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10ME71

**Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016  
Engineering Economy**

Time: 3 hrs.

Max. Marks:100

**Note: 1. Answer any FIVE full questions, selecting at least TWO questions from each part.  
2. Interest tables are allowed.**

**PART - A**

1. a. With an example, explain problem solving process. (06 Marks)  
 b. Sketch and explain cash flow diagram for borrower's and lender's point of view. (06 Marks)  
 c. A person is planning for his retired life. He has 10 more years of service. He would like to deposit 20% of his salary, which is ₹ 4,000/- in the first year and thereafter he wishes to deposit with an annual increase of ₹ 500/- for the next 9 years with interest rate of 15%. Find the total amount at the end of 10<sup>th</sup> year of the above series. (08 Marks)
2. a. List the conditions for the present worth comparison. (04 Marks)  
 b. Investment proposals A and B have the net cash flow given below : (08 Marks)

Proposal	End of Years				
	0	1	2	3	4
A (₹)	-10,000	3,000	3,000	7,000	6,000
B (₹)	-10,000	6,000	6,000	3,000	3,000

Compare the present worth of A and B at  $i = 18\%$  and which proposal should be selected.

- c. Two motor bikes of brand 'X' and 'Y' are available on the following conditions :  
 i) Motor bike 'X' – Make a down payment of ₹ 5,000 /- and then ₹ 6,000/- at the end of each year for 7 years.  
 ii) Motor bike 'Y' – Make a down payment of ₹ 15,000/- and no payment for the next 4 years. At the end of 5<sup>th</sup>, 6<sup>th</sup> and 7<sup>th</sup> year. Payments of ₹ 12,000/- is made. Compare the future worth of Motorbike 'X' and 'Y' at an interest rate of 10%. (08 Marks)
3. a. Define the following : i) Ownership life ii) Economic life. (04 Marks)  
 b. Two models of small machines perform the same function. Type 1 machine has a low initial cost of ₹ 9,500/- and relatively high operating costs of ₹ 1,900/- year more than those of Type 2 machine, and a short life of 4 years. The more expensive Type 2 machine costs ₹ 25,100/- and can be kept in service economically for 8 years. Which machine is preferred when the MARR is 8% using Equivalent Annual cost method? (08 Marks)  
 c. A company invests in one of the two mutually exclusive alternatives. The life of both alternatives is estimated to be 5 years with the following cash flows : (08 Marks)

Cash flows	Alternative	
	A	B
Investment (₹)	-1.5 lakhs	-1.75 lakhs
Annual return (₹)	60,000	70,000
Salvage value (₹)	15,000	35,000

Determine the best alternative based on the annual equivalent method by assuming  $i = 25\%$ .

4. a. Define MARR, IRR and ERR. (03 Marks)  
 b. Define the term depreciation and what are the causes for it. (04 Marks)  
 c. Net cash flows for the business proposal are given below. Calculate the rate of return for the new business. (05 Marks)

Year	0	1	2	3	4	5
Cash flow (₹)	-10,000	3,000	3,000	3,000	3,000	3,000

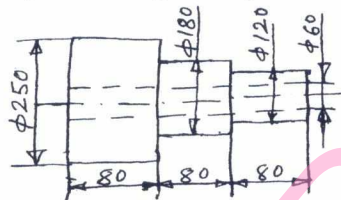
Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

- d. A CNC machine costs ₹ 30,00,000 is estimated to serve for 8 years after which its salvage value is ₹ 2,50,000. Calculate i) Depreciation fund at the end of 5<sup>th</sup> year by straight line method and declining balance method.  
ii) Book value of the machine after 4<sup>th</sup> and 6<sup>th</sup> year by declining balance method. (08 Marks)

**PART - B**

- 5 a. List and briefly explain different elements of cost required for finding selling price of the product. (06 Marks)  
b. A certain piece of work is produced by a firm in batches of 100. The Direct material cost for the batch is ₹ 160 and Direct labour cost is ₹ 200. Factory on cost is 35% of the total material and labour cost. Overhead charges are 20% of the factory cost. Calculate the Prime cost and factory cost, if the management wants to make a profit of 10% of total cost, determine the selling price of each article. (06 Marks)  
c. A C.I stepped cone pulley is shown in fig. Q5(c). Method cost = ₹ 20/kg. Calculate the material cost of Pulley by assuming density of C.I = 7.209 gm/c.c. (08 Marks)

Fig.Q5(c)



All dimensions are in mm.

- 6 a. What is Journal and ledger? Explain with a suitable example. (06 Marks)  
b. List the important differences between balance sheet and profit / loss account. (06 Marks)  
c. A company 'Z' has certain reserves and surplus as per the details given below as on 31<sup>st</sup> March 2014. (Amounts are in ₹).

Dividend Payable	72,000	Debtors	1,60,000
Bank balance	10,000	Bills Payable	20,000
Equity shares	2,00,000	Plant & Equipment	80,000
Provision for taxes	40,000	Bills receivable	20,000
Stock	77,000	Creditors	55,000
Preference shares	1,35,000	General reserve	40,000
Land & building	2,00,000	Cash in hand	15,000

Prepare a balance sheet for the company Z as on 31<sup>st</sup> March 2014.

(08 Marks)

- 7 a. List and explain different types of ratios used for financial statement analysis. (10 Marks)  
b. A company ABC is presented a balance sheet as on 31<sup>st</sup> Dec 2013 is given below :

Liabilities	Amount (₹)	Assets	Amount (₹)
Creditors	20,000	Cash at bank	15,380
Bills payable	12,750	Trade debtors	11,260
Debentures	1,00,000	Stock in hand	56,160
Reserves	67,250	Fixed assets	2,17,200
Share capital	1,00,000		

Net sales - ₹ 1,80,000 ; Net profit - ₹ 16,000 ; Gross profit - ₹ 40,000.

Calculate i) Current ratio ii) Operating ratio iii) Gross profit ratio  
iv) Proprietary ratio v) Debtor's turnover ratio.

(10 Marks)

- 8 a. List the important objectives of profit planning. (06 Marks)  
b. Explain different types of budgets. (10 Marks)  
c. Write a brief note on bench marking in manufacturing. (04 Marks)

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10ME72

**Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016**  
**Mechanical Vibrations**

Time: 3 hrs.

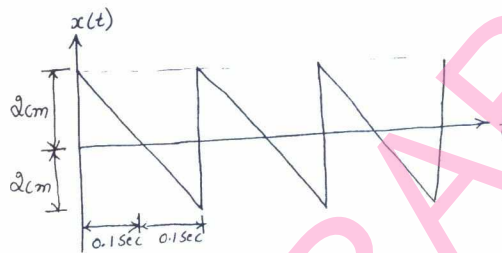
Max. Marks:100

**Note: Answer any FIVE full questions, selecting atleast TWO questions from each part.**

**PART - A**

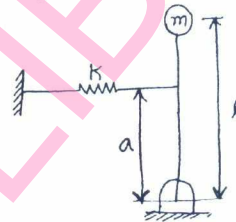
- 1 a. Add the following harmonic motion and check the solution graphically :  
 $x_1 = 2\cos(\omega t + 0.5)$        $x_2 = 5\sin(\omega t + 1.0)$ . (10 Marks)
- b. Represent the periodic motion given in the following fig.Q1(b) by harmonic series. (10 Marks)

Fig.Q1(b)



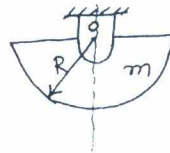
- 2 a. Determine the natural frequency of undamped free vibration system using energy method. (06 Marks)
- b. Determine the natural frequency of the system shown in fig. Q2(b). (07 Marks)

Fig.Q2(b)



- c. A semicircular disc of radius 'R' and mass 'm' is pivoted freely about the center as shown in fig. Q2(c). Determine its natural frequency of oscillation for small displacement. Use energy method. (07 Marks)

Fig.Q2(c)



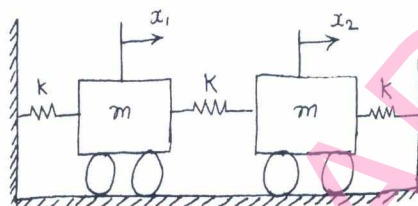
- 3 a. A spring mass damper system consists of a spring of stiffness 343N/m. The mass is 3.43kg. The mass is displaced 20mm beyond the equilibrium position and released. Find the equation of motion for the system, if the damping coefficient of the dash pot is 13.72N – sec/m. (10 Marks)
- b. A spring mass damper system is having a mass of 10kg and a spring of such stiffness which causes a static deflection of 5mm. The amplitude of vibration reduces to 1/4 the initial value in 10 oscillations, determine i) Logarithmic decrement ii) Actual damping present in the system iii) Damped natural frequency. (10 Marks)
- 4 a. Define “transmissibility”. Derive an expression for motion transmissibility. (10 Marks)
- b. A machine of mass 500kg is supported on spring of stiffness 10<sup>6</sup>N/m. if the machine has a rotating unbalance of 0.25 Kg-m, determine i) The force transmitted to the floor at 1200 rpm ii) The dynamic amplitude at this speed iii) The phase angle. (10 Marks)

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**PART - B**

- 5 a. Mention the instruments used to measure displacement and acceleration. Discuss the relevant frequency response curves. **(10 Marks)**  
 b. A rotor of mass 12 kg is mounted midway on a 25mm diameter horizontal shaft supported at the ends by two bearings. The span between the bearing is 900mm. Because of some manufacturing defect the Cg of the rotor is 0.02mm away from geometric centre of rotor. If the system rotates at 3000 rpm, determine the amplitude of steady state vibrations and dynamic force on the bearing. Take  $E = 200\text{Gpa}$ . **(10 Marks)**
- 6 a. For the system shown in fig. Q6(a), i) Derive the equation of motion ii) Setup frequency equation and obtain natural frequencies of the system iii) Obtain modal vectors iv) Draw mode shapes. Neglect the inertia of wheels and friction between wheel and surface. **(12 Marks)**

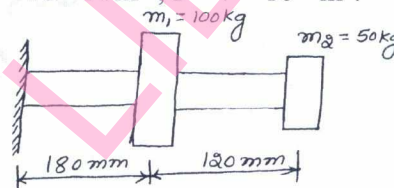
Fig.Q6(a)



- b. Explain the principle of undamped dynamic vibration absorbers. Obtain an expression for  $\frac{X_1}{X_{st}}$  for main mass and  $\frac{X_2}{X_{st}}$  for absorber mass. **(08 Marks)**

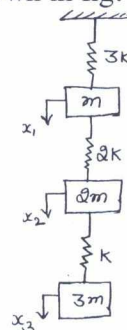
- 7 a. Find the lowest natural frequency of vibration for the system shown in Fig. Q7(a), by Rayleigh's method.  $E = 1.96 \times 10^{11} \text{ N/m}^2$ ,  $I = 4 \times 10^{-7} \text{ m}^4$ . **(08 Marks)**

Fig.Q7(a)



- b. Using Stodola's method, determine the fundamental mode of vibration and its natural frequency of the spring mass system shown in fig. Q7(b). **(12 Marks)**

Fig.Q7(b)



- 8 a. Explain the role of i) Exciter ii) Transducer iii) Signal conditioner and iv) Analyzer used in experimental modal analysis. **(08 Marks)**  
 b. Explain briefly dynamic testing of machines. **(04 Marks)**  
 c. Describe the three types of maintenance schemes given below :  
 i) Break down maintenance ii) Preventive maintenance iii) Condition based maintenance. **(08 Marks)**

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10ME754

## Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016

### Non – Conventional Energy Sources

Time: 3 hrs.

Max. Marks:100

**Note:** Answer any FIVE full questions, selecting atleast TWO questions from each part.

#### PART - A

- 1
  - a. Explain Tar sands and oil shale as energy sources and also mention their limitations. (10 Marks)
  - b. What is the need for alternate energy sources? Explain by considering solar energy. (05 Marks)
  - c. Discuss the limitations of non – conventional sources of energy. (05 Marks)
- 2
  - a. Define the following : i) Latitude ii) Declination angle iii) Surface azimuth angle  
iv) Hour angle v) Zenith angle. (10 Marks)
  - b. With a neat sketch, explain the working of pyranometer. (05 Marks)
  - c. Write short notes on spectral distribution of extra terrestrial radiation. (05 Marks)
- 3
  - a. Calculate the monthly average hourly radiation falling on a flat plate collector facing south ( $\gamma = 0^\circ$ ) with a slope of  $15^\circ$ , given the following data :  
Location : Chennai ( $13^\circ 00' N$ ) ; Month : October ;  
Time : 1100 to 1200 (LAT) ;  $\bar{I}_g : 2408 \text{ kJ/m}^2 - \text{h}$  ;  $\bar{I}_d : 1073 \text{ kJ/m}^2 - \text{h}$ .  
Assume ground reflectivity to be 0.2. (10 Marks)
  - b. Describe solar pond for solar energy collection and storage. (06 Marks)
  - c. Explain how solar energy can be used for drying, with a neat sketch. (04 Marks)
- 4
  - a. Explain briefly the parameters affecting the performance of flat plate collectors. (06 Marks)
  - b. Derive the expression for transmissivity based on reflection – refraction at the interface of two media. (08 Marks)
  - c. Write short notes on collector efficiency factor and collector heat removal factor . (06 Marks)

#### PART - B

- 5
  - a. Describe the main considerations in selecting the site for wind generators. (08 Marks)
  - b. Explain with a neat sketch, the working of a photo – voltaic cell. Draw I – V characteristics. (06 Marks)
  - c. With a neat sketch, explain the horizontal axis wind machine. (06 Marks)
- 6
  - a. With a neat sketch and T- S diagram, explain the concept of liquid dominated total flow system of generating geothermal energy. (08 Marks)
  - b. Explain with a neat sketch, the working principle of closed cycle OTEC plant. (06 Marks)
  - c. Sketch and explain single basin type tidal power plant operation. (06 Marks)
- 7
  - a. Explain the process of photosynthesis. What are the conditions which are necessary for it? (06 Marks)
  - b. List the factors affecting bio gas generation. (04 Marks)
  - c. Sketch and explain the working of floating gas holder type biogas plant used in India (KVIC plant). (10 Marks)
- 8
  - a. Explain the process of electrolytic production of hydrogen, with a neat sketch. (08 Marks)
  - b. Explain briefly the different methods of hydrogen storage. (06 Marks)
  - c. Describe how hydrogen can be used as an alternative fuel for motor vehicles. (06 Marks)

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10ME769

**Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016**  
**Product Life Cycle Management**

Time: 3 hrs.

Max. Marks:100

**Note:** Answer any FIVE full questions, selecting atleast TWO questions from each part.

**PART – A**

- 1 a. Define components of PLM and explain phases of PLM. (10 Marks)  
 b. What are the threads of PLM? Explain in detail. (10 Marks)
- 2 a. Explain the characteristics of PLM. (10 Marks)  
 b. List out the drivers of PLM and explain. (10 Marks)
- 3 a. Explain Product Data Management (PDM) system and reason for implementing PDM in a organisation. (10 Marks)  
 b. Explain : i) Versioning ii) Check – in iii) Check – out  
 iv) Views v) Work flow. (10 Marks)
- 4 a. How collaborative product development can be achieved effectively using product reuse? Explain with example. (10 Marks)  
 b. What is the use of digital mock – up and prototype development in product development. (10 Marks)

**PART – B**

- 5 a. Steps involved in creation of 3DXML using CAD drawing and explain. (10 Marks)  
 b. How to create an animation for assembly instruction using a composer? (10 Marks)
- 6 a. How to optimize the product and parameterization of product design? (10 Marks)  
 b. What are the uses of publication, parameters, formula, rule, check in design of product? (10 Marks)
- 7 a. What is digital manufacturing and benefit of digital manufacturing? (10 Marks)  
 b. Explain : i) Virtual learning curve ii) Manufacturing the rest iii) Manufacturing the first one. (10 Marks)
- 8 a. What are the PLM implementation strategies? (10 Marks)  
 b. Explain : i) Impact of strategy ii) Infrastructure assessment. (10 Marks)

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