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10ME71

Seventh Semester B.E. Degree Examination, June/July 2017

Engineering Economy

Time: 3 hrs.

Max. Marks:100

Note: 1. Answer FIVE full questions, selecting at least TWO questions from each part.

2. Use of compounding interest factors tables is permitted.

PART – A

- 1 a. Briefly explain the problem solving process. How are the decisions taken? (06 Marks)
- b. Briefly explain the law of demand and law of supply. (06 Marks)
- c. A person is planning for his retired life. He has 15 years of service, he would like to deposit 20% of salary, which is Rs.12000 at the end of 1st year and there after he wishes to increase his deposit by Rs.2000 more every year along with Rs.12000 for next 14 years. What will be maturity amount of this deposit, if the interest rates are 10% and 12% per year? (08 Marks)

- 2 a. List and explain the conditions for present worth comparisons. (10 Marks)
- b. Two devices are available to perform a necessary function for 3 years. The initial cost (negative) for each device at time 0 and subsequent annual savings (positive) are shown in the following table.
Compare the net present worth of these two devices when the required interest rate is 8%.
Draw cash flow diagram.

	Year			
	0	1	02	03
Device A	-15000	6000	7000	8000
Device B	-18000	7000	8000	9000

(P/F, 8.1) = 0.92593
(P/F, 8.2) = 0.85734
(P/F, 8.3) = 0.79383

(10 Marks)

- 3 a. Define the following terms with reference to asset life:
 - i) Accounting life
 - ii) Service life. (04 Marks)
- b. A stand by lighting generator is required for a shop two types are available. If both generators have life of 4 years and interest rate is 15%, which offers lowest equivalent annual cost? (08 Marks)

	Type – 1	Type – 2
First cost	Rs.8000	Rs.6000
Salvage value	Rs.1500	Nil
Annual operating cost	Rs.800	Rs.900

- c. The following alternatives can perform the same function:

Alternative	First cost	Life	Salvage value	Annual cost
A	Rs.7000	6 years	2500	900
B	Rs.5000	3 years	1500	1200

At an annual rate of 12%, rank alternative as per the equivalent annual cost.

(08 Marks)

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.

- 4 a. A company is in process of selecting the best alternative among the following three mutually exclusive alternatives. Find the best alternative based on rate of return (calculation) comparison. (10 Marks)

Alternative	Initial Investment	Annual revenue	Life in years
A ₁	Rs.60000	Rs.15000	10
A ₂	Rs.85000	Rs.19000	10
A ₃	Rs.50000	Rs.9000	10

- b. A car was purchased for Rs.5,00,000 and salvage value Rs.1,50,000 at the end of 8 years of useful life. Calculate book value of the car at the end of 5th year by declining balance method. Straight line method of depreciation. Also find the accumulative depreciation at the end of 6th year by declining balance method and sum of the year digit method of depreciation. (10 Marks)

PART – B

- 5 a. Briefly explain the contents of elements of cost. (06 Marks)

- b. A product xyz manufactured in a small scale industry has the following details:

Variable overheads = Rs.30 per unit

Fixed overheads = Rs.70000 per month

Units manufactured 70000 units per month.

Find:

- i) The normal overhead cost per unit
- ii) If production drops to 80%, find overhead charges per unit.
- iii) If production increases to 120%, find overhead charges per unit corresponding to above description. (08 Marks)

- c. MICO factory produces 8000 spark plug per day involving a direct material cost of Rs.6,00,000. Direct labour cost of Rs.5,00,000 and factory overheads of Rs.2,00,000. Assume a profit of 20% of selling price and selling overheads are 30% of factory cost. Calculate the selling price of each spark plug. (06 Marks)

- 6 a. Write the balance sheet equation. Following is the year end details of a company.

Equity	Rs.2,00,000
Bank balance	Rs.10,000
Dividend payable	Rs.72,000
Provision for tax	Rs.40,000
Preference shares	Rs.1,35,000
Land and building	Rs.2,00,000
Debtors	Rs.2,65,000
Bills payable	Rs.20,000
Plant and equipment	Rs.80,000
Bills receivable	Rs.20,000
General reserves	Rs.40,000
Cash in hand	Rs.15000
Stock	Rs.77000
Creditors	Rs.160000

(10 Marks)

- b. Define the following with suitable equations:

- i) Current ratio
- ii) Acid list ratio
- iii) Debt equity ratio
- iv) Gross profit ratio
- v) Net profit ratio

(10 Marks)

- 7 a. What is a financial ratio? Explain liquidity and solvency ratio, mentioning their significance. (10 Marks)
- b. Calculate the current assets of xyz company with the following information:
 Stock turn over = 5 times
 Stock at the end = 5000 more than the stock at the beginning
 Sales = 2,00,000
 Gross profit ratio = 20%
 Current liabilities = Rs.60000
 Quick ratio = 0.75 (10 Marks)
- 8 a. Briefly explain the objectives of profit planning. (08 Marks)
- b. Draw a flexible budget for the overhead expenses on the following data and determine the overhead rate at 70%, 80% and 90% plant capacity.

Particular	Plant capacity (80%)
Variable overheads	
Indirect labour	Rs.1,25,000
Stores including spares	45000
Semi variable overheads	
Power (50% fixed)	2,25,000
Repairs and maintenance	20,000
Fixed overheads	
Depreciation	1,20,000
Insurance	35,000
Salaries	1,25,000
Estimated labour hours	1,60,000

(12 Marks)

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Seventh Semester B.E. Degree Examination, June/July 2017

Mechanical Vibrations

Time: 3 hrs.

Max. Marks:100

**Note: 1. Answer FIVE full questions, selecting at least TWO questions from each part.
2. Assume missing data suitably.**

PART - A

- 1 a. Define: i) Deterministic and random vibration, ii) Linear and non-linear vibration. (04 Marks)
 b. Split $x(t) = 5 \sin(\omega t + 30^\circ)$ into two simple harmonic motions, one with 60° phase lead and other with 45° phase lag. (06 Marks)
 c. Represent the following periodic motion into harmonic motion.

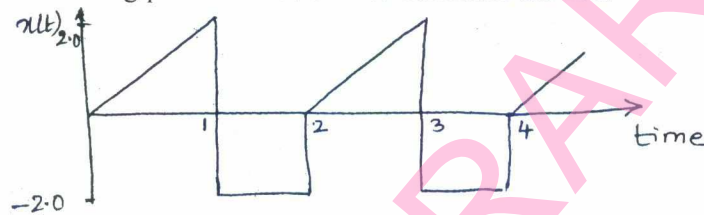


Fig.Q1(c)

(10 Marks)

- 2 a. A metallic wire of 2 mm dia and 30 m long is fixed at upper end and carries a mass M at its lower end. It is observed that the longitudinal vibration of mass in 4 cps. When an extra 2 kg is coupled to mass M, the longitudinal frequency reduces to 3.94 cps. Find the Young's modulus of the wire. (10 Marks)
 b. Find the natural frequency of the mass.

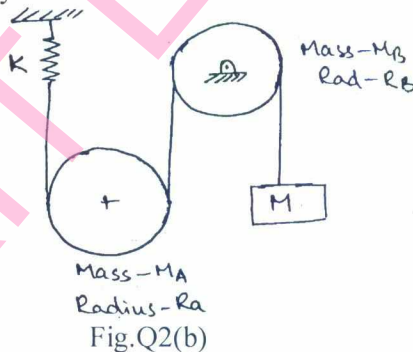


Fig.Q2(b)

(10 Marks)

- 3 a. Derive an expression for displacement of under damped vibration system with initial velocity \dot{x}_0 and initial displacement X. (10 Marks)
 b. What is the value of C such that the system of Fig.Q3(b) is critically damped if $M = 10$ kg and $K = 5$ kN/m.

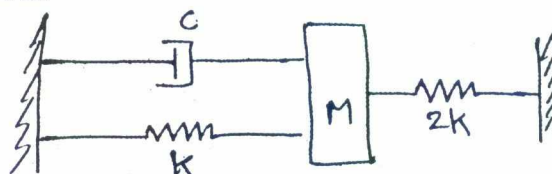


Fig.Q3(b)

(06 Marks)

- c. The spring-damper system is subjected to vibration as shown in Fig.Q3(c). Discuss the result. (04 Marks)

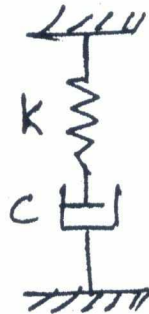


Fig.Q3(c)

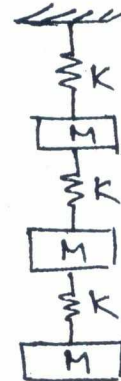


Fig.Q7(a)

- 4 a. A spring-mass-damper system is subjected to harmonic excitation of $F \sin \omega t$, having maximum value of 250 N with a frequency of 5 Hz. If the mass is 10 kg, spring with spring constant 2 kN/m and a dashpot of damping constant 50 N-s/m, determine the complete solution for the motion of the mass. (10 Marks)
- b. A reciprocating pump weighing 75 kg is mounted at the middle of a steel plate of thickness 12 mm, width 500 mm and 2.5 m long span, fixed at both the ends. If the rotating unbalance mass is 2 kg at radius 20 mm, the beam offers equivalent viscous damping of 75 N-s/m. Take $E = 200$ GPa. Calculate the amplitude of plate at resonance. (10 Marks)

PART - B

- 5 a. Explain with a neat sketch, the working principle of Frahm's reed Tachometer. (06 Marks)
- b. A 1.2 m long vertical steel shaft of 22 mm diameter supported by two bearings at its ends, carries a disc of mass 25 kg at its mid span. The eccentricity of centre of gravity of the disc from the centre of the rotor is 0.2 mm. The modulus of the elasticity for the shaft material is 200 GPa and the permissible stress is 80 N/mm^2 . Determine:
- The critical speed of the shaft
 - The range of speed over which it is unsafe to run the shaft. Neglect the mass of the shaft. (14 Marks)
- 6 a. Explain the dynamic vibration absorber. (06 Marks)
- b. An IC engine is coupled to a centrifugal pump through a pair of gears. The shaft from the flywheel of the engine to the gear wheel has 48 mm dia and is 800 mm long. The shaft from the pinion to the pump has 32 mm dia and is 280 mm long. Pump speed is 4 times the engine speed. MI of the flywheel, pump impeller are 1000 kg-m^2 and 18 kg-m^2 respectively. Find the modal shapes and corresponding modal frequencies of Torsional vibration. Neglecting inertia effects of gears. Take $G = 80 \text{ N/mm}^2$. (14 Marks)
- 7 a. Determine the fundamental natural frequency and mode shapes using Maxwell's reciprocal theorem. [Refer Fig.Q7(a)] (10 Marks)
- b. A shaft 40 mm dia and 2.5 m long has a mass of 15 kg per meter length. It is simply supported at the ends and carries three masses 90 kg, 140 kg and 60 kg at 0.8 m, 1.5 m and 2 m respectively from the left support. Taking $E = 200$ GPa, find the frequency of the transverse vibration using Dunkerley's method. (10 Marks)
- 8 a. Write short notes on:
- Spectrum analysers
 - Band pass filter (10 Marks)
- b. Explain any two frequency response methods to analyse modal shapes. (10 Marks)

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10ME73

Seventh Semester B.E. Degree Examination, June/July 2017
Hydraulics and Pneumatics

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1 a. State Pascal's law? With a neat sketch explain the basic hydraulic power system? (08 Marks)
- b. With a neat sketch explain the construction and working of a gear pump. (06 Marks)
- c. Determine the volumetric efficiency of a gear pump of external and internal diameters 75mm and 50mm respectively. Width of the gear teeth is 50mm. If the actual discharge is $30 \times 10^{-3} \text{ m}^3/\text{min}$ at 1800 rpm. (06 Marks)
- 2 a. With a neat sketch explain the operation of a vane motor. (08 Marks)
- b. A hydraulic motor has a displacement of 150 cm^3 , operates with a pressure of 75 bar and speed of 1800 rpm. If the actual flow rate consumed by the motor is $0.005 \text{ m}^3/\text{sec}$ and the actual torque delivered by the motor is 165 N-m. Find
 - (i) Volumetric efficiency
 - (ii) Mechanical efficiency
 - (iii) The actual power delivered by the motor. (08 Marks)
- c. With a neat sketch explain the working of linear actuator for single acting cylinder. (04 Marks)
- 3 a. Explain pressure reducing valve with graphical symbol. (10 Marks)
- b. Explain with a sketch non-compensated flow control needle valve. (10 Marks)
- 4 a. With circuit diagram explain meter in circuit for controlling the speed of hydraulic cylinders. (08 Marks)
- b. Describe with a circuit diagram the construction and working of a counter balance valve in hydraulic circuit. (07 Marks)
- c. With circuit diagram explain the application of accumulator as hydraulic shock absorber. (05 Marks)

PART – B

- 5 a. What are the desirable properties of hydraulic fluids? Explain briefly. (08 Marks)
- b. How hydraulic seals are classified? Explain any one method. (06 Marks)
- c. What is a filter? What are the methods of filtering? Explain briefly. (06 Marks)
- 6 a. What are the types of pneumatic actuators? With sketch explain the construction and working principle of single acting cylinder. (08 Marks)
- b. Differentiate hydraulic and pneumatic system. (06 Marks)
- c. What is cushioning? Sketch and explain the cushioning of cylinder. (06 Marks)
- 7 a. With a neat sketch and symbol explain 3/2 direction control poppet valve. (08 Marks)
- b. With a neat sketch explain how OR functions are generated in pneumatic systems. (06 Marks)
- c. Explain quick exhaust valve with circuit diagram. (06 Marks)
- 8 a. Explain the three stages of preparation of compressed air. (06 Marks)
- b. Explain control circuitry for single acting cylinders with circuit diagram. (06 Marks)
- c. Explain signal elimination using reversing valves. (08 Marks)

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10ME74

Seventh Semester B.E. Degree Examination, June/July 2017
Operations Research

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1 a. Explain in brief different phases of operations research. (06 Marks)
 b. Mention four application areas of operation research. (04 Marks)
 c. A furniture maker has 6-units of wood and 28 hrs of free time, in which he will make two – models of decorative screens. He estimates that model-1 requires 2-units of wood and 7-hrs of working time, while model-2 requires 1-unit of wood and 8-hrs of working time. The prices of the models are Rs.120/- and Rs. 80/- per screen respectively. Formulate this problem as L.P.P and solve it by graphical method. (10 Marks)

- 2 a. Define :
 i) Basic feasible solution
 ii) Optimal solution
 iii) Un bounded solution. (06 Marks)
 b. Use the Simplex method to solve following L.P.P
 Maximize $Z = 4x_1 + 10x_2$
 Subject to $2x_1 + x_2 \leq 50$
 $2x_1 + 5x_2 \leq 100$
 $2x_1 + 3x_2 \leq 90$
 $x_1, x_2 \geq 0$ (14 Marks)

- 3 a. Solve the following transportation problem (minimization)

	D ₁	D ₂	D ₃	D ₄	Supply
S ₁	21	16	25	13	11
S ₂	17	18	14	23	13
S ₃	32	27	18	41	19
Demand	6	10	12	15	

- i) Find IBFS by VAM method
 ii) Check for optimality by MODI method. (14 Marks)
 b. Find the optimal assignment cost for following assignment problem.

		Operators			
		I	II	III	IV
Machine	A	10	5	13	15
	B	3	9	18	3
	C	10	7	3	2
	D	5	11	9	7

(06 Marks)

4 Find the optimum integer solution to following I.P.P

$$\text{Maximize } Z = x_1 + 2x_2$$

$$\text{Subjected to } x_1 + x_2 \leq 7$$

$$2x_1 \leq 11$$

$$2x_2 \leq 7$$

$$x_1, x_2 \geq 0 \text{ and are integers.}$$

(20 Marks)

PART – B

5 a. A project consist of activities as given in the table :

Activities	Predecessor	Estimated time in weeks		
		t_0	t_p	t_l
A	–	1	7	1
B	A	1	7	4
C	–	2	8	2
D	B, C	1	1	1
E	C	2	14	5
F	A, C	2	8	5
G	D	3	15	6

- i) Draw the project network
 ii) Identify the critical path and determine the expected completion time of project
 iii) What is the probability that project would be completed in 17 weeks? (16 Marks)
- b. Draw the graph of direct cost, indirect cost and total cost of a project. Show the optimum duration and least cost of project on graph. (04 Marks)
- 6 a. Briefly explain the important characteristics of queuing system. (08 Marks)
- b. A box office ticket window manned by single server, customers arrive to purchase tickets according to Poisson's distribution with a mean rate of 30/hr. The time required to serve a customer has an exponential distribution with a mean of 90 sec. Determine :
- Mean queue length
 - Mean waiting time in the queue
 - Probability that there are 3 or more customers in the system
 - Percentage of time the server is busy. (12 Marks)

- 7 a. Explain :
 i) pure strategy
 ii) mixed strategy. (04 Marks)
- b. Find the optimal strategies and value of game by using dominance rule for following game.

$$\begin{bmatrix} -4 & 6 & 3 \\ -3 & -3 & 4 \\ 2 & -3 & 4 \end{bmatrix}$$
 (08 Marks)
- c. Solve the following game graphically

		Player B				
		B ₁	B ₂	B ₃	B ₄	B ₅
Player A	A ₁	2	-1	5	-2	6
	A ₂	-2	4	-3	1	0

Find the strategies for player A and B and also value of game. (08 Marks)

- 8 a. Explain the following :
 i) idle time on machine
 ii) total elapsed time (04 Marks)
- b. Mention any six assumptions made for sequencing problems. (06 Marks)
- c. There are 5-jobs each of which must go through the two machines A and B in order A, B processing times are given below :

Jobs	1	2	3	4	5
Time on (hrs) machine A	5	1	9	3	10
Time on (hrs) machine B	2	6	7	8	4

Determine the sequence for 5-jobs that will minimize the total elapsed time. Also calculate minimum elapsed time and idle times for both the machines. (10 Marks)

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10ME754

Seventh Semester B.E. Degree Examination, June/July 2017

Non-Conventional Energy Sources

Time: 3 hrs.

Max. Marks:100

Note: 1. Answer FIVE full questions, selecting at least TWO questions from each part.
2. No data handbooks are allowed.

PART – A

- 1 a. Describe briefly conventional and non-conventional energy sources. (07 Marks)
- b. What are advantages and disadvantages of renewable energy over conventional energy sources? (07 Marks)
- c. Briefly discuss the need for non-conventional energy sources. (06 Marks)
- 2 a. Explain principles of solar radiations at Earth's surface. (08 Marks)
- b. Explain with neat sketch:
 - i) Pyrheliometer
 - ii) Pyrometer
 - iii) Sun-shine recorder
 (06 Marks)
- c. Define the following:
 - i) Declination angle
 - ii) Surface azimuth angle
 - iii) Solar latitude angle
 - iv) Angle of incidence
 - v) Hour angle
 - vi) Zenith angle
 (06 Marks)
- 3 a. Explain with neat sketch working of flat plate collector to get heat energy. (10 Marks)
- b. Calculate the angle made by beam radiation with normal to flat collector on December 1st at 9.00 AM. Solar time for location at 28°35'N. The collector is tilted at an angle of latitude plus 10° with horizontal and pointing due south. (10 Marks)
- 4 a. Explain transmissivity of cover system for flat plate collector based on reflection-refraction and derive expression for transmissivity. (10 Marks)
- b. Describe with equations of overall loss coefficient and heat transfer correlations of top loss coefficient, bottom loss coefficient, and side loss coefficients. (10 Marks)

PART – B

- 5 a. With a neat sketch, explain the basic working principles of photovoltaic system for power generation. (06 Marks)
- b. Give the classifications of WIND MACHINES. Explain with neat sketch any one type of wind machine. (06 Marks)
- c. Determine the windmill rotor diameter to operate an pump which has a discharge of 40000 lit/day with a total head of 10 meters. The pump operates for 10 hours a day. The rated speed of wind 6 mtrs. The power coefficient is 0.3, density of air 1.2 kg/m³. Assume transmission efficiency as 95% and pump efficiency as 35%. (08 Marks)

- 6 a. Explain the main components of tidal power plant. (06 Marks)
b. Sketch and explain Rankine cycle for Ocean Thermal Energy Conversion. (07 Marks)
c. Discuss the problems associated with geothermal energy conversion. (07 Marks)
- 7 a. Describe the method of photosynthetic oxygen production, along with chemical reactions. (06 Marks)
b. Explain with sketch any two BioGas production plants. (08 Marks)
c. Describe the applications of bio-gas in engines and advantages. (06 Marks)
- 8 a. Discuss the sources of hydrogen and production of hydrogen. (07 Marks)
b. Explain the different method of hydrogen storage. (07 Marks)
c. Discuss the applications of hydrogen as domestic and industrial purposes. (06 Marks)

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10ME769

Seventh Semester B.E. Degree Examination, June/July 2017

Product Lifecycle Management

Time: 3 hrs.

Max. Marks:100

Note: Answer FIVE full questions, selecting at least TWO questions from each part.

PART – A

- 1 a. Define product Life Cycle Management. Explain the PLCM model with a neat sketch. (10 Marks)
b. Explain the opportunities and benefits of PLCM. (10 Marks)
- 2 a. Explain the various characteristics of PLCM. (10 Marks)
b. Discuss the various drivers of PLCM. (10 Marks)
- 3 a. What is a product data management system? What are the basic components of a PDM system? (10 Marks)
b. Classify and explain the reasons for implementing a PDM system. (10 Marks)
- 4 a. Define collaborative product development. What are the various drivers and aspects of collaborative product development? (10 Marks)
b. Write a note on :
i) Digital mock up and prototype development
ii) Virtual testing and validation. (10 Marks)

PART – B

- 5 a. Briefly explain the tools of communication for collaborative work. (10 Marks)
b. What is the importance of creating CAD drawings and animation for assembly instructions in the context of collaborative work? Explain. (10 Marks)
- 6 a. Discuss the parameters considered for optimization of design in the context of PLCM. (10 Marks)
b. What role do “know-how” and “Best Practices” play in the knowledge aspect of PLCM? (10 Marks)
- 7 a. What is digital manufacturing? What are its benefits? (10 Marks)
b. Write a note on :
i) Manufacturing the first one
ii) Virtual learning curve. (10 Marks)
- 8 a. What are the four important PLCM initiatives to support the corporate objectives? Explain. (10 Marks)
b. What are the various constituents that need to be considered for assessment of current systems? What precautions need to be taken during this assessment? (10 Marks)

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