VPM's
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Programme: MMS (2013-15)
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Subject MMS-III Operations.	New Product Development and Concurrent Engineering (NPDE 03)		
Roll No.		Marks	30 Marks
Total No. of Questions	5	Duration	2 Hours
Total No. of printed pages	2	Date	08.11.2014

Note: Q1 is compulsory and solve any TWO from the remaining FOUR questions.

Q1) 10 Marks (Compulsory)

The manifold for the Ford Zeta engine

The development of the 1.6 Zeta engine by Ford was one of its most important design projects for years. Like any engine design, it was a huge and complex task. Indeed, each part of the engine needed to go through all the stages of the 'concept through to market' design activity. Take, for example, the air intake manifold. This plays a particularly important part in the engine because it recirculates exhaust gases from the engine, reburning some of them and therefore reducing the overall emission levels from the engine.

In the Zeta engine, the manifold (unusually) is made not from metal but from a glass-reinforced nylon resin. The advantages of using this material include its strength, impact resistance, heat resistance and ease of processing. However, there were many design problems to sort out, including noise and vibration, the dimensional stability of the product and the ability of the material to stand up to the very high temperatures involved.

The design of the engine manifold took almost three years and was organized using all the interactive design principles. First of all, the various stages in the design were compressed and run in parallel (what Ford calls 'concurrent engineering'). Secondly, the various fundamental design problems were sorted out right at the beginning of the process. Third, a design team was put together involving not only various personnel from the Ford Motor Company but also the more significant suppliers. Those involved included design representatives from the Du Pont chemical company who were supplying the material, Dunlop who were to perform the moulding operation, and several specialist suppliers including Dowty who were designing the seals, Elring who were involved in gasket design, Elm Steel who were involved with supplying tubing, and so on.

Design technology also played a large part in the development of this product. For example, Du Pont used CAD techniques to study the effects of engine vibration on the manifold. By simulating engine conditions, the various stress levels in the manifold could be estimated. This allowed the team to explore different design solutions without having to devote time and cost to manufacturing too many alternative prototypes – particularly important because the design of the manifold had to fit in with the overall design of the engine itself. Prototype manifolds were needed to supply the main engine design team who were wanting to start engine testing several months before the end of the manifold design process.

By involving its suppliers, by using them to resolve the considerable technical problems early on in the project, and by solving the technical problems in an interactive and simultaneous manner, the team managed to get a highly complex and very novel product designed to fit into the overall engine project more quickly, more cheaply and more dependably than it could otherwise have done.

Questions

1. In developing this product, Ford put together a team of suppliers. Do you think it would do the same for every single supplier of every part in every product? If not, how should it choose which suppliers, which parts and which products to subject to this sort of treatment?
2. Should Ford have included its suppliers as well?

Attempt any TWO from the remaining FOUR Questions

Q2) *Any two from (a) or (b) or (c) ———— (5x2) = 10 Marks*

a) Explain the process of concept development and testing in designing a new product.
b) Comment: "Significance of time bound research in new product development."
c) "Value engineering plays a crucial role in designing the product." comment with an example.

Q3) *Any two from (a) or (b) or (c) ———— (5x2) = 10 Marks*

a) Identify the major internal and external sources of idea generation for new product development in an organization.
b) When do companies use "Concurrent Engineering"?
c) List down the barriers which enterprise faces to launch new product in the market.

Q4) *Any two from (a) or (b) or (c) ———— (5x2) = 10 Marks*

a) Discuss the role of research and development department in developing a new product. Explain with an example.
b) Discuss the emergence of "Naukri.com" or any enterprise of your choice.
c) How can be the *product life cycle concept* form an integral part of new product development?

Q5) *Any two from (a) or (b) or (c) ———— (5x2) = 10 Marks*

a) *Volvo's environmental priority strategies (EPS) system*

There are many ways in which the life-cycle analysis approach can be used to evaluate environmental data so that it can be used to guide product designers in the use of different materials. One such tool has been developed by Volvo, the Swedish motor manufacturer, in conjunction with the Federation of Swedish Industries and the Swedish Environmental Research Institute. It uses 'environmental indices' calculated for specific materials as follows:

Environmental index = *scope* × *distribution* × *frequency or intensity* × *durability* × *contribution* × *remediability*.

Where:
scope = general impression of the environmental impact.
distribution = extent of affected area.
frequency or intensity = regularity or intensity of the problem in the affected area.
durability = permanency of the effects.
contribution = significance of 1 kg of the emission of the substance in relation to the total effect.
remediability = relative cost to reduce the emission by 1 kg.
The 'environmental load unit' (ELU) per kg of any substance can then be calculated as the product of the index and the amount of substance released into the environment.

What do you think are the general problems in trying to quantify the environmental impact of design?

b) State the significance of the Water fall model of new product development.
c) Role of operations manager in new product development. Explain with suitable example.