BE-Sem-VII-CBSGS-Mech-M.D-II   22/11/17

Q. P. Code: 25207

(3 Hours)   Marks: 80

- Question No. 1 is compulsory.
- Attempt any three questions from the remaining.
- Assumption made should be clearly stated.
- Use of standard Design Data Book by PSG, Mahadevan is permitted.

Q.1   **Answer any four**

(a) Write the Assumption made by Lewis and derive Lewis beam strength equation.   5
(b) Write the difference between Hydrostatic Bearing and Hydrodynamic Bearing.   5
(c) Write Classification of clutch and according to uniform wear theory, prove that for   5
maximum torque capacity of plate clutch, $R_i = 0.577 R_o$
(d) What is pressure angle in cam, explain the significance of pressure angle in cam and   5
follower design.
(e) With neat sketch explain force analysis of Bevel gear.   5

Q.2   A single stage helical gear box is used to transmit 12.5 KW power at 1440 rpm of   20
pinion. The desire transmission ratio is 5:1
Assume 20 degree FD involute profile and material C50 for pinion and gear.
i)   Find the module
ii)   Check gear for Lewis dynamic load
iii)   Check gear for contact stresses.
iv)   Write constructional details.

Q.3   (a) Design a Worm and worm wheel drive to run a reciprocating feeder at 40 rpm from   15
the motor which run at 1440 rpm and delivers power of 15KW. Also check for thermal
criteria.

(b) What are the materials commonly used for mechanical seals. Explain Stationary and   5
Rotating Mechanical Seal with application.

Q.4   (a) A full journal bearing has a following specification,   10
Application: Centrifugal Pump
Load to be supported: 10KN
Speed: 960 RPM
Oil used : SAE 20
Diametral Clearance Ratio, D/C : 1000
Find, 1) Dimensions of the bearing, 2) Co-efficient of friction, 3) Minimum Film
Thickness, 4) Temperature rise of oil 5) Heat generated and Heat Dissipated.

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(b) Select suitable DGBB for the shaft diameter of 60mm and reliability of 98 percentage, which rotates at 1440rpm with radial load of 2500N and Axial load of 1200N, Expected life of the bearing is 25000 hrs and load factor is 1.2.   10

Q.5 (a) Design a chain based on bearing failure and check for tensile failure for the following specification. (Design should include, Number of teeths on sprockets, centre distance, pitch, number of link and chain length)   10

Specification:

I.	Rated power	: 4 KW
II.	Input speed	: 90 rpm
III.	Output speed	: 20 rpm
IV.	Nature of load and duty: mild shock and 8 - 10 hrs.	

(b) Find the flat belt dimensions and life in hours for the following specification, Power = 10 KW, Input Speed =1440 rpm, Output Speed = 480rpm, Centre Distance = 3 m.   10

Q.6 (a) A multiplate clutch is used to transmit 10KW power at 1440 rpm. The inner and outer diameter of contacting surfaces are 60mm and 100mm respectively. Coefficient of friction is 0.15 and permissible intensity of pressure is 0.25MPa. Determine1) The number of pressure plate and friction plate, 2) The axial force required to transmit power, 3) The actual average pressure, 4) The actual maximum pressure intensity after wear.   10

(b) A Rotary disc cam with central translatery roller follower has following motion. Forward Stroke of 25mm in 120^0 of cam rotation with SHM motion, dwell of 60^0 of cam rotation and return stroke of 25mm in 100^0 of cam rotation with SHM. Remaining dwell to complete the cycle. Mass of the follower is 1Kg and cam shaft speed is 600 rpm .The maximum pressure angle during forward stroke and return stroke is limited to 25^0. The external force during forward stroke is 300 N and that of return stroke is 50N.   10

    I.   Draw displacement , Velocity and Acceleration time diagram
    II. Find Prime circle radius, Base circle radius
    III. Calculate radius of curvature of pitch curve and cam profile
    IV. Determine the face width of the cam based on contact stress.

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144   B.E - Sem - VII - CBSGS - Mechanical - CAD/CAM   28/11/1.

Q. P. Code: 24915

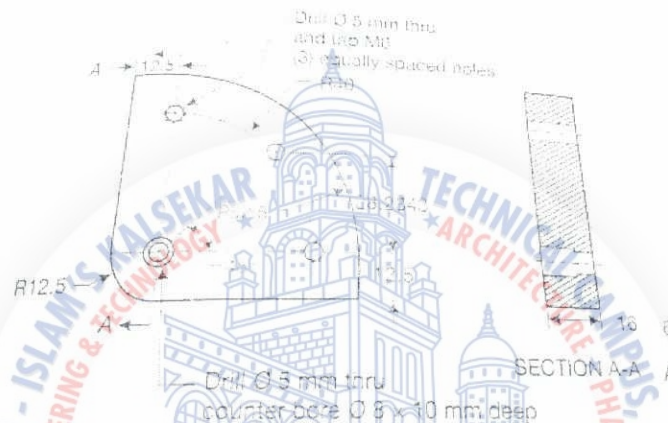(3 Hours)   Max. Marks: 80

Note:
1. **Question 1 is Compulsory**
2. Solve any three from remaining five
3. Figures to right indicate full marks
4. Assume suitable data if necessary

Question No.			Max. Marks
Q.1		Explain **any four** of the following:	20
		(a) Viewing transformation.	
		(b) Why is the rapid prototyping used?	
		(c) Benefits of CIM	
		(d) What is the need for concatenation of transformation?	
		(e) Machining Centers and its types	
		(f) Parameter optimization	
Q.2	a)	Determine the parametric representation of the line segment between the position vectors P_1 [1 1] and P_2 [4 5]. Find the slope and tangent vectors for the line.	10
	b)	Explain Selective Laser Sintering (SLS). How is it different from 3D printing?	10
Q.3	a)	Explain significance of (i) Data capture techniques and (ii) Socio-techno-economic aspects with respect to Computer Integrated Manufacturing (CIM) and technology driven practices.	10
	b)	A Square with an edge length of 10 units is located on the origin with one of the edges at an angle of 30^0 with the X-axis. Calculate the new position of the square if it is rotated about the Z-axis by an angle of 30^0 in the clock wise direction.	10
Q.4	a)	What are the different types of errors which may get introduced while converting the CAD solid model into RPT compatible format?	6
	b)	What are the major steps to solve the problem using FEM? Whether it gives exact answer? Why it has become popular?	6
	c)	The coordinates of four data points P_0, P_1, P_2 and P_3 are (2,2,0), (2,3,0), (3,3,0) and (3,2,0) respectively. Find the equation of Bezier curve and determine the coordinates of points on the curve for u =0, 0.25, 0.5 and 0.75.	8

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Q.5 a) Explain CAE Case study based on modeling and analysis of structural   10
        (vibration analysis) system.

     b) Write complete part program using the ISO codes for the different holes   10
        present in the component as shown in figure. The operations and tools
        required are given below.

Op.No.	Description	Tools required
1	Drill one hole	Twist drill 5 mm dia
2	Counter bore one hole	End mill 8 mm dia
3	Drill three holes	Twist drill 5 mm dia
4	Tapping three holes	Machine Tap M6

Q.6 Write short note on :   20
     a) Role of CAD/CAM in CIM.
     b) Rapid Tooling
     c) P & H refinement methods of CAE.
     d) Feedback devices

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BE-MECHANICAL-VII- CBSGS — MUS

(146)

QP CODE : 27421

(3 Hours)   (Maximum Marks – 80)

Note:

1. Question No.1 is compulsory.

2. Attempt any three questions from remaining five questions.

3. Assume suitable data if required.

Q.1   Solve any four   (20)

    a. State advantages of multistage reciprocating compressor.

    b. Describe the function of air vessel in reciprocating pump with the help of neat sketch.

    c. Differentiate centrifugal pump and reciprocating pump.

    d. What is the basic criteria in selecting the piping network in compressed air system?

    e. Why axial flow compressors are used for jet aircraft applications?

Q.2   a)   Derive an expression for volumetric efficiency of single stage single acting   (12)
reciprocating air compressor with clearance and discuss atleast four factors which affect volumetric efficiency.

    b)   A rotary air compressor working between 1 bar and 2.5 bar has internal and external   (08)
diameters of impeller as 300 mm and 600 mm respectively. The vane angle at inlet and outlet are 30^0 and 45^0 respectively. If air enters impeller at 15 m/s. Find speed of impeller in r.p.m. and work done per kg of air.

Q.3   a)   A single acting reciprocating pump having 12 cm diameter and 25 cm stroke takes liquid   (12)
from sump at 2 m below the center of pump and delivers to tank at 10 m above the center of pump. The diameter of suction and delivery pipes is 8 cm each and length of suction pipe is 3 m and delivery pipe is 12 m. Only one air vessel is placed to the delivery pipe very near to the pump axis. The separation pressure is 88 KN/m^2 below atmospheric pressure. Taking density of liquid as 1200 kg/m^3 and f = 0.01, find maximum speed of the pump without separation and power required to run the pump.

    b)   Define NPSH, Thoma's cavitation factor and suction specific speed of pump. Explain   (08)
NPSHA and NPSHR w.r.t. cavitation in pumps using neat sketch.

[TURN OVER

Q.4 a) Draw an indicator diagram, considering the effect of acceleration and friction in suction and delivery pipes. Derive an expression for the work done per second in case of a single-acting reciprocating pump. (10)

b) A two stage single acting Reciprocating compressor takes in air at the rate of 0.2 m³/s. The intake temperature and pressure of air are 0.1 MPa and 16°C. The air is compressed to final pressure of 0.7 MPa. The intermediate pressure is ideal and cooling is perfect. The compression index in both the stages is 1.25 and the compressor runs at 600 r.p.m. Neglect clearance and determine (10)
   1. Intermediate pressure
   2. Total volume of each cylinder
   3. Power required to drive the compressor.
   4. Rate of heat rejection in the intercooler.

Q.5 a) Explain construction and working of centrifugal compressor with the help of neat sketch. (08)

b) A centrifugal pump runs at 1440 r.p.m. The impeller is 40 cm in diameter and 2.5 cm wide at outlet. The pump lifts water through height of 30 m of which suction lift is 2.5m. The suction and delivery pipes are 30 cm in diameter. The losses due to friction in suction and delivery pipes are 1.5 m and 5.5 m respectively. The exit blade angle is 25°. Assume the flow to be radial at inlet and monomeric efficiency is 84%. Calculate quantity of water flowing through the pump and pressure at suction and delivery end of pump if atmospheric pressure is 10.35 m of water. (12)

Q.6 Solve any four (20)

   a. Why capacity control of compressors is essential? State the methods of capacity control in compressor.
   b. Explain chocking, surging and stalling in axial flow compressor with the help of neat sketch.
   c. Define coefficient of discharge, volumetric efficiency and slip in reciprocating pump. Describe negative slip with proper reason.
   d. Describe the methods of speed reduction to meet variable flow reduction in pumping system.
   e. Draw and comment on performance characteristics of reciprocating pump.

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B.E-Sem-VII - CBSGS- Mechanical- PP&C   12/12/1

Q.P. Code: 27216

(Three Hours)   Total Marks: 80

N.B.: (1) Question No. 1 is compulsory.
    (2) Answer any **three** questions out of the remaining **five** questions.
    (3) Figures to the right indicate full marks.
    (4) Illustrate answers with neat sketches where ever required.
    (5) Answers to the questions should be grouped and written together.
    (6) Assume suitable data if required.

Q1.   Answer any four
  (a)   What are the components and types for a Manufacturing systems   5
  (b)   What are the prerequisites of PPC   5
  (c)   Define the terms: lead time, safety stock, reorder point and maximum inventory.   5
  (d)   What are the characteristics of forecasting?   5
  (e)   Explain optimistic time, most likely time and pessimistic time for PERT.   5

Q2. (a)   How the size of an organization affects the various Factors which influence the PPC.   10
  (b)   What is a work order? What is its importance? Explain with suitable example.   10

Q3. (a)   The demand for an item is deterministic and constant over time and is equal to 600 units per year. The unit cost of the item is Rs.50 while the cost of placing an order is Rs.5. The inventory carrying cost is 20% of the cost of inventory per annum and the cost of shortage is Rs.1 per month. Find the optimal ordering quantity when stock outs are permitted. If the stock outs are not permitted what would be the loss to company.   10
  (b)   Explain **any one** with example: 10
       1. Two bin system of inventory control
       2. ABC analysis for inventory Control

Q4. (a)   Why process planning is needed? Explain the various types of Computer Aided Process Planning.   10
  (b)   The following data gives the sales of the company for the various years. Fit the straight line and forecast the sales for the year 2018 and 2019. [Tabulate the calculations]   10

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
Sale Rs. (000)	13	20	20	28	30	32	33	38	43

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Q5. (a) Discuss the importance of process planning. Also discuss in brief the types of   10
process planning.

(b) A company has three factories X, Y, Z. It supplies goods to four warehouses W1, W2,   10
W3 and W4. The production capacities of the factories and demand of the warehouses
are as shown in the table. Determine the optimal solution of the problem.

		Warehouse				
		W1	W2	W3	W4	Production Capacity
Factory	X	19	30	50	12	7
	Y	70	30	40	60	10
	Z	40	10	60	20	18
Demand		5	8	7	15	

Q6. (a) Consider the LPP and solve by Simplex method   10

Maximize $Z = 4X_1 + 3X_2 + 6X_3$

Subject to

$$2X_1 + 3X_2 + 2X_3 \leq 440$$
$$4X_1 + 32X_3 \leq 470$$
$$2X_1 + 5X_3 \leq 430$$

$$X_1, X_2, X_3 \geq 0$$

(b) A Project consist of following six activities :   10

Activity	Normal time N(t)	Crash time (ct)	Normal cost	Crash cost
1—2	3	2	1600	1800
1—3	7	5	1400	2000
2—3	5	3	2500	3000
3—4	4	3	500	800
3—5	2	1	4200	4400
4—5	8	6	1600	2600

     i.   Draw the network for the activities stated above

    ii.   Identify the Critical Path

   iii.   What is Total Project duration and associated cost.

   iv.   If the duration of project to be reduced by 1 week, which activity or
activities duration to be reduced? What will be the total project cost?

Correction in QP Code: 27216

University of Mumbai

Correction in Program Code: T5327 - B.E.(MECHANICAL ENGG)(SEM VII) (CBSGS)(REV-2012) / T1274 - Production Planning & Control   **QP Code: 27216**

please note the correction.

Q.6.(a) second equation should be read as 4X1+3X3<=470 instead of 4X1+32X3<=470

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B.E - Sem-VII - CBSGS - Mechanical - PPE　　　　6/12/17

Q. P. Code : 27997

[Time : 3 hours]　　　　　　　　　　[Marks : 80]

N.B. :　1) Question No. 1 is compulsory.
　　　　2) Attempt any three questions from remaining Five.
　　　　3) Assume suitable Data wherever necessary.
　　　　4) Justify your answers with diagrams and graphs.

Q.1　　Write short notes on any four:-　　　　　　　　　　　　20
　　　i)　Methods of ash disposal.
　　　ii)　Electrostatic precipitator.
　　　iii)　Half life and radioactive decay.
　　　iv)　Modified rankine cycle.
　　　v)　Advantages of combined cycle power plants.

Q.2 (a)　Prove that efficiency of power plant will be maximum at load where heat　　10
　　　　rate is equal to incremental heat rate.

Q.2 (b)　Calculate cost of generation per unit delivered from power plant if　　06
　　　　Installed capacity is 200 MW, annual load factor is 0.4, capital cost of
　　　　power plant is 280 lac, annual expenses are 60 lac and interest and
　　　　depreciation is 13%

Q.2 (c)　The turbine is to operate under a head of 24 m at 200 r.p.m. The　　04
　　　　discharge is 8.5 m³/s. If overall efficiency is 88 % determine power
　　　　generated and specific speed of turbine.

Q.3(a)　An electrical system of 120 MW capacity experiences linear changes in　　08
　　　　load such that its daily load curve is identified as follows

Time	Load (MW)	Time	Load(MW)
12 PM	24	12.30 PM	48
2 AM	12	1 PM	60
6 AM	12	5 PM	60
8 AM	60	6 PM	84
12 AM	60	12 PM	24

　　　　Plot the chronological and load duration curve for the system, find the
　　　　load factor and utilization factor.

Q.3(b)　Describe in-plant coal handling scheme.　　　　　　　　08

Q.3(c)　Explain working of saddle siphon spillway.　　　　　　04

page 1 of 2

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Q.4 (a)   The nature of the load required for 24 hours and thermal efficiencies of   12
          the plant at the respective loads are as follows:

Time period	Load(MW)	Thermal efficiency
10 AM - 6 PM	120	32%
6 PM - 8 PM	60	24%
8 PM - 12 AM	30	15%
12 AM – 6 AM	15	10%
6 AM – 10 AM	75	25%

i) Find total input to thermal plant if the load is supplied by the
   Single thermal plant only.
i) If the above load is taken by combined thermal and hydro power
   Plants then find the % saving in the input to the plant.
   Take Thermal efficiency at full load = 32 %
ii) Find overall efficiencies in both cases.

In hydraulic plant pump efficiency is 82% and turbine efficiency is 92%.

Q.4 (b)   What is depreciation? Explain different methods to calculate depreciation   08
          cost.

Q.5 (a)   A gas turbine unit with pressure ratio of 6:1 and maximum cycle   10
          temperature of 610 °C. has the isentropic efficiencies of the compressor
          and turbine; 0.8 and 0.82 respectively. Calculate the power o/p in kW of
          an electric generator geared to the turbine when air enters compressor at
          15 °C at the rate of 16 kg/s. Take $Cp = 1.005$ kJ/kg K and $\gamma = 1.4$ for
          compression and $Cp = 1.005$ kJ/kg K and $\gamma = 1.3$ for expansion process.

Q.5 (b)   What are the methods of reducing the wheel or rotor speed of steam   10
          turbines?

Q.6   Answer any Four:-   20
          i)   Classify nuclear reactors.
          ii)   Write short note on selection of type of dam.
          iii) Compare steam power plant and hydroelectric power plant.
          iv)   Write short note on Spreader stoker.
          v)   What is chain reaction? What is significance of multiplication
                Factor?

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