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10ME71

Seventh Semester B.E. Degree Examination, June/July 2019

Engineering Economy

Time: 3 hrs.

Max. Marks: 100

- Note:** 1. Answer any FIVE full questions, selecting at least TWO questions from each part.
2. Use of discrete interest factor table is allowed.
3. Assume any missing data suitably.

PART – A

- 1 a. Discuss why engineers have to study economics. (10 Marks)
b. Differentiate between tactics and strategies give an illustration. (10 Marks)
- 2 a. State and explain any five conditions for present worth comparison. (10 Marks)
b. A precision machining component manufacturing company wants to expand its operation. For this purpose it has decided to add a CNC machine. One of the following two machine is to be selected based exclusively on future worth method of comparison:
Machine useful life = 4 years
Interest rate = 12%

	M ₁	M ₂
Initial cost (Rs.)	4,00,000	8,00,000
Salvage value at the end of life period (Rs.)	2,00,000	5,50,000
Annual maintenance cost (Rs.)	40,000	Nil

Which of the above machine M₁, M₂ to be selected? (10 Marks)

- 3 a. What is sinking fund? Explain its concept and philosophy. (10 Marks)
b. Jyothy Industries is considering to purchase a semi-automated welding machine for one of its export order, at an estimated initial cost of Rs.85,000. After a service life of 5 years its salvage value is estimated to be Rs.6000. Maintenance and operating costs are expected to be Rs.8000 for the first year of operation which increases by Rs.1500 per every year of additional use. Determine what annual saving must be obtained through the use of this equipment to make the purchase of this equipment economically justifiable. Consider interest rate of 10%. (10 Marks)
- 4 a. What is depreciation? List and briefly explain the causes. (10 Marks)
b. A CNC machine costs Rs.30,00,000. Its service life is 8 years and its salvage value after 8 years is Rs.2,50,000. Find:
i) Depreciation fund at the end of fifth year by fixed percentage method and declining balance method.
ii) Book value of the machine after 4th year by declining balance method.
iii) Book value after 6th year by declining balance method. (10 Marks)

PART – B

- 5 a. What is selling price? How selling price for a component is fixed? Explain its components. (10 Marks)
b. Find the factory cost of a forged hammer made from solid cast iron press of circular cross section of 30 cm dia and 160 mm length. Time taken to forge is 150 min and labour cost is Rs.22/hour (rate). Factory overheads are 40% of direct labour cost, material cost of cast iron is Rs.12/kg. Density of cast iron = 6.8 gm/cm³. (10 Marks)

- 6 a. What is balance sheet? Explain its importance. Prepare an illustrative balance sheet showing different accounts (model balance sheet). (10 Marks)
b. What are the sources of financial information? Briefly explain any of the two. (10 Marks)
- 7 a. List and explain different types of financial ratios, briefly. (10 Marks)
b. What are the advantages and limitations of ratio analysis? (10 Marks)
- 8 a. What is profit planning? What are the objectives? (10 Marks)
b. What are the types of budgets? Explain. (10 Marks)

Seventh Semester B.E. Degree Examination, June/July 2019
Mechanical Vibrations

Time: 3 hrs.

Max. Marks: 100

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

PART - A

- 1 a. Define the following terms: i) Amplitude ii) Resonance (02 Marks)
- b. Split the harmonic motion $x = 10 \sin\left(\omega t + \frac{\pi}{6}\right)$ into 2 harmonic motions on having a phase angle of zero and the other of 45° . Use graphical method and analytical methods. (08 Marks)
- c. A periodic motion is observed on the oscilloscope is illustrated in Fig.Q1(c). Represent this motion by harmonic series.

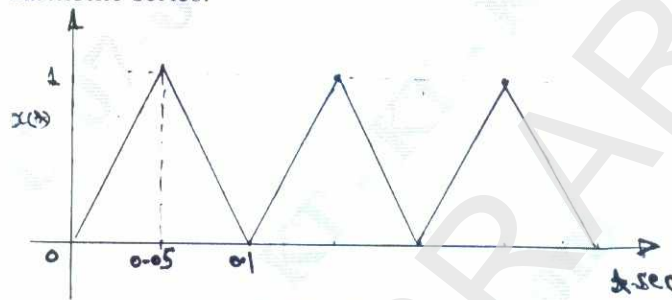


Fig.Q1(c)

(10 Marks)

- 2 a. Determine the natural frequency of a simple spring mass system:
 i) Newton's second law method
 ii) Energy method (06 Marks)
- b. Determine the natural frequency of a simple pendulum shown in Fig.Q2(b).

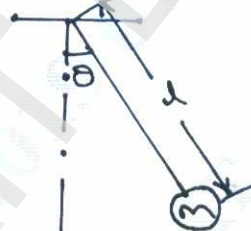


Fig.Q2(b)

(04 Marks)

- c. Use the energy method to find the natural frequency of oscillation of the homogeneous cylinder shown in Fig.Q2(c).

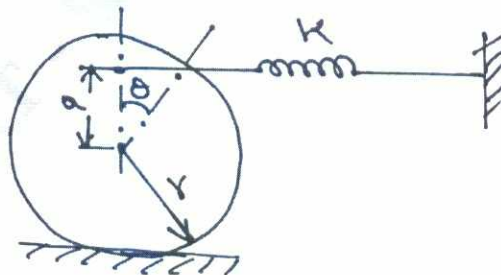


Fig.Q2(c)

(10 Marks)

- 3 a. Set-up the differential equation for a spring-mass-damper system and obtain the complete solution for the undamped condition. (12 Marks)
- b. Determine:
- Critical damping coefficient
 - Damping factor
 - Natural frequency of damped vibrations
 - Logarithmic decrement
 - Ratio of a consecutive amplitudes of vibrating system
- Which consists of mass of 100 kg a spring of stiffness 30 kN/mt and a damper? The damping provided is only 25% of the critical value. (08 Marks)
- 4 a. Define transmissibility and derive an expression for the transmissibility ratio. (12 Marks)
- b. A mass of 6 kg suspended of a spring of stiffness 1180 N/mt is forced to vibrate by the harmonic force 10 N. Assuming damping coefficient of 85 N-S/mt. Determine:
- The resonant frequency
 - Amplitude of resonance
 - Phase angle of resonance
 - Frequency corresponding to peak amplitude
 - Phase angle corresponding to the peak amplitude
- (08 Marks)

PART – B

- 5 a. Explain and discuss vibrometer and accelerometer devices with the help of relative amplitude ratio versus frequency ratio plot. (08 Marks)
- b. A rotor of a turbo charger weigh's 70 N and is supported between bearings which are 40 cm apart. The bearing can be considered as of shorter width. The center of gravity of the disc is at a distance of 0.25 cm from the geometrical center. Determine:
- The critical speed of the disc
 - Max deflection of the shaft at a speed of 3000 rpm
 - The dynamic force transmitted to the bearing
 - The maximum and minimum bending stress induced in the shaft.
- Take a diameter of shaft 20 mm and $E = 2.1 \times 10^{11}$ N/mt. (12 Marks)
- 6 a. Explain the working principle of dynamic absorber. (08 Marks)
- b. A string is tightly stretched between two supports as shown in Fig.Q6(b). The tension 'T' in the string may be assumed to be constant for small displacement. Obtain the two natural frequencies for the system.

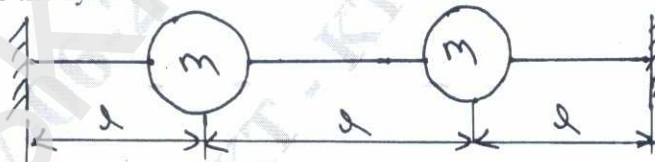


Fig.Q6(b)

(12 Marks)

- 7 a. Determine the natural frequencies of the system shown in Fig.Q7(a) by Holzers method. Given $J_1 = J_2 = J_3 = 1 \text{ kg m}^2$, $K_{t1} = K_{t2} = 1 \text{ N-mt/rad}$.

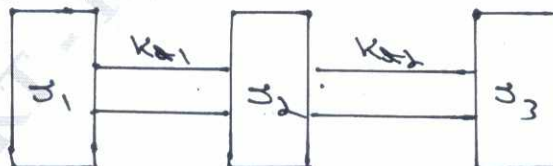


Fig.Q7(a)

(10 Marks)

- b. Calculate the natural frequency of the system shown in Fig.Q7(b) by matrix iteration method.

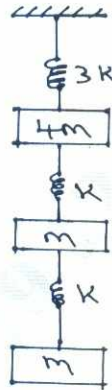


Fig.Q7(b)

(10 Marks)

- 8 a. Explain machine condition monitoring techniques.
b. Write a note on dynamic testing of machines.

(10 Marks)

(10 Marks)

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10ME73

Seventh Semester B.E. Degree Examination, June/July 2019
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. Write the displacement characteristics of Fixed and Variable displacement pump. (03 Marks)
 - b. Explain Pressure compensated vane pump, with a neat figure. (07 Marks)
 - c. Derive an expression for theoretical displacement of a axial piston pump. (04 Marks)
 - d. Explain the working of internal gear pump, with a neat figure. (06 Marks)
- 2
 - a. Explain the working of single and double acting cylinder.. (05 Marks)
 - b. Explain how bent axis motor differs with axial motor with schematic sketches. (08 Marks)
 - c. A hydrostatic transmission operating at 10 MPa has the following data :

Hydraulic pump	Hydraulic motor
$V_D = 100 \text{ cm}^3$	$V_D = ?$
$\eta_{\text{vol}} = 90\%$	$\eta_{\text{vol}} = 92\%$
$\eta_{\text{mech}} = 85\%$	$\eta_{\text{mech}} = 87\%$
$N = 1500 \text{ rpm}$	$N = 700 \text{ rpm}$

Find the a) Displacement of the motor.

b) Output torque to motor.

(07 Marks)

- 3
 - a. Explain with a neat figure, the working of a Compound Relief Valve. (07 Marks)
 - b. Explain how a pressure compensated flow is obtained through a flow control valve, with the help of a neat sketch. (07 Marks)
 - c. Explain the working of the following D.C. Valves using graphic symbols :
 i) 3/2 valve ii) 4/2 valve. (06 Marks)
- 4
 - a. Explain how speed of a hydraulic cylinder is controlled using a regenerative hydraulic circuit. (07 Marks)
 - b. Explain Meter in circuit design of a hydraulic system. (06 Marks)
 - c. Sketch the hydraulic circuit for use of accumulator as an auxiliary power source and explain its working. (07 Marks)

PART – B

- 5
 - a. Write notes about service properties of hydraulic fluids. (06 Marks)
 - b. What are the undesirable effects of solid contaminations? (06 Marks)
 - c. Explain with neat sketches the working of Full – flow and By - pass filter. (08 Marks)
- 6
 - a. Describe the structure of pneumatic control, with a block diagram. (07 Marks)
 - b. Explain the working of cylinder cushioning, with a neat sketch. (07 Marks)
 - c. Describe any two basic mounting arrangements of pneumatic actuators. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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- 7 a. Explain the working of a puppet valve, with a schematic diagram and graphic symbol. (07 Marks)
- b. Explain how a shuttle valve functions as an OR gate. (04 Marks)
- c. Explain with a circuit diagram, controlling of extension of a double acting cylinder using logic gates. (09 Marks)
- 8 a. Explain with a neat circuit diagram, the coordinated sequencing motion of two cylinders with signal overlap steps. (08 Marks)
- b. Explain Pilot assisted solenoid control of d.c. valves with a circuit diagram. (07 Marks)
- c. Explain the preparation of compressed air. (05 Marks)

Seventh Semester B.E. Degree Examination, June/July 2019
Operations Research

Time: 3 hrs.

Max. Marks:100

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

2. Areas under the standard normal distribution (statistical table).

PART – A

- 1 a. A Farmer has 100 acre farm. He can sell all tomatoes, lettuce or radishes he can raise. The price he can obtain is Rs. 1.00 per kg tomatoes, Rs. 0.75 a head for lettuce and Rs. 2.00 per kg for radishes. The average yield per acre is 2,000 kg of tomatoes, 3,000 heads of lettuce, and 1000 kgs of radishes. Fertilizer is available at Re.0.50 per kg and the amount required per acre is 100 kgs each for tomatoes and lettuce and 50 kgs for radishes. Labour required for sowing, cultivating and harvesting per acre is 5-man-days for tomatoes and radishes and 6 man-days for lettuce. A total of 400 man-days are available at Rs.20 per man-day. Formulate this problem as a linear programming model to maximize the farmer's total profit. (10 Marks)
- b. Solve the following LP problem graphically :
 Max $z = 8000x_1 + 7000x_2$
 Subject to $3x_1 + x_2 \leq 66$
 $x_1 + x_2 \leq 45$
 $x_1 \leq 20, x_2 \leq 40$
 and $x_1, x_2 \geq 0$. (10 Marks)
- 2 a. Use BIG-M method to maximize $Z = 3x_1 - x_2$
 Subject to $2x_1 + x_2 \leq 2$
 $x_1 + 3x_2 \geq 3$
 $x_2 \leq 4$
 $x_1, x_2 \geq 0$. (10 Marks)
- b. Obtain the dual of the following primal problem:
 Minimize $z = 3x_1 - 2x_2 + x_3$
 Subject to $2x_1 - 3x_2 + x_3 \leq 5$
 $4x_1 - 2x_2 \geq 9$
 $-8x_1 + 4x_2 + 3x_3 = 8$.
 $x_1, x_2 \geq 0, x_3$ is unrestricted. (10 Marks)
- 3 a. Find the optimal solution to the following:
 Transportation problem shown in Table Q3 (a) in which the calls contain the transportation. Cost in Rupees. (10 Marks)

		To Ware houses					Available
		W ₁	W ₂	W ₃	W ₄	W ₅	
From	F ₁	7	6	4	5	9	40
	F ₂	8	5	6	7	8	30
	F ₃	6	8	9	6	5	20
	F ₄	5	7	7	8	6	10
Required		30	30	15	20	5	

Table Q3 (a)

- 3 b. Solve the following Assignment problem shown in Table Q3 (b).

	I	II	III	IV	V
1	11	17	8	16	20
2	9	7	12	6	15
3	13	16	15	12	16
4	21	24	17	28	26
5	14	10	12	11	13

Table Q3 (b)

- 4 a. What is integer programming problem, and methods adopted to solve them? (05 Marks)
 b. Solve the following integer programming problem, using Gomary's fractional cutting plane method.

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

$$\text{Subject to Constraints } 2x_2 \leq 7$$

$$x_1 + x_2 \leq 7$$

$$2x_1 \leq 11$$

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

(15 Marks)

PART - B

- 5 a. A project has the following time schedule, shown in Table Q5 (a).

Activity	1-2	1-3	1-4	2-5	3-6	3-7	4-6	5-8	6-9	7-8	8-9
Duration (in months)	2	2	1	4	8	5	3	1	5	4	3

Table Q5 (a)

- (i) Construct PERT network.
 (ii) Compute Total float, Free float and Independal float for each activity.
 (iii) Critical path and its duration. (10 Marks)
- b. A small project is composed of seven activities whose time estimates are listed in Table Q5 (b).
 (i) Draw the project network.
 (ii) Find the critical path.
 (iii) Find the probability of the project being completed within 19 weeks. (10 Marks)

Activity	Estimated Direction in Weeks		
	Optimistic	most likely	Pessimistic
	a	m	b
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

Table Q5 (b)

- 6 a. What are the elements of a queuing system (structure of queuing system)? (05 Marks)
 b. A self service stores employs one cashier at its counter. Nine customers arrive on an average every 5 minutes, while the cashier can serve 10 customers in 5 minutes. Assuming poisson's distribution for arrival rate and exponential distribution for service time. Find :
 (i) Arrival and service rate per minute.
 (ii) Average number of customer in the system.
 (iii) Average number of customers in the queue or Average queue length.
 (iv) Average time a customer spends in the system.
 (v) Average time a customer waits before being served. (15 Marks)

- 7 a. Explain, what is theory of Games, and based on what principle Neumann forward it also state characteristics of games. (10 Marks)
- b. Solve the following 2×5 game by graphical method, refer Table Q7 (b). (10 Marks)

Player B

		1	2	3	4	5	
Player A	x_1	1	-5	5	0	-1	8
	$x_2 = 1 - x_1$	2	8	-4	-1	6	-5

Table Q7 (b)

- 8 a. What are the assumptions in sequencing problems? (05 Marks)
- b. There are 5 jobs, each of which is to be processed through three machines A, B and C in the order ABC. Determine the optimum sequence for the 5-jobs and the minimum elapsed time. Also find the idle time for the three machines refer the Table Q8 (b) for machining time in hours. (15 Marks)

Job	A	B	C
1	3	4	7
2	8	5	9
3	7	1	5
4	5	2	6
5	4	3	10

Table Q8 (b)

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10ME754

Seventh Semester B.E. Degree Examination, June/July 2019
Non Conventional Energy Source

Time: 3 hrs.

Max. Marks:100

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

PART - A

- 1 a. What are the needs for alternate sources of energy? (04 Marks)
 b. Write short notes on : i) Water power plant ii) Geothermal power plant. (06 Marks)
 c. Compare the Tarsands and oil shale based on definition and production route. (10 Marks)
- 2 a. Define the following terms : i) Langley ii) Declination iii) Surface azimuth angle
 iv) Hour angle v) Day length. (10 Marks)
 b. The following hourly values are measured around mid day on a clear days at a site [(25° 06'N) (79° 03'E)].

Date : June 19, 2016

LAT	9-10	10-11	11-12	12-13	13-14	14-15
(I _g) langlay / h	67.6	77.0	79.30	84.50	79.50	64.0
(I _d) langlay/h	17.1	15.2	17.6	18.6	16.9	17.6

Compare the value with values which would be predicted by the ASHRAE method. Use constants A = 1092 w/m², B = 0.185 and C = 0.137. (10 Marks)

- 3 a. Write down the general equation for flux on Tilted surface and explain each term in detail. (10 Marks)
 b. Describe the construction and working principle of parabolic trough based solar power plant. (10 Marks)
- 4 a. List out the parameters, which effects the performance of liquid flat plate collector and explain any five in detail. (10 Marks)
 b. Write down the energy balance equation on absorber unit to evaluate the liquid flat plate collector and explain each term in detail. (10 Marks)

PART - B

- 5 a. Explain the working principle and current voltage characteristics of a solar cell with neat sketch. (10 Marks)
 b. Find the electrical power output of a three blade propeller type wind machine operating at a design wind speed of 36 kmph at a height of 23m from the ground. The diameter of the rotor is 15m. Make suitable assumptions and plot the variation of electrical power output with wind speed if the cut in speed is 14 kmph and cutout speed is 90 kmph. (10 Marks)
- 6 a. Describe the working principle of a open cycle OTEC system with neat diagram. (10 Marks)
 b. Explain with neat sketch, the working principle of Geothermal power plant. (10 Marks)
- 7 a. Describe in detail the term "Energy Plantation". (06 Marks)
 b. Explain the construction and working principle of Bio gas plant with neat sketch. (10 Marks)
 c. List out the various application of Biogas. (04 Marks)
- 8 a. What are the various methods of Hydrogen production? Explain Electrolysis route of hydrogen generation in detail. (14 Marks)
 b. Describe the Domestic and Industrial safe burning of Hydrogen. (06 Marks)

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10ME769

Seventh Semester B.E. Degree Examination, June/July 2019
Product Lifecycle Management

Time: 3 hrs.

Max. Marks: 100

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

PART – A

- 1 a. Explain the phases in PLM life cycle model with neat sketch. (10 Marks)
b. List various threads of PLM and explain their importance. (10 Marks)
- 2 a. List and explain the external drivers. (10 Marks)
b. Explain the conceptualization. (10 Marks)
- 3 a. Explain PDM system and its importance. (10 Marks)
b. Explain the following : (10 Marks)
i) Versioning
ii) Check in and Check – out.
- 4 a. What is collaborative product Development? (08 Marks)
b. Explain the following : (12 Marks)
i) Start and Smart part
ii) Collaboration room
iii) Digital Mock – up and prototype development.

PART – B

- 5 a. Explain the creation of an animation for assembly instruction on 3D Vai composer. (10 Marks)
b. What are the benefits of 3D XML? (05 Marks)
c. Explain change management. (05 Marks)
- 6 a. Explain the following : (08 Marks)
i) Parameters
ii) Design table.
b. What do you mean by virtual testing and validation? Explain with suitable example. (12 Marks)
- 7 a. What are the benefits of Digital manufacturing? (05 Marks)
b. Explain the manufacturing first one. (10 Marks)
c. Explain the virtual learning curve. (05 Marks)
- 8 a. Explain Infrastructure Assessment. (05 Marks)
b. What are importances of PLM strategy? (05 Marks)
c. List the steps to develop and implement a PLM strategy. Explain any two. (10 Marks)

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