L-2/T-1/NAME **Date: 03/11/2019**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-1 B. Sc. Engineering Examinations 2018-2019

Sub: **HUM 113** (Economics)

Full Marks: 140 Time: 3 Hours

The figures in the margin indicate full marks

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE** questions.

Symbols indicate their usual meaning.

1. (a) Define supply function. **(5)**

   (b) What are the main causes of shifting of the supply curve? Explain. **(10)**

   (c) Why do demand curves generally slope downward? **(8⅓)**

2. (a) How would you measure price elasticity of demand at any point of a straight line demand curve? Explain graphically. **(13⅓)**

   (b) From the following table calculate elasticity of demand if you move from point A to C and explain what you understand from the result. **(10)**

POINT	Y	Q
A	5000	500
B	6000	600
C	7000	700

3. (a) Explain the properties of an indifference curve. **(13⅓)**

   (b) Explain consumer's equilibrium with the help of budget line and indifference curve. **(10)**

4. (a) How is price determined in an economy under competition? What will happen to the price and quantity due to change in supply? **(10)**

   (b) From the following demand and supply functions, calculate equilibrium price and quantity and show the result in a graph. **(13⅓)**

$$P = 0.20\,Q + 10$$

$$P = -0.10\,Q + 40$$

   (i) What will happen to the equilibrium price and quantity if government imposes a unit tax of TK 10 per unit?

   (ii) Describe the change in equilibrium. Show the equilibrium coordinates on the same graph.

Contd P/2

HUM 113 (NAME)

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE** questions.
Symbols indicate their usual meaning.

5. (a) What are the main challenges that every economy struggles to overcome? How are these challenges or the problems linked to these challenges addressed with reference to different economic systems? Explain. **(13)**

   (b) Distinguish between a fixed factor and a variable factor with examples. Explain the law of diminishing marginal returns and show the relationship between average physical product (APP) and marginal physical product (MPP) with graphical presentations. **(10⅓)**

6. (a) Describe the different types of returns to scale (RTS) of production in Economics. How would you relate these RTS with economies and diseconomies of production? **(13)**

   (b) Derive average and marginal revenue curves for a price-taking firm and a firm facing downward sloping demand curve (using a hypothetical revenue schedules). From the following average revenue (AR) function and average cost (AC) function find the maximum profit giving level of output and the maximum profit. **(10⅓)**

$$AR = 4350 - 13\,Q$$
$$AC = Q^2 - 5.5\,Q + 10 + 675/Q$$

7. (a) What do you understand by supernormal profit, normal profit, loss minimizing level of output and shut down point? Present these cases with separate graphs. **(13)**

   (b) Discuss the assumptions of perfect competition. Show that in the short run a firm's marginal cost curve represents its supply curve. **(10⅓)**

8. Write short notes on any THREE of the following **(23⅓)**

   (a) Causes of inflation and its controlling measures
   (b) Circular flow of income and expenditure in an open economy
   (c) GNP, GDP, NNP and depreciation cost
   (d) Short run and long run cost curves.

L-2/T-1/NAME **Date: 26/10/2019**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-1 B. Sc. Engineering Examinations 2018-2019

Sub: **MME 293** (Shipbuilding Materials)

Full Marks: 210 Time: 3 Hours

The figures in the margin indicate full marks

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE** questions.

1. (a) Differentiate between Izod and Charpy impact tests. Explain the effect of crystal structure and grain size on the ductile-brittle transition temperature (DBTT) of metallic materials. **(10)**

(b) Draw S-N curves for a ferrous metal and a non-ferrous metal. Explain how we can get useful information on the fatigue property for both metals from the curves. **(10)**

(c) A cylindrical rod 100 mm long and having a diameter of 10.0 mm is to be deformed using a tensile load of 27,500 N. It must not experience either plastic deformation or a diameter reduction of more than 7.5×10^{-3} mm. Of the materials listed as follows, which are possible candidates? Justify your choice(s) **(15)**

Alloys	Modulus of Elasticity (GPa)	Yield Strength (MPa)	Poisson's Ratio
Aluminum alloy	70	200	0.33
Brass alloy	101	300	0.34
Steel alloy	207	400	0.30
Titanium alloy	107	650	0.34

2. (a) Acidic refractory (e.g Silica) is usually cheaper and more available than basic refractory (e.g Dolomite/Magnesite). Why do then steel making furnaces commonly have basic lining? **(10)**

(b) Give the advantages of LD steelmaking over EAF steelmaking. **(7)**

(c) State what happens to the impurity oxides that enter the blast furnace in the correct sequence up to their removal. **(10)**

(d) What purposes to the Stoves serve in iron making in blast furnace? **(8)**

3. (a) Suppose you have ordinary low carbon steel (%C<0.2) and have the option of adding Ni, Cr, C, V and Mo as alloying elements. Your target is to make steel blades suitable for surgical instruments. State with clear reasoning(s) which alloying elements you will add and in what amount. **(10)**

(b) Briefly describe the fabrication process and mechanical properties of 18-4-1 tool steel. **(12)**

(c) A component of red alpha brass is operated in an ammonia rich environment. The component cracks after few days. What is this phenomena called? What are its reasons and how can it be prevented? **(13)**

Contd P/2

MME 292/NAME

4. (a) How are the coarse needles in Al-Si alloys are modified to obtain a ductile material? **(8)**

(b) With necessary diagram briefly describe the operating steps of any NDT method, which you think is suitable in detecting surface cracks of a steel component. **(12)**

(c) In a radiograph what will be the difference in appearance of cracks and high density impurities? **(5)**

(d) You are given these two alloys: Mg alloy AZ31 and Mild steel. Which alloy do you think is better for corrosive marine atmosphere? Justify your choice. **(10)**

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE** questions.

5. (a) Differentiate between phase and element. **(8)**

(b) Using the equilibrium diagram of a 70%Cu-30%Ag alloy (Figure for Q. No. 5-b), calculate the fractions of pro-eutectic α and eutectic α at just above and below the eutectic temperature respectively. **(10)**

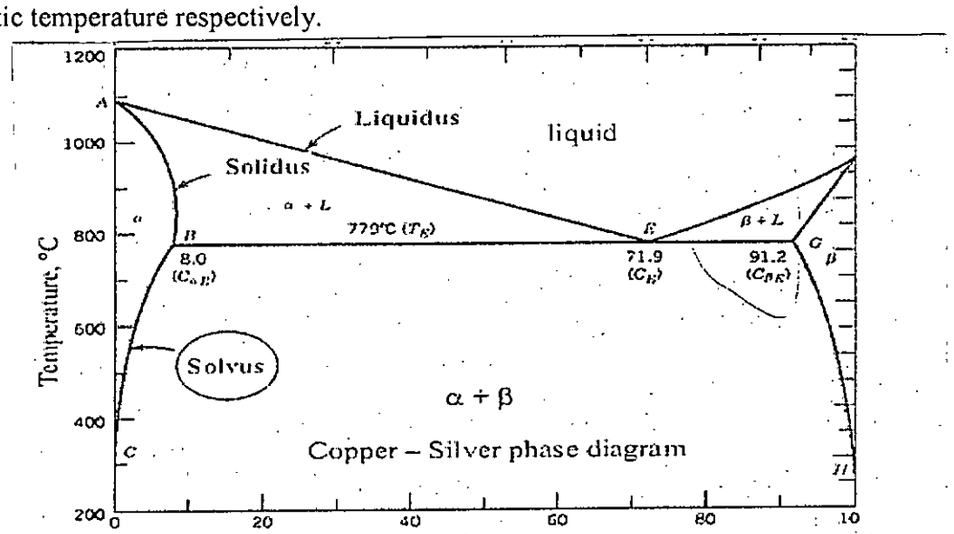

Figure for Question 5 (b)

(c) Non-equilibrium cooling of an alloy generally results in cored structure— explain. **(10)**

(d) Why eutectoid steel has no pro-eutectoid phase in its microstructure? **(7)**

6. (a) What is the purpose of surface hardening? Explain how a hard surface on a low carbon gear part would be produced. **(16)**

(b) Briefly describe how pearlite is formed from austenite. **(9)**

(c) Identify the steel having 50% pearlite and 50% ferrite at room temperature. For the identified steel, calculate (i) the fraction of pro-eutectoid ferrite and pearlite and (ii) the fraction of ferrite and cementite. **(10)**

Contd P/3

7. (a) Select the outline of an annealing process suitable for toughening hyper-eutectoid steel. **(12)**

(b) Mention the effect of tempering on properties of quenched low carbon steel. **(11)**

(c) Describe how chemical composition and manufacturing process of malleable cast iron affect its properties. **(12)**

8. (a) Sketch and level the microstructural changes that occur in eutectoid steel during equilibrium cooling from 900°C to room temperature. **(17)**

(b) Normalized hypo-eutectoid steel has higher hardness as compared to annealed hypo-eutectoid steel of same composition - explain. **(10)**

(c) Write a short note on diffusionless transformation with martensitic transformation. **(8)**

L-2/T-1/NAME **Date: 20/10/2019**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-1 B. Sc. Engineering Examinations 2018-2019

Sub: **NAME 251** (Mechanics of Structure)

Full Marks: 210 Time: 3 Hours

The figures in the margin indicate full marks

The symbols have their usual meanings. Assume reasonable value of any data if missing.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE** questions.

1. (a) Derive Euler's column formula with necessary assumptions. **(15)**

   (b) The simply supported beam as shown in Fig. for Q. No. 1(b) has the T-shaped cross-section (I_{NA} = 87.49 in.^{4}, $\bar{y}$ = 5.886 in. from the bottom). Determine the values and locations of the maximum tensile and compressive bending stresses. **(20)**

2. (a) Determine the force in the members EF, EG, GI and HI of the truss as shown in Fig. For Q. No. 2(a). **(20)**

   (b) A beam has a hinge support at A and roller supports at C and D as shown in Fig. for Q. No. 2(b). An internal hinge is also placed at B. Determine the reactions at A, C and D. **(15)**

3. (a) The simply supported beam as shown in Fig. for Q. No. 3(a) carries two concentrated loads. Derive an expression for the shear force and the bending moment for each of the three segments of the beam. **(15)**

   (b) Draw the shear force and bending moment diagram for the loaded beam as shown in Fig. for Q. No. 3(b). **(20)**

4. (a) Fig for Q. No. 4(a) shows a rigid bar that is supported by a pin at *A* and two rods, one made of steel and the other of bronze. Neglecting the weight of the bar, compute the stress in each rod caused by the 50-kN load. **(20)**

   (A_{steel} = 600 mm^2, A_{bronze} = 300 mm^2, E_{steel} = 200 GPa, E_{bronze} = 83 GPa)

   (b) The composite bar as shown in Fig. for Q. No. 4(b) is stress-free before the axial loads P_1 and P_2 are applied. Assuming that the walls are rigid, calculate the stress in each material if P_1 = 150 kN and P_2 = 90 kN. **(15)**

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SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) Distinguish between the following terms: **(12)**

   (i) modulus of resilience and modulus of toughness

   (ii) ductility and brittleness

   (iii) true strain and engineering strain

   (vi) true stress and engineering stress

   (b) A strip of metal is originally 1.5 m long. It is stretched in three steps: first to a length of 1.75 m, then to 2.0 m, and finally to 3.0. Show that the total true strain is the sum of the true strains in each step, that is, that the strains are additive. Show that, using engineering strains, the strain for each step cannot be added to obtain the total strain. **(15)**

   (c) Define yield strength. How can you determine the yield strength by Offset method? **(8)**

6. (a) With necessary assumptions, derive an expression for the angle of twist produced by torque in a solid circular shaft. **(20)**

   (b) A hollow bronze shaft of 3 in. outer diameter and 2 in. inner diameter is slipped over a solid steel shaft 2 in. in diameter and of the same length as the hollow shaft. The two shafts are then fastened rigidly together at their ends. For bronze, $G = 6 \times 10^6$ psi, and for steel, $G = 13 \times 10^6$ psi. What torque can be applied to the composite shaft without exceeding a shearing stress of 8000 psi in the bronze or 12000 psi in the steel? **(15)**

7. (a) Determine the moments of inertia I_x and I_y of the area as shown in Fig. for Q. No. 7(a) with respect to centroidal axes that are respectively parallel and perpendicular to the side AB. **(15)**

   (b) The state of plane stress at a point is represented by the stress element as shown in Fig. for Q. No. 7(b). Draw the Mohr's circle, determine the principal stresses and the maximum shear stresses and draw the corresponding stress elements. **(20)**

8. (a) Determine by the double-integration method the slope and deflection at the free end of a cantilever beam l ft. long with a concentrated load P at the free end. Assume E and I constant. **(18)**

   (b) The simply supported beam ABC as shown in Fig. for Q. No. 8(b) carries a distributed load of maximum intensity w_0 over its span of length L. Determine the maximum deflection of the beam. **(17)**

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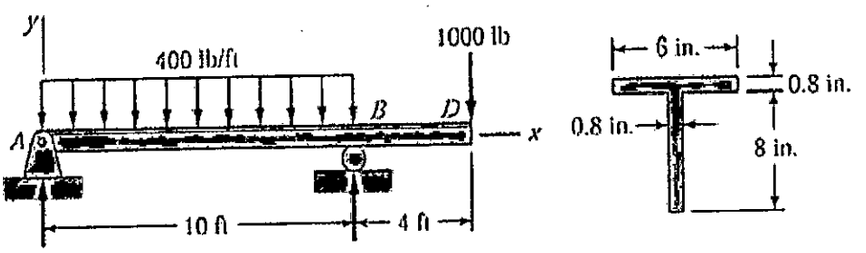

Fig. for Q. No. 1(b)

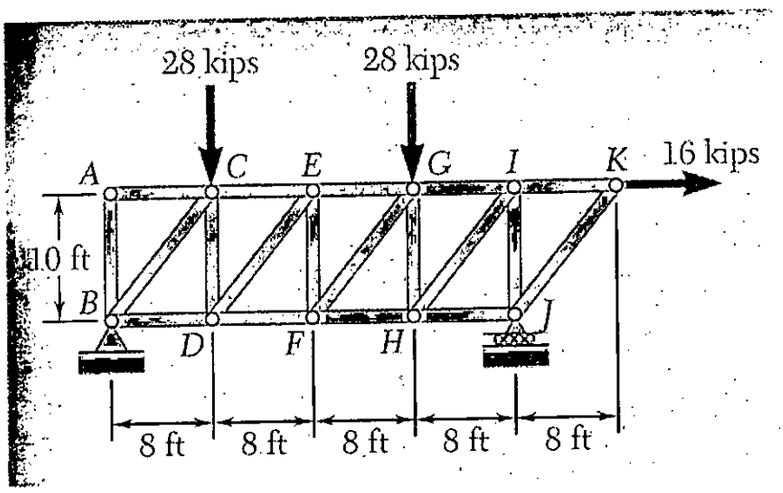

Fig. for Q. No. 2(a)

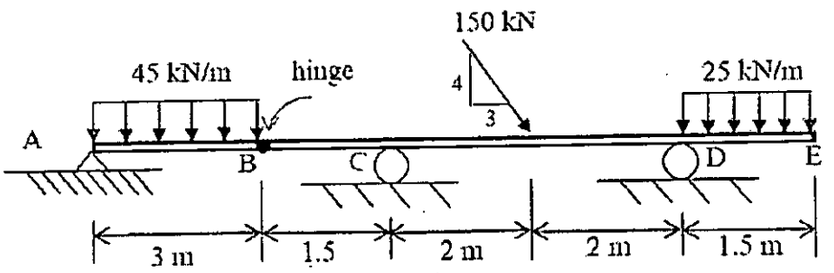

Fig. for Q. No. 2(b)

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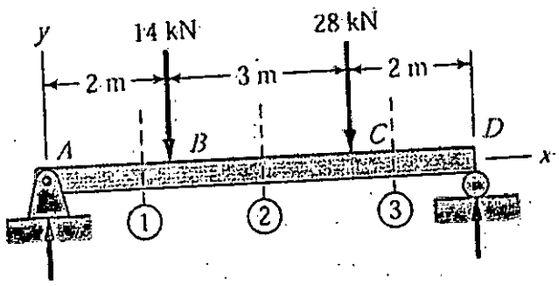

Fig. for Q. No. 3(a)

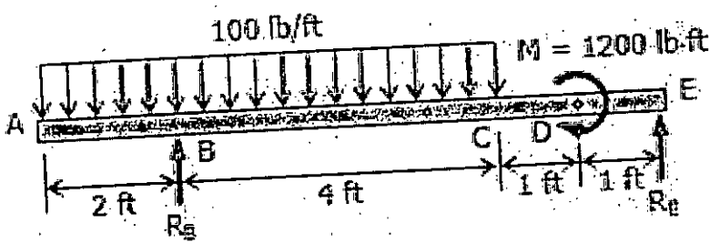

Fig. for Q. No. 3(b)

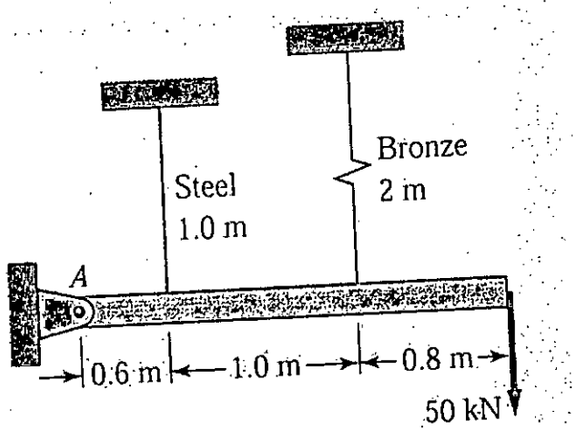

Fig. for Q. No. 4(a)

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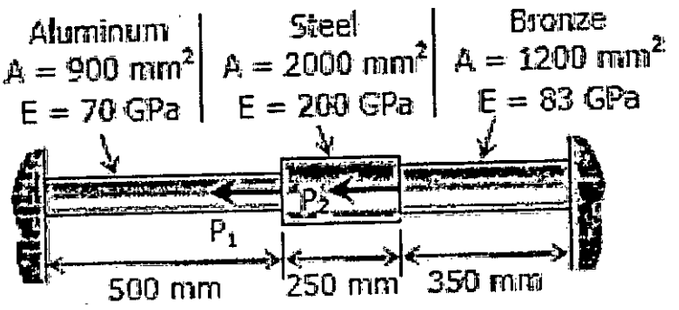

Fig. for Q. No. 4(b)

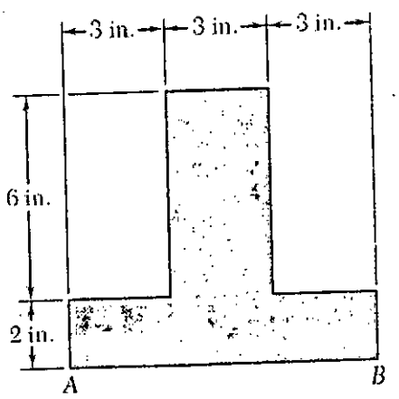

Fig. for Q. No. 7(a)

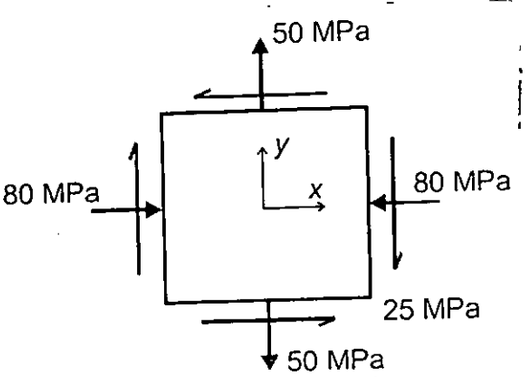

Fig. for Q. No. 7(b)

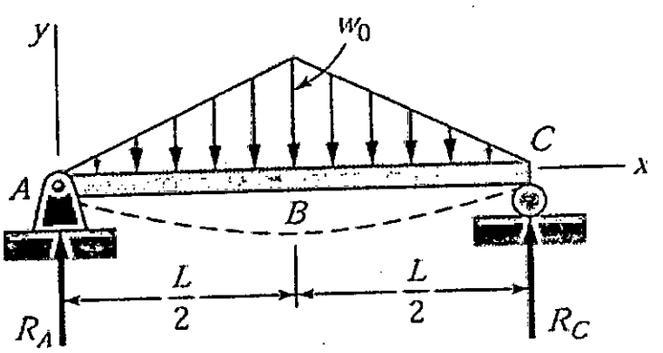

Fig. for Q. No. 8(b)

L-2/T-1/NAME Date : 30/10/2019

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-1 B. Sc. Engineering Examinations 2018-2019

Sub : **NAME 219** (Marine Engines and Fuels)

Full Marks: 210 Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) What are the differences between octane number and cetane number? **(5)**

   (b) What will happen if 87 octane fuel is used instead of 91, or vice versa? **(8)**

   (c) Define the following: (i) Net calorific value, (ii) Ariline point, (iii) Cloud point, (iv) API gravity, (v) Catalytic cracking, (vi) Isomerization. **(12)**

   (d) Write a short note on marine fuel. **(10)**

2. (a) With neat sketches differentiate between single hole nozzle and pintle nozzle. **(8)**

   (b) A propulsion engine is capable of developing 28,000 brake horsepower at 100 rev/min. The engine is of the two-stroke type and has eight cylinders. Calculate the volume of fuel to be injected per cycle per cylinder at full power and at 32 rev/min. The specific fuel consumption is 155 and 200 g/bhph at 100 and 32 rev/min respectively; the specific gravity of the fuel is 0.96 at 15°C. Comment on the results. **(10)**

   (c) What are the effects of engine overcooling and undercooling? **(5)**

   (d) Write short notes on the following- **(12)**

   (i) Cooling system in marine diesel engine.

   (ii) Thermostat valve.

   (iii) Pump circulation system.

3. (a) With necessary sketches, compare direct injection type and indirect injection type combustion chamber. **(12)**

   (b) Describe the working principle of divided combustion chamber and pre-combustion chamber. **(13)**

   (c) The induction swirl in a C.I engine helps in increasing indicated thermal efficiency- Justify this statement. **(5)**

   (d) Compare knock in CI engine with SI engine knock. **(5)**

4. (a) What is prime mover? Why actual gas turbine cycle deviates from the idealized one? **(6)**

   (b) Write the expression of thermal efficiency of a Brayton cycle with regeneration and compare this efficiency to the efficiency of a simple Brayton cycle. **(5)**

   (c) Draw the block diagram and corresponding T-s and P-v diagrams of a gas turbine cycle (Brayton) with intercooling. **(12)**

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(d) A gas turbine has a pressure ratio of 10 to 1 and the maximum cycle temperature is 1500°C. The isentropic efficiencies of the compressor and the turbine are 90% and 95% respectively. The value of C_p = 1.005 kJ/kgK and γ = 1.4 are constant throughout the cycle. If the air enters the compressor at 30°C and at a rate of 30 kg/s, determine- **(12)**

(i) the net work of the cycle.
(ii) the back work ratio.
(iii) the thermal efficiency.

SECTION - B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) What is piston ring? State the functions of compression ring and oil ring. **(10)**
(b) With neat sketch, explain dry liner and wet liner. **(10)**
(c) Discuss schematically the diesel engine combustion process. **(15)**

6. (a) What is knocking in diesel engine? How knocking can be prevented? **(10)**
(b) Differentiate between crosshead piston and trunk piston with neat sketch. **(10)**
(c) A four stroke, four cylinders and 600 RPM diesel engine needs fuel 2400 lb/hr. Air is needed 14 cft/lb. The calorific value of fuel is 18000 BTU/lb. The air-fuel ratio is 22, stroke length is 1.5 ft, bore 15 inch and indicated horse power is 6000 hp. **(15)**
Calculate:
(i) Specific fuel consumption
(ii) Thermal efficiency
(iii) Air rate
(iv) Mean effective pressure
(v) Volumetric efficiency.

7. (a) State the functions of carburetor. Draw only the schematic showing how does a carburetor work. **(10)**
(b) Describe mist lubrication system. What are the advantages and disadvantages of mist lubrication system? **(20)**
(c) What do you understand by flash point and fire point? **(5)**

8. (a) Make a list of several types of renewable energy sources. What are the advantages of solar energy? **(10)**
(b) Discuss elaborately liquid dominated system and vapour dominated system of geothermal power plant using neat sketches. **(20)**
(c) What is SAE number? Discuss in brief. **(5)**
