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10ME71

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018
Engineering Economy

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***
2. Interest factors tables permitted.

PART – A

1 a. Explain briefly the problem solving process with a diagram. **(05 Marks)**

b. Enumerate the difference between Intuition and analysis. **(05 Marks)**

c. Determine the effective interest rate for a nominal annual rate of 10% that is compounded :
i) Quarterly ii) Monthly iii) Daily iv) Hourly. **(06 Marks)**

d. A 45 years old person is planning for his retired life. He plans to divert Rs 30,000/- from his bonus as investment every year for the next 15 years. The bank gives 12% interest rate compounded annually. Find the maturity value of his accounts when he is 60 years old. **(04 Marks)**

2 a. Briefly explain the conditions for present worth comparison. **(06 Marks)**

b. Two devices are available to perform necessary functions for 3 years. The initial Costs (-ve) for each device as time zero and sub – sequent annual savings (+ve) both in rupees are shown in the following table. The required interest rate is 8%. **(10 Marks)**

Years	0	1	2	3
Device A	9000	4500	4500	4500
Device B	14000	6000	6000	8000

c. How do you compare assets that have unequal lives? Explain. **(04 Marks)**

3 a. Define the following terms with respect to EAWC :
i) Ownership life or Service life ii) Accounting life iii) Economic life. **(06 Marks)**

b. A plot can be purchased for Rs 13,80,000. Company A offers a loan at 7.5% nominal interest to be compounded monthly, if a down payment of Rs 25,000 is paid initially. The loan is to be paid off in 15 years. Company B offers 20 year repayment period with the same down payment but the nominal interest rate is 9% compounded monthly. Evaluate the monthly payment for the above two alternatives. **(08 Marks)**

c. A stand by lighting generator is required for a shop. Two types are available.

	Type 1	Type 2
First cost	Rs 5,000	Rs 3,200
Salvage value	Rs 1,000	Nil
Annual operating costs	Rs 780	Rs 950

If both generators have a life of 4 years and the interest rate is 15% per year, which offers the lowest equivalent annual cost. **(06 Marks)**

4 a. Explain the following : i) Minimum Acceptable rate up return (MARR) ii) Internal Rate of Return (IRR). **(04 Marks)**

b. Describe the causes of depreciation. **(06 Marks)**

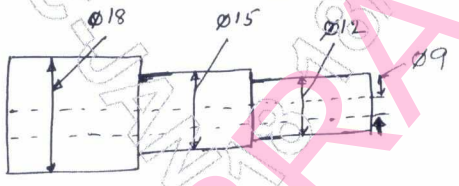
c. A CNC LATHE machine has a first of Rs 5,00,000/- with a salvage value of Rs 1,00,000/- after 5 years. Determine the following :
   i) Depreciation charge using straight line method.
   ii) Book value or diminishing value of the machine at the end of 2nd year.
   iii) Depreciation charge using SOYD method. **(10 Marks)**

PART – B

5 a. With a neat sketch, explain the component of costs traditionally used in the accounting for the price of a manufactured product. **(06 Marks)**

b. A TVS factory producing 500 spark plugs per day. The direct material cost is found to be Rs 40,000/- , direct labour costs is Rs 35,000/- and factory over heads chargeable to it Rs 10,000/-. If the selling on cost is 30% of the factory cost. Estimate the selling price of each spark plug to realize a profit of 15% of the selling price. **(06 Marks)**

c. A C.I cone pulley is shown in figure. Taking density of C.I as 7.0208 gm/cc. Estimate unit weight of component. Calculate the cost of material, if cost per kg is Rs 20/-. All dimensions in cm. All three steps have equal length of each 6cm. **(08 Marks)**



6 a. What are the objectives of financial management? **(05 Marks)**

b. Explain Finance functions. **(05 Marks)**

c. Write the balance sheet equation. Following is the year end details of a Company XYZ, prepare the balance sheet for year end 31st March 2017. **(10 Marks)**

Equity shares	2,00,000/-	Bills payable	20,000/-
Bank balance	10,000/-	Plant & equipment	80,000/-
Dividend payable	72,000/-	Bill receivable	20,000/-
Provisions for tax	40,000/-	Creditors	55,000/-
Preference shares	1,35,000/-	General reserves	40,000/-
Land & Building	2,00,000/-	Cash in hand	15,000/-
Debtors	1,60,000/-	Stock	77,000/-

7 a. Describe the users of financial ratio analysis in brief. **(05 Marks)**

b. List and explain the various financial ratio's. **(15 Marks)**

8 a. List the essentials of Profit Planning. **(05 Marks)**

b. List the types of budgets and explain master budget. **(07 Marks)**

c. For ABC company, analyse a production budget for 3 months ending 31.03.2017 for four products on the basis of following information. **(08 Marks)**

Product	Estimated stock on 01.01.2017	Estimated sales during Jan – March 2017	Desired closing stock on 31.03.2017
A	20,000	1,00,000	30,000
B	30,000	1,50,000	50,000
C	40,000	1,30,000	30,000
D	30,000	1,20,000	20,000

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10ME72

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018
Mechanical Vibrations

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer any FIVE full questions, selecting at least TWO questions from each part.***
2. ***Draw neat sketches wherever required.***

PART – A

1 a. What is vibration? Enumerate the causes and effects of vibrations. **(05 Marks)**

b. With a neat sketch, explain the pheonomenon of beats. **(05 Marks)**

c. Represent the periodic motion shown in Fig. Q1 (c) by a harmonic series. **(10 Marks)**

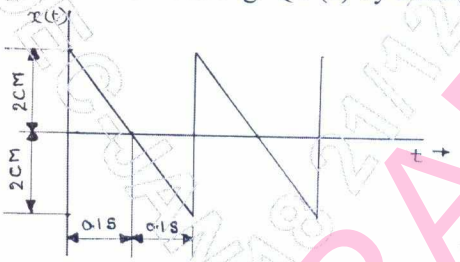

Fig. Q1 (c)

2 a. Determine the natural frequency of a spring-mass system in which the mass of the spring is not negligible. **(10 Marks)**

b. Determine the natural frequency in CPS of a string in tension with a mass as shown in Fig. Q2 (b). **(10 Marks)**

Fig. Q2 (b)

3 a. Define logarithmic decrement. Show that logarithmic decrement δ is given by $\frac{2\pi\xi}{\sqrt{1-\xi^2}}$ for an underdamped system. **(08 Marks)**

b. A spring mass damper system has a mass of 10 kg, spring stiffness 250 N/m and damping coefficient of 15 N-S/m. Determine the natural frequency, critical damping coefficient, damping factor, damped natural frequency, period of vibration, logarithmic decrement, ratio of two successive amplitudes and number of cycles after which the original amplitude is below 15%. **(12 Marks)**

4 a. Define transmissibility. Show that damping in vibration isolation is useful, when the frequency ratio is greater than $\sqrt{2}$ only. **(05 Marks)**

b. A 40 kg fan has a rotating unbalance of magnitude 0.1 kg-m. The fan is mounted at the free end of a Cantilever beam of length 1.2 m. Find the steady state amplitude of the fan when it operates at 1000 rpm. The beam is specially treated to add viscous damping of $\xi = 0.0617$ Take E = 200 GPa and $I = 1.3\times10^{-6}\,m^4$. **(07 Marks)**

c. A flywheel of mass Moment of Inertia 0.1 kg-m^2 is suspended from a thin wire of stiffness 1.2 N-m/rad. A periodic torque having maximum value of 0.6 N-m at 4 rad/s is impressed upon the flywheel. A damping couple of 0.8 N-m at an angular velocity of 2 rad/s is applied by a viscous dashpot. Determine (i) Maximum angular displacement. (ii) Maximum couple applied to the dashpot. **(08 Marks)**

PART – B

5 a. Plot Z/Y v/s frequency ratio and phase angle v/s frequency ratio graph and enumerate the salient features from it. **(06 Marks)**

b. With a neat sketch, explain Fulltron Tachometer. **(05 Marks)**

c. A vertical shaft of diameter 20 mm rotates in long bearings and a disc of mass 18 kg is attached to the shaft at midspan. The span of the shaft is 0.8 m with an eccentricity of the disc from the shaft axis of 0.5 mm. Neglecting the mass of the shaft and considering the shaft fixed-fixed, find the critical speed. Also determine the range of speed for which the stress in the shaft due to bending exceeds 150 MPa. Take E = 210 GPa. **(09 Marks)**

6 a. Determine the natural frequency of oscillation of the double pendulum. **(12 Marks)**

b. What are vibration absorbers? Show that the spring force of absorber system is equal and opposite to exciting force when the main system is stationary. **(08 Marks)**

7 a. Find the fundamental frequency of the system shown in Fig. Q7 (a) using Stodola method (3 trails). **(08 Marks)**

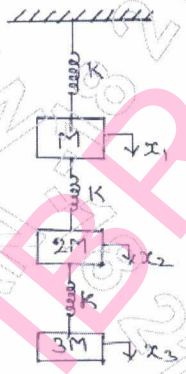

Fig. Q7 (a)

b. Find the natural frequencies of the 3 DOF system using Holzer's method shown in Fig. Q7 (b). Neglect friction. **(12 Marks)**

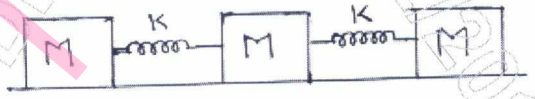

Fig. Q7 (b)

8 a. What is experimental modal analysis? Explain the two basic ideas and the necessary equipment for the measurement of vibration. **(10 Marks)**

b. With necessary graphs, explain the different maintenance techniques. **(10 Marks)**

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10ME73

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018
Hydraulics & Pneumatics

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. With a neat block diagram, explain the structure of hydraulic power system. **(06 Marks)**

b. A gear pump has a 75 mm outside diameter, a 50 mm inside diameter and a 25 mm width. If the volumetric efficiency is 90% at rated pressure, what is the corresponding actual flow rate? The pump speed is 1000 rpm. **(04 Marks)**

c. A pump has a displacement volume of 100 cm^3. It delivers 0.0015 m^3/s at 1000 rpm and 70 bars. If the prime mover input torque is 120 N.m. Determine
(i) What is the overall efficiency of the pump?
(ii) What is the theoretical torque required to operate the pump? **(06 Marks)**

d. What are the advantages of hydraulic system? **(04 Marks)**

2 a. A pump supplies oil at 75.8 litres/min to a 50.8 mm diameter double-acting hydraulic cylinder. If the load is 4448 N (extending and retracting) and the rod diameter is 25.4 mm, find
(i) The hydraulic pressure during the extending stroke.
(ii) The piston velocity during the extending stroke.
(iii) The cylinder power during the extending stroke.
(iv) The hydraulic pressure during the retraction stroke.
(v) The piston velocity during the retraction stroke.
(vi) The cylinder power during the retraction stroke. **(09 Marks)**

b. Explain with a neat sketch a Gear Pump. **(05 Marks)**

c. A hydraulic motor has a displacement of 164 cm^3 and operates with a pressure of 70 bars and a speed of 2000 rpm. If the actual flow rate consumed by the motor is 0.006 m^3/s and the actual torque delivered by the motor is 170 NM, find
(i) Volumetric efficiency.
(ii) Mechanical efficiency.
(iii) Overall efficiency.
(iv) The actual kW delivered by the motor. **(06 Marks)**

3 a. Explain with neat sketch of $\frac{3}{2}$ Poppet valve with symbolic representation. **(08 Marks)**

b. Explain with neat sketch of pilot operated pressure Relief valve. **(07 Marks)**

c. Explain with a neat sketch the working of shuttle valve with symbolic representation. **(05 Marks)**

4 a. Explain with a neat circuit diagram, the working of double pump hydraulic system. **(10 Marks)**

b. Explain with a neat circuit diagram, the counter balance valve application. **(10 Marks)**

PART – B

5 a. Write any five desirable properties of a hydraulic fluid. **(05 Marks)**

b. Explain three basic types of filtering methods used in hydraulic system. **(06 Marks)**

c. Explain static seals and dynamic seals with examples. **(05 Marks)**

d. Identify the most common causes of hydraulic system break down. **(04 Marks)**

6 a. State five disadvantages of using air instead of hydraulic oil. **(05 Marks)**

b. Explain with schematic sketch of FRL unit with ANSI symbol. **(09 Marks)**

c. Explain the characteristics of compressed air. **(06 Marks)**

7 a. Explain with a neat circuit diagram, the working of two step speed control system. **(10 Marks)**

b. Explain the pressure dependent control of circuit with a $^{5}/_{2}$ double pilot operated DCV, two $^{3}/_{2}$ spring return and double acting cylinder. **(10 Marks)**

8 a. Write a brief note on SPST-NO, SPST-NC, DPST-NO/NC, DPDT-NO/NC and LS-NO with symbol of these switches. **(10 Marks)**

b. Explain with neat sketch of circuit of sequencing of two pneumatic cylinder that can be done by using Solenoids, limit switches and valves. **(10 Marks)**

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10ME74

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018
Operations Research

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer FIVE full questions, selecting at least TWO questions from each part.***
2. Use of normal distribution tables is permitted.

PART – A

1 a. Define operations research. Give the historical development of operations research. **(06 Marks)**

b. A farmer has 100 acre land. He can sell all the tomatoes, lettuce or radishes that he can raise. The price he can obtain is ₹ 10/- per kg of tomatoes, ₹ 7/- a head of lettuce and ₹ 10/- per kg of radishes. The average yield per acre is 2000 kg of tomatoes, 3000 heads of lettuce and 1000 kg of radishes. Labour required for Sowins, Cultivating and harwesting per acre is 5 man-days for tomatoes and radishes and 6 man-days for lettuce. A total of 400 man-days of labour is available at ₹ 100/- per man day. Formulae this problem as LPP to maximize the farmer's profit. **(08 Marks)**

c. Define the following terms with reference to LPP:
(i) Feasible solution. (ii) Infeasible solution. (iii) Unbounded solution. **(06 Marks)**

2 a. Explain the concepts of degeneracy in simplex method. **(05 Marks)**

b. Solve the following LPP using simplex method,

$$z_{min} = x_1 - 3x_2 + 2x_3$$

Subject to: $3x_1 - x_2 + 2x_3 \le 7$

$$-2x_1 + 4x_2 \le 12$$

$$-4x_1 + 3x_2 + 8x_3 \le 10$$

$$x_1, x_2, x_3 \ge 0$$

(15 Marks)

3 a. Larsen and Toubro company needs 3, 3, 4 and 5 million cubic feet of fill at four earthen dam sites I, II, III and IV in Karnataka. It can transfer the fill from three mounds A, B, C where 2, 6, 7 million cubic feet of fill is available respectively. Costs of transportation of one million cubic feet of fill from mounds to the four sites in lakhs of rupees are given in the following table.

		To I	II	III	IV
From	A	15	10	17	18
	B	16	13	12	13
	C	12	17	20	11

Determine the optimal transportation plan which minimizes the total transportation cost to the company. **(12 Marks)**

b. A batch of 4 jobs can be assigned to 5 different machines. The following table shows the installation time in hours for each job on various machines. Find the optimal assignment of jobs to machines which will minimize the total installation time. **(08 Marks)**

		Machine M_1	M_2	M_3	M_4	M_5
Job	J_1	10	11	4	2	8
	J_2	7	11	10	14	12
	J_3	5	6	9	12	14
	J_4	13	15	11	10	7

4 a. What is an integer programming problem? Explain the importance of integer programming. **(05 Marks)**

b. Use branch and bound method to solve the following integer programming problem:

$Z_{max} = 7x_1 + 9x_2$

Subject to,

$-x_1 + 3x_2 \leq 6$

$7x_1 + x_2 \leq 35$

$x_2 \leq 7$

$x_1, x_2 \geq 0$ and are integers. **(15 Marks)**

PART – B

5 a. Explain the basic steps involved in PERT/CPM. **(04 Marks)**

b. Write short notes on crashing of a project network. **(04 Marks)**

c. An organization has large number of activities but it is interested in controlling a part of these activities to 7 in number. The following data is available for these activities.

Activity	Precedence	Time (days)		
		t_0	t_m	t_p
A	-	4	6	8
B	A	6	10	14
C	A	8	15	22
D	B	9	9	9
E	C	10	14	18
F	A	5	5	5
G	D, E, F	8	10	12

(i) Draw a PERT network for the activities.

(ii) Identify the critical path and its duration.

(iii) If the organization puts 47 days as dead line to complete, what is the probability of completion in 47 days. **(12 Marks)**

6 a. Define the term queue. State and explain the characteristics of queing system. **(08 Marks)**

b. Patrons arrive at a reception counter at an average inter arrival time of 2 minutes. The receptionist on duty takes an average of one minute per person. (Arrivals are as per exponential and services are as per Poisson distribution).

(i) What is the probability that a person will straight away meet the receptionist?

(ii) For what portion of the time the receptionist is busy?

(iii) What is the average queue length?

(iv) What is the average number of patrons in the system?

(v) What is the average waiting time of a patron?

(vi) What is the average time a patron spends in the system? **(12 Marks)**

7 a. Explain the following terms related to theory of games:

(i) Pay-off matrix.

(ii) Min.Max and Max.Min principle.

(iii) Dominance rule.

(iv) Pure and mixed strategies.

(v) Fair game. **(10 Marks)**

b. Use the dominance rule and solve the following game whose pay.off matrix for player A is:

		B		
		B_1	B_2	B_3
A	A_1	-4	6	3
	A_2	-3	-3	4
	A_3	2	-3	4

(10 Marks)

8 a. List out any four assumptions underlying sequencing problems. **(04 Marks)**

b. Consider the processing times (in minutes) of 5 jobs each of which must undergo through 2 machines M_1 and M_2 in the order M_1M_2.

		Job				
		J_1	J_2	J_3	J_4	J_5
Machine	M_1	5	1	9	3	10
	M_2	2	6	7	8	4

Obtain the sequence for the jobs that minimizes the total elapsed time and also find the idle time of both the machines. **(08 Marks)**

c. There are five jobs, each of which is to be processed through machines A, B and C in the order CAB, processing time in hours is given below:

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

Determine the optimum sequence for the jobs and the total elapsed time. **(08 Marks)**

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10ME754

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018
Non Conventional Energy Sources

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. With neat sketch, explain the production of oil from oil shale and Tar sands. **(12 Marks)**

b. Explain the advantages and limitations of use of non-conventional sources of energy. **(08 Marks)**

2 a. With a neat sketch, explain the working principle of an instrument used to measure Global radiation. **(10 Marks)**

b. With the help of appropriate sketch, explain altitude, zenith angle and solar azimuth angle. **(10 Marks)**

3 a. With a neat sketch, explain the working principle and applications of solar pond. **(12 Marks)**

b. With a neat sketch, explain thermal storage wall and roof storage with respect to passive solar heating system. **(08 Marks)**

4 a. Briefly explain the effect of various parameters on performance of liquid flat plate collectors. **(10 Marks)**

b. Data for a flat plate collector used for heating the building are given below :

Sl No	Factor		Specification
1	Location and latitude	–	Baroda, 22°N
2	Day and time	–	January 1, 11:30 to 12:30 (IST)
3	Annual average intensity of solar radiation.	–	0.5 Langley/min
4	Collector tilt	–	Latitude + 15°
5	Number of glass covers	–	02
6	Heat removal factor for collector	–	0.810
7	Transmittance of the glass	–	0.88
8	Absorptance of the glass	–	0.90
9	Top loss coefficient for collector	–	7.88W/m^2°C [6.80 Kcal/hrm^2°C]
10	Collector fluid temperature	–	60°C
11	Ambient Temperature	–	15°C

Calculate:

i) Solar altitude angle
ii) Incident angle
iii) Collector efficiency. **(10 Marks)**

PART – B

5 a. With a neat sketch, explain the working principle of horizontal axis wind turbine using two aerodynamic blades. **(10 Marks)**

b. Describe the main considerations in selecting a site for wind generators. **(10 Marks)**

6 a. With a neat sketch, explain single and double basin tidal power plant. **(10 Marks)**

b. Briefly explain the various factors which affect the operational and environmental problems with respect to Geothermal energy. **(10 Marks)**

7 a. With a neat sketch, explain the Indian bio-gas-plant. **(10 Marks)**

b. What are the applications of Bio-gas? Explain the modifications needed for C.I. engine using Biogas. **(10 Marks)**

8 a. Discuss briefly the four methods of hydrogen storage. **(10 Marks)**

b. What are the various routes of hydrogen production? Explain the hydrogen production through electrolysis of water with simple sketch. **(10 Marks)**

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10ME769

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018
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 Product Life Cycle Management and explain briefly the "Life Cycle Model" of PLM. **(08 Marks)**

b. List and explain the threads of PLM. **(12 Marks)**

2 a. Explain any three characteristics of PLM. **(12 Marks)**

b. Explain briefly the following internal drivers of PLM :
i) Productivity ii) Innovation iii) Collaboration iv) Quality. **(08 Marks)**

3 a. Explain clearly the chick in and check out concepts. **(08 Marks)**

b. Explain briefly the following :
i) Work flow ii) PDM system iii) Meta data. **(12 Marks)**

4 a. Explain PLM maturity model in detail. **(10 Marks)**

b. Explain briefly any two of following :
i) Collaborative product development management [cPDm].
ii) Product reuse.
iii) Engineering vaulting. **(10 Marks)**

PART – B

5 a. Explain the tools of communication for collaborative work. **(10 Marks)**

b. Explain the procedure of creation of animations in assembly instructions on 3D. **(10 Marks)**

6 a. What is Knowledge Management? Explain Parameterization of design. **(10 Marks)**

b. Explain any two of the following :
i) Publication ii) Formula iii) Reaction. **(10 Marks)**

7 a. Define Digital Manufacturing and list any eight benefits. **(10 Marks)**

b. Write a short note on Virtual learning curve and explain manufacturing the first one. **(10 Marks)**

8 a. What is Strategy? Explain the impact of strategy on PLM. **(10 Marks)**

b. How to assess the current systems of PLM? Mention any four applications. **(10 Marks)**

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