DEPARTMENT OF **CIVIL**

QUESTION BANK

ACADEMIC YEAR: **2018-19** CLASS: **I B.Tech CIVIL**

FACULTY **I** SEMESTER: **II**

SUBJECT**: ELEMENTS OF MECHANICAL**

Course Weight age: **Internal Marks: 30** **External Marks: 70**

MID -I QUESTIONS

UNIT-I

1. Derive the relation between
(a) Modulus of elasticity (E) and modulus of rigidity (G)
(b) Modulus of elasticity (E) and bulk modulus (K)
(c) Hence show that E = 9KN/ (3K+G). [10]

2. a) Define (i) Poisson's ratio and (ii) Volumetric strain [3]
ii. The Modulus of rigidity for a material is $0.51x10^5$ N/mm^2. A 10 mm diameter rod of the Material was subjected to an axial pull of 10 kN and the change in diameter was observed to be $3x10^{-3}$ mm. Calculate Poisson's ratio and the modulus of elasticity.[7]

3. Derive the expressions for total extension for tapered rectangular and circular cross-sectional rods subjected to tensile load P. [10]

4. A straight bar 60 cm long consists of three portions : the first 18 cm length is of 30 mm dia, the middle 26 cm length is of 20 mm dia. and the remaining 16 cm length is of 25 cm dia. if it is subjected to an axial pull of 100 kN find the total extension of the bar. Find also the stresses, strains and changes in length of different portions. Take E = 200 GPa [10]

5. A rectangular plate made of steel is 4 m long and 20 mm thick and is subjected to an axial Tensile load of 40 kN. The width of the plate varies from 30 mm at one end to 80 mm at the Other end. Find the elongation, if E = 2x105 N/mm2. [10]

6.a.Explain in detail about Compound Stresses

b. Explain in detail about Thermal Stresses

UNIT-II

1(a).Describe the different kinds of loads on beams and their end reactions [3]
(b) Define Shear force and bending moment diagram in detail [4]
(c)Draw the B.M diagram of a cantilever beam of span L [3]

2. A simply supported beam of length 10m carries point loads of 4kN, 10kN and 7kN at a distance of 1.5m, 2.5m and 3m respectively from left end A. Draw the S.F. and B.M. diagrams for the simply supported beam [10]
3. A simply supported beam of span 9 m loaded with a varying load of intensity zero at the left hand side and 3 kN/m at the right side. Draw the S.F and B.M diagrams. [12]
4. (a) Derive an expression for bending stress at a layer in a beam. [10]
(b)Derive the bending equation from fundamentals M/I= f/y = E/R

5. (a)Obtain the expression for shearing stress at a section of a loaded beam [4]
(b)Show that the ratio of maximum shear stress to average shear stress is 1.5 in case of a rectangular section (bxd). [6]

UNIT-III

1.(a)Deduce the longitudinal stress for a thin spherical shell subjected to an internal pressure of intensity 'p', with a thickness 't' and diameter 'd'. [4]
(b)Discuss the necessity and mechanics of compound cylinders [4]
(c)Derive the relation for volumetric strain and volume change for a thick spherical shell [4]

2. Derive an expression for circumferential stress and longitudinal stress for a thin shell subjected to an internal pressure. [10]

3. A compound cylinder, formed by shrinking one tube on to another, is subjected to an internal pressure of 80N/mm^2. Before the fluid is admitted the internal and external diameters of the compound cylinder are 120mm and 200 mm and the diameter at the junction is 160mm. If, after shrinking on, the radial pressure at the common surface is 10N/mm^2, calculate the final stress set up by the section. [10]

4. A cylindrical shell 3 m long has 1 m internal diameter and 15 mm metal thickness. Calculate the circumferential and longitudinal stresses induced and also changes in the dimensions of the shell, if it is subjected to an internal pressure of 1.5 N/mm^2. Take E = 200 kN/mm^2 and Poisson's ratio = 0. [10]

5. A steel cylinder (thick) of 300 mm external diameter is to be shrunk to another steel cylinder of 150 mm internal diameter. After shrinking the diameter at the junction is 250 mm and radial pressure at the common junction is 28 N/mm^2. Find the original difference in radii at the junction. Take E = 2x10^5 N/mm^2. [10]

6. Derive the Lames equations from the fundamentals in a thick cylindrical shell for the given radi(r1 and r2) and internal fluid pressure, p. [10]

7. A cylindrical drum 400 mm in diameter has a thickness of 8mm. If the drum is subjected to an internal pressure of 2 N/mm2, determine the increase in the volume of the drum. Take young's modulus of elasticity, E=1.6x10^{5}N/mm^2 and poisson's ratio 0.25.
8. A thick spherical shell of 350mm inside diameter is subjected to an internal pressure is 2N/mm^2.Determine the necessary thickness of the shell, if the permissible stress in the shell material is 2.8N/mm^2
9.A pipe of 300 mm internal diameter and 60 mm thickness carries a fluid at a pressure of 15 MN/m^2. Calculate the maximum and minimum intensities of circumferential stresses across the section. Also sketch the radial stress distribution and circumferential stress distribution across the section.

MID -II QUESTIONS

UNIT-IV

1. a)Define Steam Boiler and Classify Different types of boilers
b) Write the essentialities of boiler
2. a)explain selection of different types of boilers
b) Explain about boiler mountings and boiler accessories
3. Expalin the working principle of any one Water tube boiler with neat sketch.
4. Explain the working principle of any one Fire tube boiler with neat sketch.
5. a)Explain any two boiler mountings with neat sketch
b) Explain any two boiler accessories with neat sketch.
6. What is a steam turbine .Classify different type of steam turbines?
7. a).Classify and explain different types of Compressors
b) Write the uses of compressed air
8. Explain the working principle of reciprocating compressor with neat sketch

9. What is the work done in single stage and two stage compression?

UNIT-V

1. Explain working principle of 4 stroke petrol engine with neat sketch?
2. Explain working principle of 4 stroke Diesel engine with neat sketch?
3. Explain working principle of 2 stroke petrol engine with neat sketch?
4. Explain working principle of 2 stroke Diesel engine with neat sketch?

5.a) Compare two stroke engines with four stroke engines?
b) Compare Compression ignition engine with Spark ignition engine?

6.a) What is an I.C engine? Classify different types of engines
b) Explain the basic engine components and nomenclature?

UNIT-VI

1. Explain in detail about belt and rope drives with neat sketches.
2. Describe the following a)velocity ratio b) slip c) length of the belt d) ratio of friction tensions
3. An engine, running at 150 r.p.m., drives a line shaft by means of a belt. The engine pulley is 750 mm diameter and the pulley on the line shaft being 450 mm. A 900 mm diameter pulley on the line shaft drives a 150 mm diameter pulley keyed to a dynamo shaft. Find the speed of the dynamo shaft, when a) there is no slip, and b) **there** is a slip of 2% at each drive.
4. The power is transmitted from a pulley 1 m diameter running at 200 r.p.m. to a pulley 2.25 m diameter by means of a belt. Find the speed lost by the driven pulley as a result of creep, if the stress on the tight and slack side of the belt is 1.4 MPa and 0.5 MPa respectively. The Young's modulus for the material of the belt is 100 MPa.
5. A shaft which rotates at a constant speed of 160 r.p.m. is connected by belting to a parallel shaft 720 mm apart, which has to run at 60, 80 and 100 r.p.m. The smallest pulley on the driving shaft is 40 mm in radius. Determine the remaining radii of the two stepped pulleys for 1. a crossed belt, and 2. an open belt. Neglect belt thickness and slip.
6. Two pulleys, one 450 mm diameter and the other 200 mm diameter are on parallel shafts 1.95 m apart and are connected by a crossed belt. Find the length of the belt required and the angle of contact between the belt and each pulley. What power can be transmitted by the belt when the larger pulley rotates at 200 rev/min, if the maximum permissible tension in the belt is 1 kN, and the coefficient of friction between the belt and pulley is 0.25?
7. A shaft rotating at 200 r.p.m. drives another shaft at 300 r.p.m. and transmits 6 kW through a belt. The belt is 100 mm wide and 10 mm thick. The distance between the shafts is 4m. The smaller pulley is 0.5 m in diameter. Calculate the stress in the belt, if it is **1.** An open belt drive, and **2.** Across belt drive. Take $\mu = 0.3$.
8. a)Explain different types gears
   b) Explain about law of gearing
9. a) Explain different types of gear profiles
   b) Write the applications of the gear
10. a)Explain different types gear trains with neat sketch
    b) Two parallel shafts, about 600 mm apart are to be connected by spur gears. One shaft is to run at 360 r.p.m. and the other at 120 r.p.m. Design the gears, if the circular pitch is to be 25 mm.
11. The speed ratio of the reverted gear train, as shown in Fig. 13.5, is to be 12. The module pitch of gears A and B is 3.125 mm and of gears C and D is 2.5 mm. Calculate the suitable numbers of teeth for the gears. No gear is to have less than 24 teeth
12. A compound train consists of six gears. The number of teeth on the gears are as follows:
    Gear: A B C D E F No. of teeth: 60 40 50 25 30 24
    The gears B and C are on one shaft while the gears D and E are on another shaft. The gear A drives gear B, gear C drives gear D and gear E drives gear F. If the gear A transmits 1.5 kW at 100 r.p.m. and the gear train has an efficiency of 80 per cent, find the torque on gear F.