Marks scored:

KATHMANDU UNIVERSITY
End Semester Examination [C]
July, 2017

Level : B. E./B. Tech.
Year : III
Course : CIEG 305
Semester: I

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

Registration No.:
Date JUL 12 2017

SECTION "A"
[20 Q. × 0.5 = 10 marks]

1. Two beam of equal cross sectional area are subjected to equal bending moment. If one beam has square cross section and the other has circular section, then
   a. Both beams will be equally strong
   b. Circular section beam will be stronger
   c. Square section beam will be stronger
   d. The strength of the beam will depend on the nature of loading

2. A cantilever beam is loaded uniformly throughout its length. The shape of the shear force will be
   a. Right angle triangle
   b. An isosceles triangle
   c. A rectangle
   d. Equilateral triangle

3. The shear force in the centre of a simply supported beam carrying a uniformly distributed load of w per unit length, is
   a. zero
   b. $wl^2/2$
   c. $wl^2/4$
   d. $wl^2/8$

4. The deflection of any rectangular beam simply supported is
   a. Directly proportional to its weight
   b. Inversely proportional to its width
   c. Inversely proportional to the cube of its depth
   d. Directly proportional to the cube of its length

5. The influence line for reaction at a support of a simply supported beam is
   a. Triangle with ordinate 1 at that support
   b. Triangle with ordinate 1 at the other support
   c. Rectangle with ordinate of ½
   d. Rectangle with ordinate of 1

6. The statically indeterminate structures can be solved by
   a. Using equations of statics alone
   b. Equations of compatibility alone
   c. Ignoring all deformations and assuming the structure to be rigid
   d. Using the equations of statics and the necessary number of equations of compatibility

7. An internally indeterminate structure
   a. Must be externally indeterminate
   b. Must be externally determinate
   c. May be unstable structure based on support
   d. Must be stable structure

8. A prop is
   a. An additional support provided to a stable structure to avoid any displacement at the desired point in a direction perpendicular to the plane of the prop
   b. The support which gives the maximum number of reactions for the stability of the structure
   c. A support which will not affect the geometry of the deformed structure
   d. A dummy support provided for architectural purposes

9. For the application of moment area method to find deflection at the section in a beam
   a. The position of at least one tangent to the elastic curve, at any section, should be known
   b. The M/EI diagram must be a triangle
   c. The beam must be of uniform moment of inertia
   d. The BM if known is sufficient

10. The basic form of a pin jointed frame is a
    a. Triangle b. Rectangle c. Trapezium d. Parallelogram

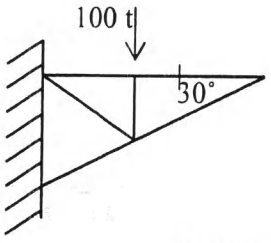
11. In a pin jointed frame it is sufficient if the forces in all the members meeting at a joint are
    a. Co – planar
    b. Co – planar and concurrent
    c. Equal in magnitude
    d. Concurrent

12. When a single load W moves over a simply supported beam, the maximum Shear Force at a section will occur when the load is placed
    a. Over the nearer support
    b. Over the farther support
    c. Over the section
    d. At centre of span

13. The moments in the arch will be zero, if
    a. Ends are hinged
    b. Ends are fixed
    c. The arch coincides with the line of thrust
    d. The arch axis is parallel to the line of thrust

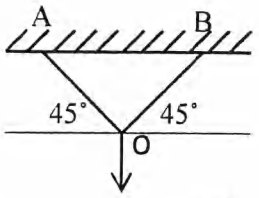
14. A truss containing j joints and m members, will be a simple truss if
    a. $m = 2j - 3$ b. $j = 2m - 3$ c. $m = 3j - 2$ d. $j = 3j - 2$

15. In the truss shown in figure the force in member marked by |, is



    a. 100 t compressive
    b. 100 t tensile
    c. Zero
    d. indeterminate

16. Two bars AO and BO are of uniform area A and length l are hinged at O as shown in figure. A load W is applied at O. The vertical deflection of O will be



a. Wl/AE b. $Wl/2AE$ c. W^2l/AE d. $W^2l/2AE$

17. When uniformly distributed load, longer than the span of the simply supported girder, moves from left to right, then the maximum bending moment at mid-section of span occurs when the uniformly distributed load occupies
a. Less than the left half span
b. Whole of left half span
c. More than the left half span
d. Whole span

18. A suspension cable supporting loads will be under
a. Tension
b. Bending
c. Compression
d. Compression and tension

19. The ratio of the stresses produced by a suddenly applied load and by a gradually applied load on a bar is
a. 1 b. 2 c. ½ d. 3

20. A three hinged parabolic arch of uniform corss section has a span of 60 m and rise of 10 m. It is subjected to uniformly distributed load of intensity 10 kN/m throughout the span. The bending moment at 10 m from left hand support is
a. 0 b. 4500 kN/m c. 750 kN/m d. 3000 kN/m

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Semester: I
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SECTION "B"

Attempt *ALL* questions. Assume data if necessary.

1. A three – hinged parabolic arch of span 20 m and rise 5 m carries a triangular loading whose intensity varies from 15 kN/m at each abutment to zero at the crown. Find the reactions at the supports and the maximum bending moment and the section where it occurs. [5]

2. A beam ABCD 9 m long is simply supported at the ends A and D and carries a concentrated load of 18 kN at C. the parts AB, BC and CD are each 3 m long. The moment of inertia of the section for the parts AB, BC and CD are respectively 3I, 2I and I. find using conjugate beam method (i) slopes at A, B, C and D (ii) Deflections at B and C. Take E = 200 kN/mm^2 and I = 4.15 X 10^7 mm^4. [5]

3. Draw influence line diagram for reaction at A and B, shear force and bending moment at E (mid – point of AB) of the beam shown in Figure 1. Also calculate their maximum values if UDL of 2 kN/m longer than the span traverses the beam. [5]

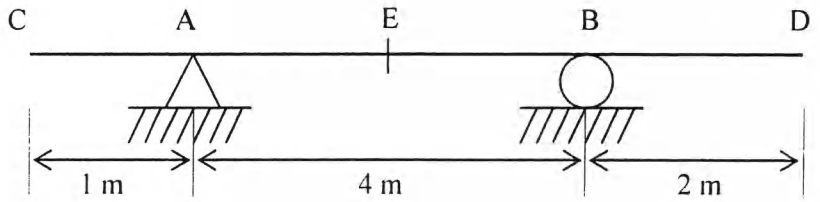
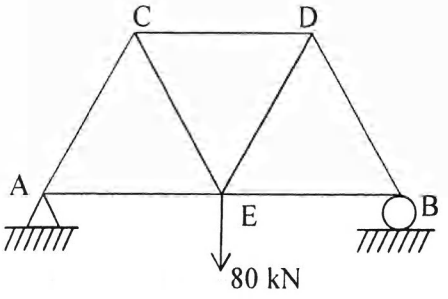


Figure 1.

4. A suspension cable with 100 m span and 8 m dip is stiffened by a three – hinged girder. The dead load of the girder and deck is 7.5 kN/m. Find SF and BM in the girder at a section 20 m from left hand hinge when a concentrated load of 150 kN is placed at 16 m from the left end. Find the maximum tension in the cable. [5]

5. Determine the vertical deflection of joint E of the truss shown in figure 2, due to given loading, due to increase of temperature by 20° C in the member AE and EB and also due to the member CE and DE being 10 mm too long. Given for all members, length of each chord is 2 m, cross sectional area = 100 mm^2, Young's modulus = 200 kN/mm^2 and $\alpha = 12 \times 10^{-6}$/°C. [10]



6. Determine slope at A and C and deflection at E (midpoint of CD)of the beam shown in Figure 3 using moment area method. [5]

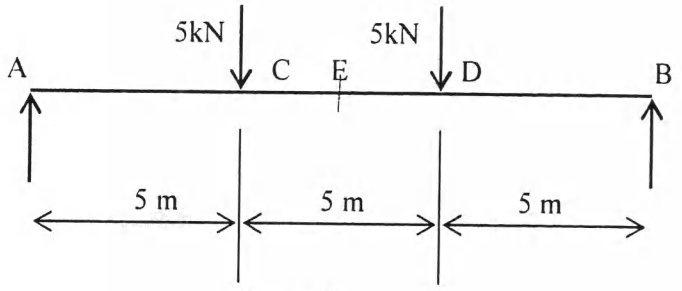


Figure 3

7. A footbridge of width 3 m and span 60 m is carried by two cables of uniform section having central dip of 5 m. If the platform load is 4 kN/m^2, calculate the maximum pull in each cable due to this load. What will be the central dip in each cable if a single concentrated load of amount equal to total platform load as above acts at the centre of each cable instead of having bridge? Neglect self-weight of the cables. [5]

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SECTION "A"
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Encircle the most appropriate answer to the following questions.

1. In a 36 slots 4 pole 3 phase alternator the winding pitch is 7. The electrical angle by which the winding is chorded is equal to .....degrees.
a. 40 b. 30 c. 60 d.15

2. A 10 pole synchronous generator revolves at 600 rpm. The stator has 90 slots and 8 conductors per slot. The flux per pole is 0.04Wb, distribution factor is 0.965 and pitch factor is 1. The no load terminal voltage will be V
a. 771.23 b.1542.46 c. 1781.02 d. 890.53

3. A synchronous generator with load frequency of 61Hz and slope 1MW/Hz is connected to supply a load of 1000kW. The system frequency will be .....
a. 59 b. 60 c. 61 d. 62

4. When two generators are operating together an increase in governor set points on one of them .....
a. increasesthe power supplied by thatgenerator.
b. increasesthe reactive power supplied by that generator.
c.decreases the system frequency .
d. increases the power supplied by the othergenerator.

5. Two generators G1 and G2 are connected in parallel to supply a load of 80MW. G1 is rated as 40MVA with 5% speed regulation and G2 is rated as 60MVA with 5% speed regulation. The load sharing between the two generators will be .....
a. G1 48MW and G2 32MW b. G1 40MW and G2 40MW
c. G1 30MW and G2 50MW d. G1 32MW and G2 48MW

6. A 470 V, 50 Hz, Y-connected six pole synchronous generator has a per phase synchronous reactance of 1Ω. Its full load armature current is 60 A at 0.8 p.f. lagging and the armature resistance is negligible compared to inductance. The field current has been adjusted so that the terminal voltage is 480V at no load. The terminal voltage of the generator if it is loaded with rated current at 0.8 p.f. laggingis V
a. 524.9 b.458.3 c.231 d. 400.2

7. A 3-phase Y-connected, 100 kVA, 480 V, 60 Hz synchronous generator has synchronous impedance (0.08+j2.3)Ω . The per unit impedance of the generator is .....
a. 2.304 b. 0.08 c. 0.0347 d. 0.998

8. A dc test is performed on a 208-V,Y-connected 7.5-hp induction motor. If V_{DC}= 13.6 V and I_{DC} = 28 A, the stator resistance R_1 is .....Ω
a. 0.48 b. 0.24 c. 0.16 d. 0.32

9. If a three phase 4 pole 50Hz induction motor runs at a speed of 1440 rpm, then the slip is .....
a. 0.03 b. 0.1 c. 0.04 d. 0.05

10. Hunting in a synchronous motor takes place .....
a. when supply voltage fluctuates
b. when load varies
c. when power factor is unity
d. motor is under loaded

11. A 400 V, 50 Hz 30 hp, three-phase induction motor is drawing 50 A current at 0.8 power factor lagging. The stator and rotor copper lossesare 1.5 kW and 900 W respectively. The friction and windage losses are 1050 W and the core losses are 1200 W. The air-gap power of the motor will be .....
a. 23.06 kW b. 24.11 kW c. 25.01 kW d. 26.21 kW

12. If there is an open circuit in the rotor of a squirrel cage induction motor .....
a. rotor will overheat
b. line fuses will blow
c. motor will be noisy
d. motor will not start

13. A 400 V, 15 kW, 4-pole, 50Hz, Y-connected induction motor has full loadslip of 4%. The output torque of the machine at full load is .....
a. 1.66 Nm b. 95.50 Nm c. 99.47 Nm d. 624.73 Nm

14. In a capacitor start and run motors the function of the running capacitor in series with the auxiliary winding is to .....
a. improve power factor
b. increase overload capacity
c. reduce fluctuations in torque
d. improve torque

15. A field excitation of 20 A in a certain alternator results in an armaturecurrent of 400 A in short circuit and a terminal voltage of 2000 V on opencircuit. The magnitude of the internal voltage drop within the machine at aload current of 200 A is .....
a. 1 V b.10 V c. 100 V d. 1000 V

16. An induction motor has a rotor resistance of 0.002 ohm per phase. If the resistance is increased to 0.04 ohm per phase then the maximum torque .....
a. reduces to half
b. increases by 100%
c. increases by 200%
d. remains unaltered

17. The crawling in the induction motor is caused by .....
a. low voltage supply
b. high loads
c. harmonics developed in the motor
d. improper design of machine

18. Two transformers of identical voltages but of different capacities are operating in parallel. For satisfactory load sharing .....
a. impedances of both transformers must be equal
b. per unit impedances of both transformers must be equal
c. per unit impedance and X/R ratio of both transformers must be equal
d. impedance and X/R ratio of both transformers must be equal

19. The lighting impulse test to be performed on a transformer requires ..... voltage waveform with T_{front}/T_{tail} of 1.2/50μs.
a. ac b. dc c. impulse d. ramp

20. For the Dy11 vector group of a three phase transformers, the HV winding .... to LV winding.
a. lags by 11° b. leads by 11° c. lags by 30° d. leads by 30°