Code-15
Mechanical Engineering
Time : 3Hours
Max Marks: 150

Note: Attempt *Five* questions in all. All question carry equal marks. Question No. 1 is compulsory. Answer *Two* questions from Part-I and *Two* questions from Part-II. The parts of the same question must be answered together and must not be interposed between answers to other questions.

1. Write critical notes on any of *Four* of the following: **(4X 7½ = 30)**

(a) Strain energy concepts and theories of failure

(b) Advantages of PERT and CPM methods in project management and explain the difference between PERT and CPM

(c) Difference between Spark ignition and Compression ignition engines.

(d) Solar refrigeration

(e) Heat pump refrigeration cycle

(f) Economics of power generation

Part I

2.(a) Discuss briefly the classification of a hydroelectric plant based on : **(15)**

(i) Availability of water head

(ii) Nature of load capacity

(b) Why the steam turbines compounded? What are different methods of compounding? **(15)**

3.(a) At a point in a loaded structure, a pure shear stress state $\tau = \pm 400$ MPa prevails on two given planes at right angles: (15)

(i) What would be the state of stress across the planes of an element taken at +45° to the given planes.

(ii) What are the magnitudes of these stresses?

(b) What is value analysis? Apply this analysis in manufacturing an engineering product of your choice. (15)

4.(a) Two gears messy externally to provide velocity ratio 3 : 1. Both the gears standard addendum and pressure angle is equal to 20°. Determine minimum number of teeth on the pinion to avoid interference. (15)

(b) What are the different stresses set up in a bolt due to initial tightening, while used as a fastener? Name all these stresses in details with suitable diagram. (15)

Part II

5.(a) Is material requirement planning (MRP) , material planning system, a production planning system or both? Explain also develop an MRP for a manufacturing plant manufacturing any mechanical product. (15)

(b) Explain the need of forecasting, How are the forecasting methods classified? The past data about the load on a machine centre is given below: (15)

Month	Load, machine - Hours
1	585
2	611
3	656
4	748
5	863
6	914
7	964

If a five month moving average is used to forecast the next month's demand, compute the forecast of the load on the machining centre in the 8th month.

6.(a) Explain the following with suitable example: (15)

(i) Effect of size on the tensile strength

(ii) Effect of surface finish on endurance limit.

(b) What are the various preventive maintenance plans are implemented in power plant unit. Support your answer by taking suitable examples. (15)

7.(a) Describe various problems related to environment that are created by exhaust emission from the I.C. Engines and how to overcome these problems. What are the major exhaust emissions? (15)

(b) What is Taylor's tool life equation and how it is relevant to manufacturing science? (15)