and outward movements of slope-forming materials along surfaces of separation and flowing at a faster rate
    c. movement of weathered surface soil layer/rock of steep slope
    d. rapid movement of deposited or eroded sediments along the stream including large volume of water through the stream

13. According to Cruden and Varnes (1992), velocity class 5 (Rapid) categorizes to _____ mm/sec.
    a. 5×10^{-3} b. 50×10^{-6} c. 50 d. 5×10^{3}

14. Confined aquifer refers to _____.
    a. which water seeps from the ground surface directly above the aquifer
    b. which an impermeable dirt/rock layer exists that prevents water from seeping into the aquifer from the ground surface located directly above
    c. a saturated but relatively impermeable material that does not yield appreciable quantities of water to well
    d. a saturated but relatively impermeable material that does not yield appreciable quantities of water to well

15. Indirect subsurface investigation is _____.
    a. related with direct contact with subsurface through different geophysical surveys.
    b. related to exploratory excavation
    c. related with digging ditches, pits, trench, etc.
    d. related without direct contact with subsurface.

16. _____ rock represents the metamorphic rock.
    a. Limestone b. Dolomite c. Gabbro d. Marble

17. Engineering geological investigations of dams and reservoirs reveal that the beds with gentle upstream dip (10-30°) indicates _____.
    a. unstable b. unfavorable c. not bad d. ideal

18. _____ separates Terai and Siwaliks (Chure) in the Nepal Himalaya.
    a. MFT b. MBT c. MCT d. STD

19. For the preparation of aggregates, _____ are used.
    a. gravels b. clay minerals c. cobbles d. boulders

20. The magnitude of earthquake 8 Richter Scale will be _____ times larger than the magnitude 5.
    a. 10 b. 100 c. 1000 d. 10,000